

Audio

FEBRUARY 1985 • \$2.00

MFSL'S
ROLLING STONES
COLLECTION

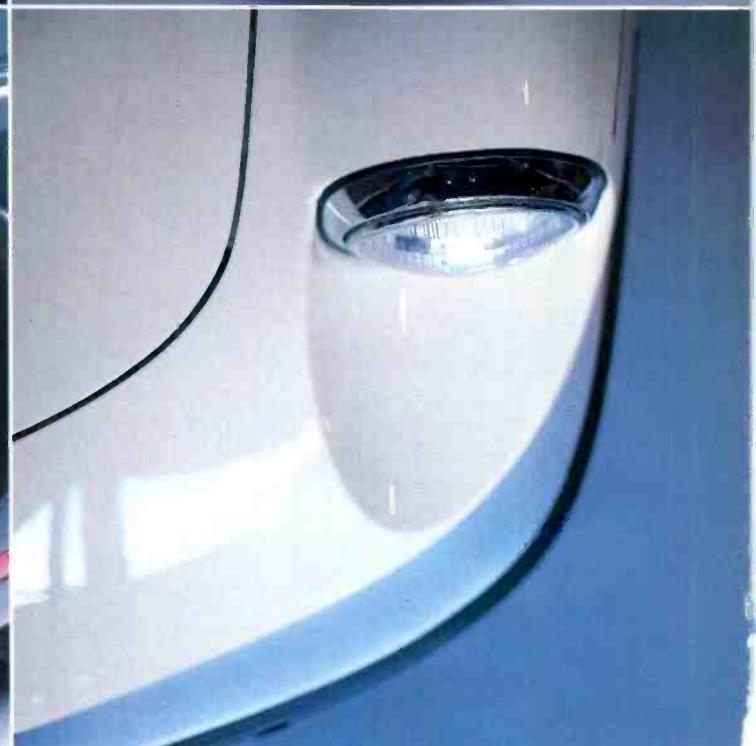
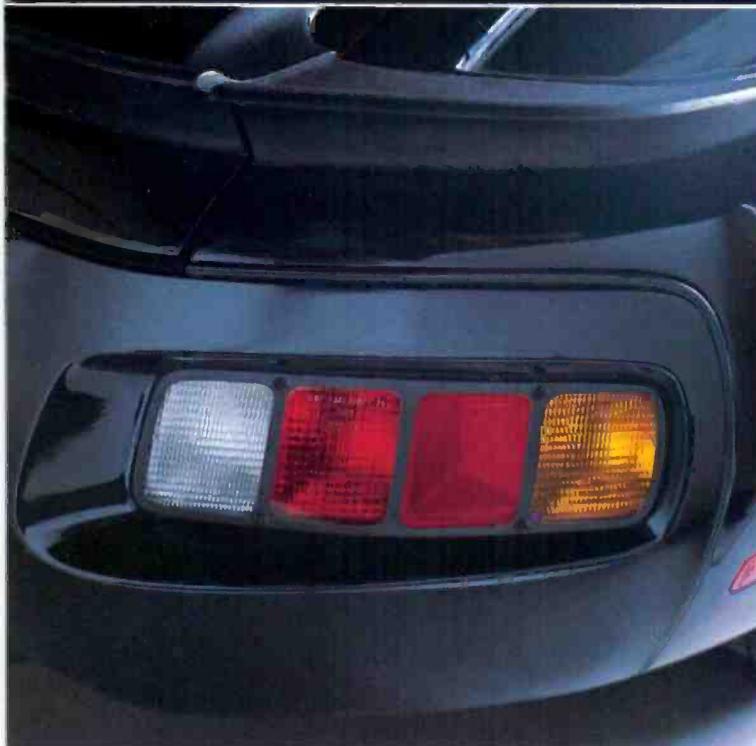
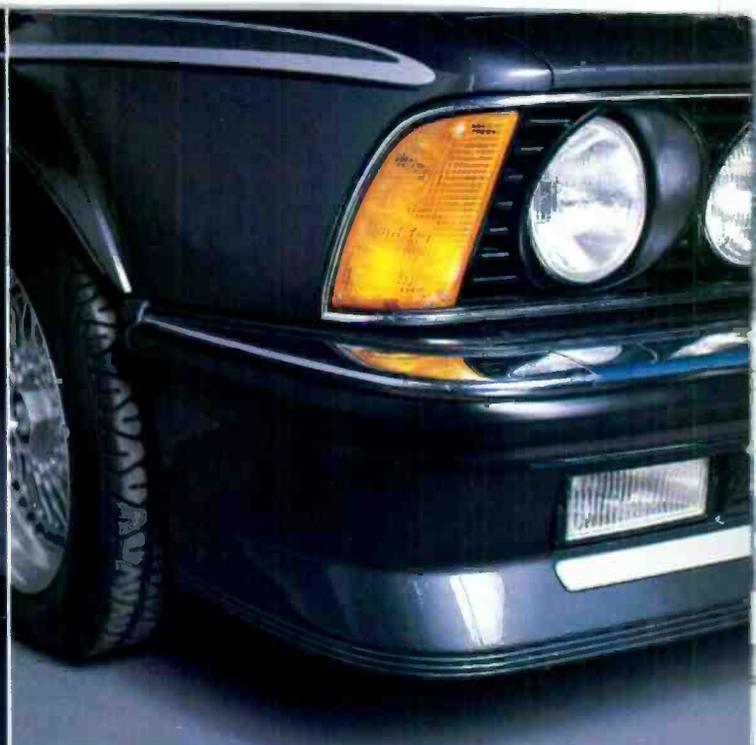
BREAKTHROUGH UNIT:
PIONEER CLD-900
PLAYS LASER DISCS
AND COMPACT DISCS!

**NOISE - REDUCTION
ADD - ON UNITS:**
ONE FOR TAPE, ONE
FOR ANY SOURCE



TESTED:
TECHNICS SP-10 TURNTABLE
SIGNET TK10ML CARTRIDGE





Very few companies selling car stereos are real *audio* companies. With 75 years of experience reproducing sound, Denon simply wishes to point out the level of their home audio technology present in the new DC-series of car audio equipment.

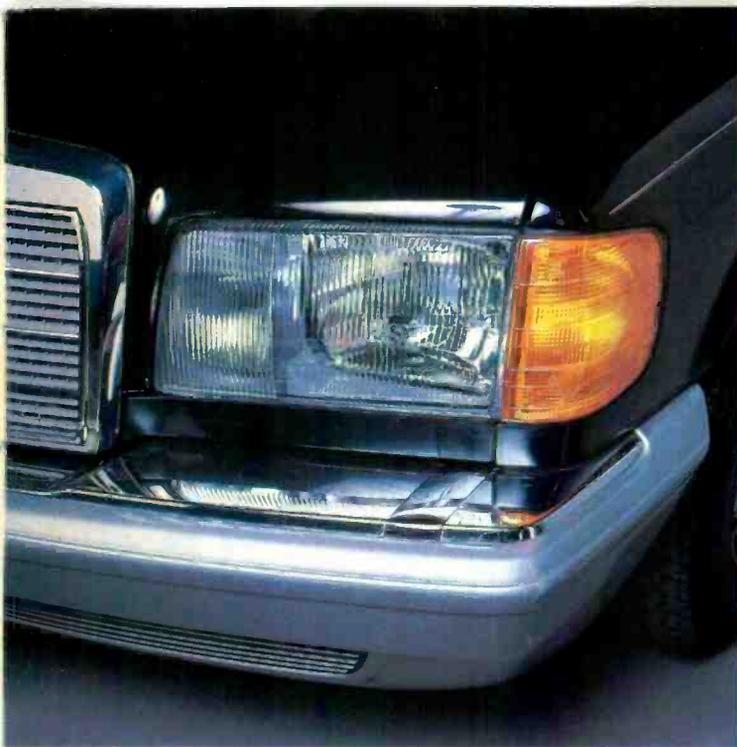
For example, the only audio components—home or auto—offering the level of circuit sophistication found on the new Denon Car Audio DCA-3250 Power Amplifier are Denon's own top-of-the-line receiver and separates.

Similarly, the Dynamic Range Expansion circuitry found on Denon's new Car Audio DCR-7600 AM/FM Stereo Tuner/Cassette Deck otherwise can be found only on Denon's DE-70 Dynamic Equalizer.

The *differences* between Denon car and Denon home audio equipment will become apparent the moment you sit behind the wheel. To build car audio for people who love good sound as much as fine cars, Denon created a very limited, ultra-high quality range of car audio components, specifically engineered to become *part* of the automobile. Controls fall to hand and information is displayed with the *driver* clearly in mind.

For the car lover, Denon Car Audio does more than offer true auto high fidelity—it becomes an integral part of the thrill of driving.

DENON



**Finally,
car audio as good
as your car**

Enter No. 16 on Reader Service Card

Audio

FEBRUARY 1985

VOL. 69, NO. 2



See page 46.



See page 34.

FEATURES

FREQUENCY CONTOURING FOR IMAGE ENHANCEMENT	Richard J. Kaufman	34
THE DNR NOISE REDUCER: HOW IT WORKS AND HOW TO BUILD IT	Leonard Feldman and R. Aryana	40
BUILD A HIGH-PERFORMANCE NOISE REDUCER	John H. Roberts	46

EQUIPMENT PROFILES

PIONEER CLD-900 COMPACT DISC/LASERDISC PLAYER	Leonard Feldman	52
TECHNICS SP-10MK3 TURNTABLE	Edward M. Long	58
SIGNET TK10ML PHONO CARTRIDGE	B. V. Pisha	65
HITACHI DA-600 COMPACT DISC PLAYER	Leonard Feldman	71
CELESTION SL-600 LOUDSPEAKER	Anthony H. Cordesman	78

MUSIC REVIEWS

ROCK/POP RECORDINGS	Michael Tearson, Jon & Sally Tiven	82
CLASSICAL RECORDINGS	Edward Tatnall Canby	90
AUDIOPHILE RECORDINGS		96
COMPACT DISCS		102

DEPARTMENTS

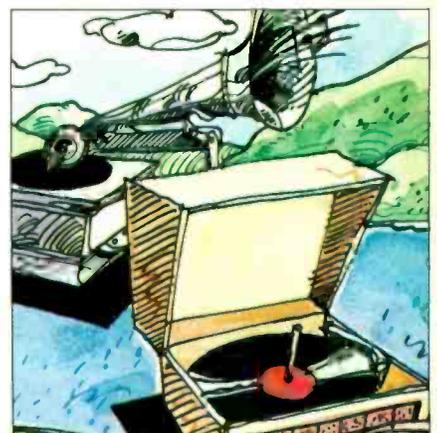
AUDIOCLINIC	Joseph Giovannelli	6
TAPE GUIDE	Herman Burstein	8
DIGITAL DOMAIN	Ken Pohlmann	10
BEHIND THE SCENES	Bert Whyte	13
WHAT'S NEW		15
AUDIO ETC	Edward Tatnall Canby	18
ROADSIGNS	David L. Clark	22
SPECTRUM	Ivan Berger	28

The Cover Equipment: Pioneer CLD-900 Compact Disc/LaserDisc player.
The Cover Photographer: Ross Elmi.

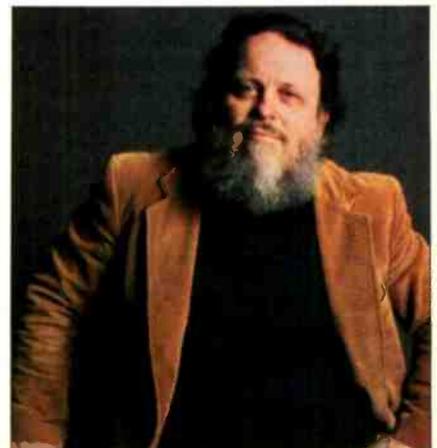
Audio Publishing, Editorial and Advertising Offices,
1515 Broadway, New York, N.Y. 10036.



Subscription Inquiries, (800) 525-9511; in Colorado (303) 447-9330.



See page 10.



See page 90.

“Magnavox? You sure?!”

(sigh!) We're not complaining, but it does get monotonous having to tell people it's really a Magnavox every time they see a Magnavox. Like with our innovative Video Camera and Stereo VCR Deck.

The Video Camera, a mere 2.4 lbs., fits into your hand. All you do to shoot is push a button. The camera is so sensitive you can shoot from the light of a birthday candle. The automatic focus guarantees crisp, clear pictures every time. You can even use 35mm lenses for special effects.

The portable Stereo VCR Recorder, just 7 lbs. with battery, slips out of the docking tuner, connects to the camera and you're ready to shoot anywhere with stereo sound.

For TV use with total remote control, the recorder slips back into the docking tuner. Incidentally, the Magnavox Stereo VCR allows the unattended recording of as many as 8 events during a 14-day period.

Ready for more? Most portable VCR's have only 2 heads, which can cause static in slow motion and fuzz in freeze frame. The Magnavox Stereo VCR with 4 heads assures you perfect pictures on all special effects.

By the way, having read this much, you might think you're reasonably equipped to recognize your next Magnavox. Sure.



MAGNAVOX

America's best kept secret.

Audio

Eugene Pitts III
Editor

Art Director: Cathy Cacchione

Technical Editor: Ivan Berger
Managing Editor: Kay Blumenthal
Assistant Art Director: Linda Zerella
Assistant Editor: Andrea Lynne Hecker

Associate Editors:
Edward Tatnall Canby, Bert Whyte, B. V. Pisha

Senior Editors:
Leonard Feldman, Richard C. Heyser,
Howard A. Roberson

Editor-At-Large: David Lander
Audio Retailer Section Editor:
Luther Sperberg

Contributing Editors/Artist:
Herman Burstein, David L. Clark,
Anthony H. Cordesman, Ted Costa,
John M. Eargle, Joseph Giovanelli,
Laurence L. Greenhill, Bascom H. King,
Edward M. Long, C. G. McProud,
Peter W. Mitchell, Jon Sank, Donald Spoto,
Len Strazewski, Michael Tearson,
Jon & Sally Tiven, Paulette Weiss

General Manager: Mary Anne Holley
Production Manager: Patti Burns
Special Projects Coordinator: Phyllis K. Brady
Ad Coordinator: Ruth M. Linehan

Roman Beyer
V.P./Publisher

ADVERTISING

Advertising Director: Stephen Goldberg
(212) 719-6335

Eastern & Audio Retailer
Sales Manager: Stephen W. Withoff
(212) 719-6337

Account Managers: Susan L. Newkirk
(212) 719-6346
Lesia Rader Giberson
(212) 719-6291

Western Manager: William J. Curtis
Regional Manager: Joy Aronson
(213) 827-8655

Classified Manager: Laura J. LoVecchio
(212) 719-6338

OPERATIONS

Circulation Director: Leon Rosenfield
Production Director: David Rose
Research Director: Lester Abberbock

CBS MAGAZINES EXECUTIVE STAFF

President: Peter G. Diamandis
Sr. V.P./Adv.: Michael J. O'Neill
V.P., Finance & Adm'n.: Robert J. Granata
V.P., Circulation: Robert F. Spillane
V.P., Mfg. & Distribution: Murray Romer

AUDIO (ISSN 0004-752X, Dewey Decimal Number 621.381 or 778.5), including **AUDIO RETAILER**, is published monthly by CBS Magazines, A Division of CBS Inc., at 1515 Broadway, New York, N.Y. 10036. Printed in U.S.A. at Nashville, Tenn. Distributed by CBS Magazine Marketing. Second class postage paid at New York, N.Y. 10001 and additional mailing offices. Subscriptions in the U.S., \$17.94 for one year, \$32.94 for two years, \$45.94 for three years; other countries, add \$6.00 per year.

AUDIO is a registered trademark of CBS Inc. ©1985, CBS Magazines, A Division of CBS Inc. All rights reserved.

Editorial contributions are welcomed but should be accompanied by return postage. Submissions will be handled with reasonable care, but the Editor assumes no responsibility for safety or return of manuscripts, photographs, or artwork. The Publisher, in his sole discretion, reserves the right to reject any ad copy he deems inappropriate.

AUDIO Publishing, Editorial and Advertising Production offices, 1515 Broadway, New York, N.Y. 10036. Subscription offices, P.O. Box 5318, 1255 Portland Place, Boulder, Colo. 80322; (800) 525-9511, (303) 447-9330 in Colorado. Postmaster: Send change of address to P.O. Box 5316, 1255 Portland Place, Boulder, Colo. 80302.

Introducing The First CBS Masterworks Artist Laureate.



Isaac Stern

As a master violinist with a long and outstanding career as a concert and recording artist, cultural ambassador and dedicated teacher, Isaac Stern certainly needs no introduction. Among his countless achievements, he is a recent recipient of the Kennedy Center Honors and a long-time and tireless Carnegie Hall supporter.

In proud recognition of a recording relationship that spans 4 decades CBS Masterworks has now honored Isaac Stern as our first *Artist Laureate*—in acknowledgment of his unique and distinguished career.

It is an award no man deserves more.

And an accolade we at CBS Masterworks are extremely proud to bestow.



© CBS. "Masterworks" and the CBS Masterworks logo are trademarks of CBS Inc. © 1984 CBS Inc.

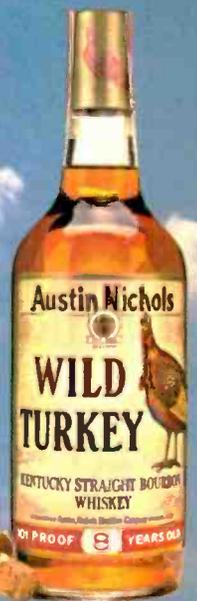
MASTERWORKS

Enter No. 13 on Reader Service Card



Fly First Class.

**Wild Turkey. It's not the best because it's expensive.
It's expensive because it's the best.**



Now you can send a gift of Wild Turkey® 101 Proof anywhere* by phone through Nationwide Gift Liquor. Call Toll Free 1-800-CHEER-UP (Arizona 602-957-4923). *Except where prohibited. Major credit cards accepted. Austin, Nichols Distilling Co., Lawrenceburg, KY © 1985.

Vocal Elimination

Q. During a recent visit to a popular bar, I noticed that the now-extinct "mechanical bull" had been replaced by a "sing-along" machine which played hit records, but which deleted the vocal, allowing the patrons themselves to sing the track. I have seen several ads over the years for such a machine, and I have always wondered how they operate. Do they use frequency filters? Do they respond to transients? Please enlighten me so that I can know the sing-along machine as well as I knew the mechanical bull!—Scott Hampton, De Kalb, Ill.

A. The odds are that you were not listening to hit records with deleted vocals, but to specially made records with no vocal tracks, intended for just this purpose. The Japanese call this "karaoke" (which means "empty orchestra"). It's quite popular in Japan, and many karaoke recordings already exist.

However, you may be correct in assuming that these were ordinary records whose vocals had been deleted electronically. This is usually done by wiring one channel out of phase with the other, then combining the channels. Vocals are usually centered in the mix, with equal amplitude in both channels, and so will be cancelled out. All other center-channel or monophonic information will be cancelled out as well, including most of the bass. Instruments which are recorded primarily in one channel or the other will still be heard.

The process usually results in a thin sound, monophonic and bassless. (If the vocalist is female, however, it is often possible to boost the bass in one channel, increasing bass response while still keeping the voice out of the mix.) Any reverberation added to the voice in the recording will be stereophonic, and therefore won't be cancelled by this system. Though blurred, the vocal is still audible. But in a noisy environment such as you describe, this echo of a voice is not likely to be all that annoying.

Tuner Loss of Highs in Mono

Q. After removing my tuner from its equipment cabinet in order to clean and dust around it, and, after reattaching it, I noticed something strange.

When I switch my tuner from stereo to mono, the highs seem to disappear on certain program material. When programs are broadcast in mono, the switching between stereo and mono has no effect on the highs whatsoever.

I have also noticed that some instruments disappear almost completely when I set my tuner switch to mono, and this is not just a loss of highs. Please let me know what's happening, in case I should have to return my tuner for alignment during the warranty period.—Larry Cook, Albany, Ga.

A. The symptoms you describe are those of phasing problems, either in your system or, more likely, at the broadcasting stations.

It's a bit puzzling why a tuner new enough to be under warranty should need to be removed for cleaning and dusting. If the tuner is new, and if your previous tuner did not show these symptoms, then perhaps you should have it checked. The same holds true if the tuner is not new, but you are certain the problem did not exist before.

However, it's more probable that you are more aware of this situation now because, having rearranged your system, you are doing much more critical listening than you normally would if you were not trying to be certain that you have your system properly reassembled. Tuners are subject to far greater mishandling during shipping than you have subjected yours to during your cleaning. You definitely did not misalign it.

So what is causing these phenomena? The loss of highs you have described is quite common and is to be expected. This phenomenon depends upon the program source the station is using. If the source is a phonograph record, you may not hear this effect at all. If, however, the source is a tape—and this is possible even when you believe it is a record—you will hear this loss of highs because of phase differences between the channels of the playback head of the machine reproducing the program with respect to the recording head of the machine on which it was recorded.

The fact that some instruments virtually disappear or lose luster is a matter of the way in which they were mixed during the original recording. If they were so placed as to represent a dif-

ference signal (vertical modulation, on a disc), these instruments will disappear when your tuner is switched to mono. This is reasonable when you recall that mono implies that only information common to both channels will be reproduced.

Phase Inversion

Q. There is an amplifier specification which describes whether or not there is phase inversion in a given piece of audio equipment. What is the sonic significance of this?—Jeff Horowitz, Poughkeepsie, N.Y.

A. In general, whether a piece of equipment inverts phase or not makes little difference to the sound it produces. The only time the phase relationship between input and output absolutely must be taken into consideration is when bi-amplifying a speaker system. If one of the amplifiers inverts phase and the second one does not, the upper and lower frequency drivers will be out of phase with one another, even when they are "properly" connected. Even then, swapping the two connections to one of the speakers should solve the problem.

If an amplifier does not invert phase, then positive-going signals applied to its input will produce positive-going output signals; if it inverts phase, then positive-going inputs produce negative-going outputs, 180° out of phase.

(Editor's Note: In a recent demonstration of an amplifier with a phase-reversal switch, I noted that sounds seemed to move forward or back depending on the switch position, and that there also seemed to be some slight, subjective frequency response effects. The same effect can be obtained—though less dramatically, because of the delay involved—through reversing both sets of speaker connections, plus to minus and vice versa. Phasing also varies from record to record, so no amplifier will be "correct" all the time; if you care about correcting it for individual records, you'll have to set up a switch to reverse the phase of both channels at once.—I.B.) 

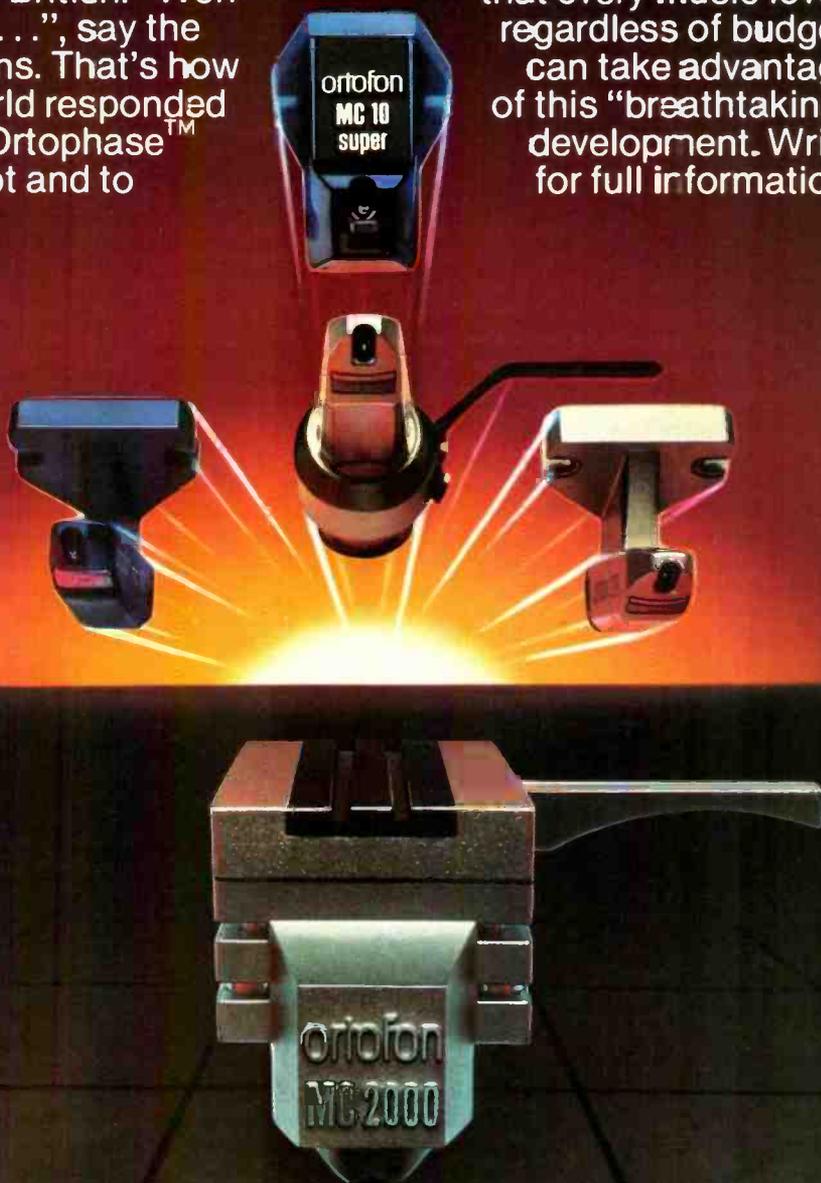
If you have a problem or question about audio, write to Mr. Joseph Giovanelli at AUDIO Magazine, 1515 Broadway, New York, N.Y. 10036. All letters are answered. Please enclose a stamped, self-addressed envelope.

ORTOPHASE™

And listening can never be the same again.

"Breathtaking . . .", say the U.S. critics. "Habit forming . . .", say the Swedes. "Heavenly . . .", say the Danes. ". . . Cannot fail to delight . . .", say the British. "Wonderbar . . .", say the Germans. That's how the world responded to the Ortophase™ concept and to

the spectacular Ortofon MC2000. Now the Ortophase principle has been incorporated into a full range of moving coil cartridges. This means that every music lover, regardless of budget, can take advantage of this "breathtaking" development. Write for full information.



ortofon

122 Dupont Street, Plainview, New York 118C3

Send \$1 for beautiful, Ortofon poster.

Enter No. 32 on Reader Service Card

TAPE GUIDE

HERMAN BURSTEIN

Tape Hiss

Q. I have about 95 cassette recordings made from FM on an old deck. Although recorded with Dolby NR, they have considerable tape hiss. They still sound pretty darn good, except for the hiss—my main problem. Some of these tapes are priceless to me, so I am not disposed to just forget about them, as one person suggested. What is the best way to get optimum fidelity but with a reduction in tape hiss? For example, should I dub my tapes onto new tapes, perhaps metal? Would I dub with Dolby C NR on the recording deck? If you say I shouldn't dub, would I play my tapes on a new deck with Dolby B or Dolby C? Which produces less hiss?—William R. Charmack, Miami, Fla.

A. Once noise is on the tape, there is no way to reduce it by means of dubbing. However, one can often get more or less satisfactory results by using a dynamic filtering noise-reduction unit. This is sometimes called a single-ended NR system because it operates only in playback, in contrast to double-ended systems, such as Dolby and dbx, which encode in recording and decode in playback. (See the October 1984 issue of *Audio* for a directory of NR units, both single- and double-ended, and the plans elsewhere in this issue for building both types.)

If you don't mind losing some of the music's treble, you could play your tapes with Dolby C, which would provide more treble cut than Dolby B, thus reducing noise at the same time.

EE Open-Reel Deck

Q. I am considering the purchase of an open-reel tape deck and would like to know whether one equipped for EE tape is worth it. Can these particular tapes be played on a deck without EE equalization?—Conrad Szablewski, Flushing, N.Y.

A. Yes, EE (extra efficiency) is worth it if you obtain a deck with proper equalization and bias for EE tape. Such tape takes advantage of the technological developments that have given us greatly improved cassette tapes. EE tape makes it possible, using an open-reel deck, to obtain performance virtually as good as regular tape, but at half-speed; for example, as good at 3¾ ips as regular tape at

7½ ips. This would be particularly true with respect to frequency response and signal-to-noise ratio. Azimuth problems, however, would not be alleviated; that is, they would be the same at a given speed (say, 3¾ ips) no matter whether EE or conventional tape is employed.

EE tape calls for playback equalization of 35 μ S at 15 ips, 50 μ S at 7½ ips, 90 μ S at 3¾ ips, and 120 μ S at 1½ ips. The respective turnover frequencies (points at which bass boost is up 3 dB) are 4.547, 3.183, 1.768, and 1.326 kHz. Most open-reel decks will come reasonably close to these playback requirements if they don't exactly match them; that is, the effect on frequency response will not exceed about 3 dB. To illustrate, if you operate at 15 ips and have to use 50- μ S instead of 35- μ S playback equalization, this will result in a mild treble boost reaching a maximum of about 3 dB.

Abrasive Tape?

Q. Will using metal tapes wear out the heads faster than would ferric, chrome, or ferricobalt tapes?—Gary Haymov, Forest Hills, N.Y.

A. I have come across no evidence or authoritative claims that metal-particle (Type IV) tapes are more abrasive than the other types. Perhaps the term "metal" is suggestive of greater abrasive power. However, the other tapes also have metal coatings—iron or chrome or a combination of the two—except that these coatings are in oxide form, that is, combined with oxygen.

In the early days of chromium dioxide tape, there were reports that it was more abrasive than ferric oxide tapes. However, these reports were disproved; in fact, if anything, the chrome tapes were somewhat less abrasive. Now, in the case of metal-particle tapes, it seems that history is repeating itself.

Treble Deficiency

Q. I have an open-reel deck with EE tape capability and dbx noise reduction. I have been using ferric tape at slow speed with dbx on. But some of the highs seem to be lost; the recording seems compressed. When I use EE tape or increase the speed or turn off the dbx, the situation improves, but not enough. Also, when dbx is off, the tape

hiss is much too noticeable. I have recorded FM interstation noise and compared the tape playback with the source; the playback FM noise seems about one-half octave lower in pitch than the original FM noise. Do you have any idea what the problem might be?—Kevin Beauchamp, APO, N.Y.

A. It is not clear to me whether you are using ferric tape when the deck's switches are set for EE tape. Substantially more bias is employed for EE tape than for ferric tape, and, because an increase in bias reduces treble, this could be a partial cause of your problem.

If you are correctly using the normal settings for ferric tapes and the EE settings for EE tapes, it sounds as though the bias in your deck is misadjusted and is excessive for both kinds of tape. Another possible cause of your problem is azimuth misalignment of the record head with respect to the playback head. Noise-reduction systems tend to best maintain flat frequency response when response is flat with NR off; departures from flat response tend to be exaggerated by NR systems. This could explain why your problem is partly reduced with dbx off. Still another possibility is that you are recording at excessively high levels, which would tend to reduce treble response because of tape saturation at the high end.

It seems advisable to have your deck checked out, and adjusted, by a qualified technician, preferably at an authorized service shop.

Pro vs. Amateur

Q. What is the difference between "professional" open-reel tapes and those ordinarily bought by consumers?—A. Yirsa, Brookfield, Ill.

A. Tapes of professional quality are made to top standards in such respects as freedom from dropouts, uniformity of sensitivity throughout the reel and from reel to reel, absence of splices, accurate dimensions, lubrication, uniform frequency response, low noise, etc. 

If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 1515 Broadway, New York, N.Y. 10036. All letters are answered. Please enclose a stamped, self-addressed envelope.

JBL Introduces Titanium Series loudspeakers. To tell the truth.



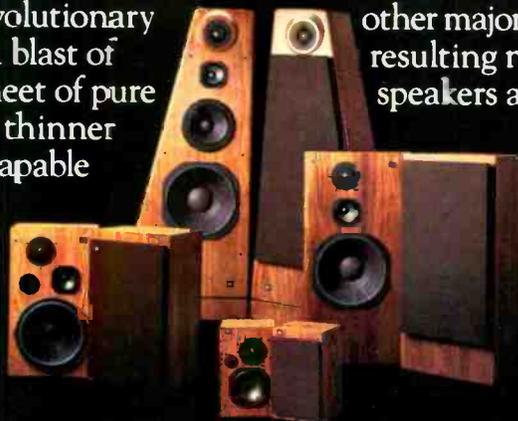
A team of specialists at JBL labored nearly five years to develop a unique manufacturing process, a patented design, a significant advance in materials application, and four stunning new loudspeaker systems.

The new Titanium Series takes its name from a truly revolutionary high frequency driver. A blast of nitrogen gas against a sheet of pure titanium creates a dome thinner than a human hair yet capable of withstanding the crushing force of more than 1000 Gs.

The new titanium high frequency driver easily copes with the

musical transients and wide dynamic range of the most demanding digital recordings, generates undistorted sound well beyond the audible range, and handles very high power without stress.

Coupled with a new midrange driver, a new dividing network, and other major and minor innovations, the resulting new Titanium Series loudspeakers are the most neutral, the most detailed, the most pleasing loudspeakers you're likely to hear. And the very best from JBL.



JBL

harman international
8500 Balboa Blvd., P.O. Box 2200
Northridge, California 91329

Pictured above: JBL's new pure titanium high frequency driver with patented diamond surround.
Enter No. 23 on Reader Service Card

KEN POHLMANN

KEEPING YOUR DISTANCE

Last month we examined the pickup used to generate laser light and read the light reflected from the Compact Disc surface. I find the pickup's design truly elegant—from the semiconductor laser to the beam splitter to the photodiode, hard-nosed and pragmatic engineering is evident throughout. Of course, the pickup is but one component in the larger system, and just as a phono cartridge is useless without a tonearm, the laser pickup's success rests on two other subsystems, the automatic focus and automatic tracking circuits. This month, I'd like to look at the design of the auto-focus system.

As we saw last month, the controlling optics for both systems are designed into the pickup; sophisticated servo systems, however, are needed to guide the pickup itself. The various manufacturers and their engineers differ as to exactly the best approach (and this is where patent lawyers enter the design process), but every CD pickup employs some kind of auto-focus, all of them constructed along basically similar lines.

A Compact Disc has in the neighborhood of 10 billion bits arranged over its 8,600 square millimeters of data area. Given that kind of density, and a laser reading beam whose diameter is 1.6 to 1.7 micrometers when it hits the reflective data layer, the beam must be kept tightly focused, within $\pm 2 \mu\text{m}$. Any unfocused condition would result in inaccurate data reading. Of course, even the flattest disc isn't perfectly flat; the disc specifications acknowledge this by allowing for a deviation of $\pm 0.6 \text{ mm}$. Thus, the objective lens must be able to refocus as the disc surface wanders. A servo-driven auto-focus system manages this, utilizing the center laser beam, a four-quadrant photodiode, control electronics and a servo motor to drive the objective lens.

The unique properties of astigmatism are used to achieve automatic focusing (Fig. 1). Specifically, the cylindrical lens just prior to the photodiode performs the essential trick needed to detect an out-of-focus condition. As the distance between the objective lens and the disc reflective surface varies, the focal point of the system also changes, and the image projected by the cylindrical lens changes its

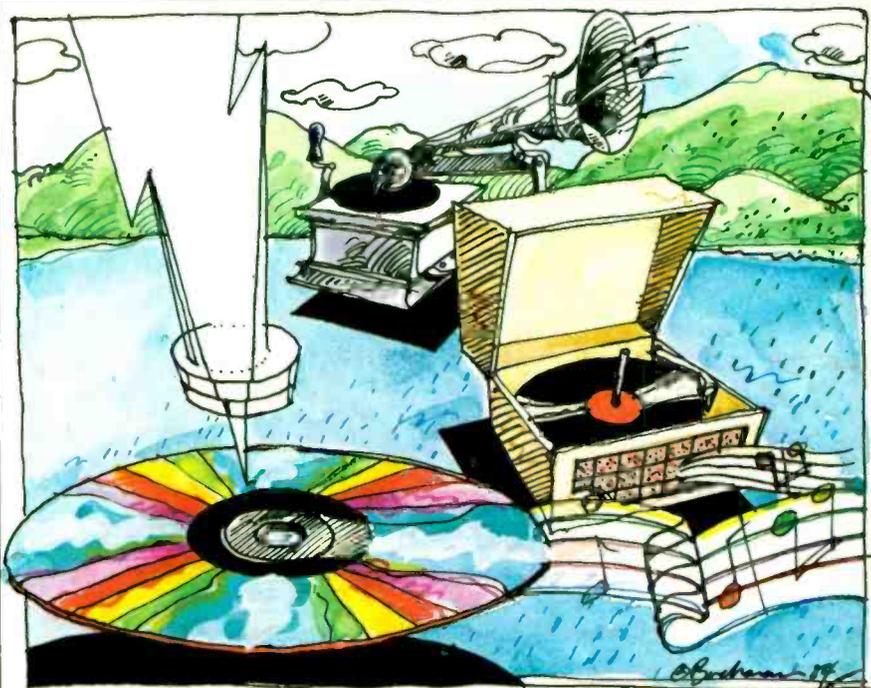


Illustration: Yvonne Buchanan

shape. That change in the image on the photodiode generates the focus error-correction signal. When the disc surface lies precisely at the focal point of the objective lens, the image reflected through the intermediate convex lens and the cylindrical lens is unaffected by the astigmatism of the cylindrical lens, and a circular spot strikes the center of the photodiode. When the distance between the disc and objective lens decreases, the image projected by the objective lens and convex lens and the cylindrical lens moves further from the cylindrical lens, and the pattern becomes elliptical. Similarly, when the distance between the disc and the objective lens increases, the image moves closer to the lens, and an elliptical pattern again results, but rotated 90° from the first elliptical pattern.

The four-quadrant photodiode reads an intensity level from each of the quadrants to generate voltages (Fig. 2). If a focus-error signal is mathematically created to be quadrants (2 + 4) minus (1 + 3), the output-error voltage is a bipolar S curve, centered about zero. Its value is zero when the beam is precisely focused on the disc; a positive-going error-correction signal is generated as the disc draws too near, and a negative-going error-correction

signal as the disc moves away. As in any closed-loop system, such as the phase-lock-loop systems which keep motor speeds constant and accurate, the difference signal continuously corrects the mechanism towards a zero difference signal and thus, in this case, a focused laser beam.

CD players use a servo system to move the objective lens up and down to keep depth of focus within the $\pm 2 \mu\text{m}$ tolerance. An electronic circuit deciphers the error-correction signal and generates a servo-control voltage. This circuit uses comparators and amplifiers to generate the servo control. The four photodiode quadrants are divided into pairs (2 + 4, 1 + 3) such that greater intensity in quadrants 2 and 4 indicates the disc is too near, and in 1 and 3 too far, and these voltages are applied to the inverting inputs of two comparators, C1 and C2, whose non-inverting inputs are referenced to ground. (The photodiode quadrants share a common ground.) The outputs are split to the inverting and noninverting inputs of two more comparators, C3 and C4. The output of C3 generates a check signal that indicates reflected light is being received at the photodiode. The output of C4 is the error-correction S-curve signal.



S-X1130 Audio/Video/Stereo Receiver

Introducing one brilliant idea on top of another.

Unmatched FM Stereo/AM Stereo reception and video control makes them fantastic. X-Balanced circuitry makes them phenomenal. Sansui's 130 watt S-X1130 and 100 watt S-X1100 Quartz PLL Audio/Video receivers are so far advanced, they even have a special decoder that lets you receive broadcasts of all AM stereo systems. What's more, their unique X-Balanced circuitry cancels out external distortion and decisively eliminates IHM, for the purest all-around listening pleasure.

But the advantages don't stop there. Both receivers are complete Audio/Video control centers that are radically different—and significantly more versatile—than any others on the market. The S-X1130 delivers all the highly advanced audio and video performance of the S-X1100, with the added bonus of sharpness and fader controls for enhanced video art functions. And both units offer additional audio dexterity with "multidimension" for expanded stereo or simulated stereo, plus sound mixing capabilities.

For more brilliant, innovative ideas, check out our full line of superior receivers. You'll know why we're first, the second you hear us.

There's more worth hearing and seeing from Sansui. Write: Consumer Service Dept., Sansui Electronics Corp., Lyndhurst, NJ 07071; Carson, CA 90746; Sansui Electric Co., Ltd., Tokyo, Japan.



Putting More Pleasure in Sound.

Enter No. 40 on Reader Service Card

Even the flattest disc isn't perfect, and the standard allows for a deviation of ± 0.6 mm. Therefore, the laser beam must be refocused constantly.

When the laser beam is accurately focused, comparators C1 and C2 see identical voltages at the inverting inputs, and their corresponding output voltages likewise are identical. Since there is no difference at C4, its output is zero, or set to a d.c. reference voltage. If the beam goes out of focus, a positive or negative deviation from the reference will occur, resulting in the S curve. The error-correction signal is amplified by A1 and A2 and passed through an analog switch, which has been turned on by the focus-check signal. The error-correction signal is then amplified at A3, which provides the proper drive current to the push-pull amplifier circuit (transistors Q1 and Q2). The actuator thus moves the objective lens to maintain the proper depth of field. Once this is achieved, the beam is focused, the error-correction signal is zeroed, and the actuator holds the lens position.

When a disc is first loaded, initial focus is obtained through a square-wave signal generated by the system microprocessor. This signal consists of two square pulses, each with a period of 1 S. The square wave is integrated by a resistor and capacitor and causes the push-pull amplifier to move the actuator coil up and down twice. The laser is turned on as the actuator moves up the first time, and the actuator stops in a focused state when the focus-check signal is obtained. If no disc is detected the first time, the actuator tries again with the second pulse. The system microprocessor will shut down if no disc is detected. When the auto-focus is not operative (if the door is open, the laser inoperative, etc.), the analog switch remains off and the inverted focus-check signal pulls the objective lens back, to prevent damage to the lens or disc.

The objective lens itself is displaced in the direction of its optical axis by a coil and permanent magnet structure (similar to that used in a loudspeaker, with the objective lens taking the place of the speaker cone). A two-axis actuator is used to accomplish this. The top assembly of the pickup is mounted on a base with a circular magnet ringing it. A circular yoke supports a bobbin containing both the focus and tracking coils. Control voltages from the focus-circuit drive transistors are applied to

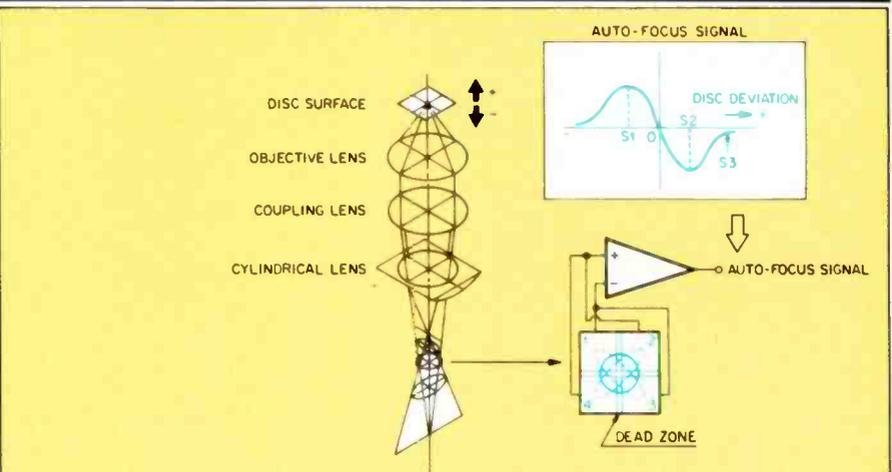


Fig. 1—The optics of a typical CD player's automatic focusing system. The cylindrical lens turns the circular image into ellipses above and below the point of correct focus, creating differences in beam intensity over the four quadrants of the photodiode.

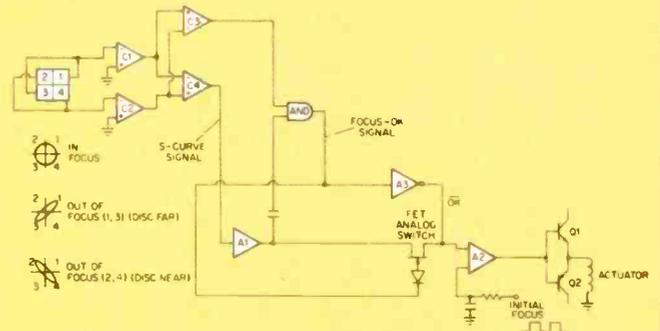


Fig. 2—Auto-focus control circuit.

the bobbin focus coil, and it moves up and down with respect to the magnet. The objective lens thus maintains its proper depth of focus. The other axis of movement, from side to side, is used to achieve tracking accuracy.

After last month's praise for the virtues of simple engineering solutions, the auto-focus system might at first glance appear too complicated to qualify for an award. But when the problem's difficulty is considered, how concise the system is becomes evident. Consider that a Compact Disc revolves $3\frac{1}{2}$ to 8 times per second; any deviations from flat literally fly past the pickup, yet the objective lens must

stay within $4 \mu\text{m}$ of that varying surface, floating underneath, as it were. I think this auto-focus system satisfies that demanding criterion with true economy. And consider the benefits of such a feature. In the past we had to be content with a diamond needle dragging through a vinyl groove, whereas now, thanks to auto-focus, only light touches our medium—no pickup wear, no medium wear. I haven't dared to put a Compact Disc in my microwave oven to see just how much warpage my player will tolerate, but I think under normal use my player's auto-focus should keep the laser beam admirably focused on the music. **A**

ON THE PRO TOUR

As evidenced at last fall's 76th AES Convention in New York, many audio manufacturers are beginning to realize the great sales potential of the burgeoning professional market. David Hafler has made an auspicious start in this direction with his new line of professional power amps. These range from the Model P125 (60 watts/channel into 8 ohms, useful in bi- and triamplification setups, and costing \$350), through the P220 and P225 (rated at 150 watts/channel into 8 ohms and priced at \$600 and \$510 respectively), to the flagship P500, a brute of an amplifier delivering 250 watts/channel into 8 ohms. The P500 can also be bridged for 800 watts into 8 ohms, and, at \$950 each, that's a lot of power for the money. All Hafler pro amplifiers have MOS-FET output transistors, can be hooked up in balanced configuration, feature a num-



Hafler P500 amplifier

ber of input connectors (including XLR), and are available in kit form.

Crown has already established their credentials in the professional amplifier market. Their Micro-Tech 1000 is something of a departure, with new circuitry permitting as much as 1,000 watts/channel into 4 ohms in bridged mode, in a relatively small unit measuring 19 x 3½ x 16 inches. In stereo mode, the Micro-Tech 1000's normal output is 250 watts/channel into 8 ohms, with as much as 500 watts/channel at 2 ohms. Price is \$995.

The world of amplifiers is full of acronyms. Perhaps the best known is TIM (transient intermodulation distortion), coined by Matti Ojala. Next came IIM (interface intermodulation distortion),

Crown Micro-Tech 1000 amplifier



also originating with Dr. Ojala, and now Sansui has come up with IHM—interface hum modulation. This is said to be the result of interaction between ripple current created by the power supply and counter-electromotive current created by speaker cones in motion. To combat IHM, Sansui has introduced a



Sansui B-2301 amplifier

series of X-Balanced amplifiers; in these units, all circuits are balanced—input, output, power supply, circuit drive, and even the negative feedback. The internal circuits transfer and amplify signals without reference to the ground potentials. Thus, the X-Balanced amplifiers are claimed to be completely immune to ground-related problems. The top-of-the-line model, the B-2301, offers 300 watts/channel into 8 ohms and has a signal-to-noise ratio of 120 dB. Its slew rate, 400 V/μS, and rise-time, 0.5 μS, are very fast.

As a recording engineer I have long endorsed the use of simple microphone techniques and have variously used three-channel omni spaced array, classic Blumlein, ORTF, M-S, and other similar configurations. These days, most classical digital recording is done on two-channel units—the ubiquitous Sony PCM-F1, Sony PCM-1610, JVC 900 series, or Mitsubishi X-80. In spite of this, there are occasions when a simple digital mixer would be very helpful. At the AES Convention, Sony gave a paper on such a unit, the K-1105. A number of these mixers have been built and apparently used for mastering of Compact Discs. The K-1105 is an eight-channel mixer with two main and two auxiliary outputs. There is a signal processing unit, an eight-channel A/D unit, an eight-channel D/A unit, and a remote control. The signal processor has low-cut and high-cut filters, plus a four-band equalizer and emphasis/de-emphasis equalizer for each channel. The remote control

has faders and pan pots as in an analog mixer. The whole setup is transportable, and, of course, the big advantage is that all mixing and signal processing remain in the digital domain. No availability or price information as yet.

As you can imagine, there was plenty of activity related to Compact Disc players. Studer introduced a \$1,550 professional/broadcast player. The Model A725 has balanced high-level line outputs as well as fixed and variable unbalanced outputs, and a host of special cueing functions that studios have requested. For example, it has fader start, for use with mixers which have cueing switches connected to their faders; when you raise the fader, the mixer signals the player to start. Audible cueing lets you scan the disc while listening for your cue point (most CD players are mute in search mode). There's automatic re-cueing, so you can cue up a passage, play it to check



Studer A725 pro CD player

your cue point, and return to that point at the touch of a button. (On most players, cue points disappear from memory once they've been played.) There's also a "Loop" function—automatic repeat of the music between any two user-marked points.

An LCD panel shows track and index numbers, elapsed and remaining times for the current track, and status of the pause, auto-stop and loop functions. During programming, the display shows the number of steps to be executed and the track numbers or timings of both start and end points. Other features of the Studer Model A725 include a peak-level calibration tone and remote control.

Sony also introduced a professional CD player system, consisting of the CDP-3000 and CDS-3000. This system is a lower-priced version of their big professional player/analyzer, the CDP-5000 and CDA-5000. The CDP-3000, at \$2,100, is a high-precision, front-loading CD player which features an aluminum die-cast chassis and exten-

audio-talk from audio-technica®

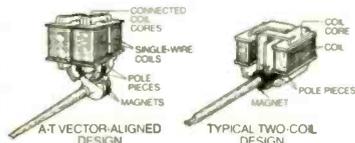
Number 12 in a Series

COILED FOR ACTION!

The coils in a moving magnet phono cartridge are important in determining the ultimate quality possible from the unit. Their design can affect frequency response, output level, sensitivity to hum and noise, and other critical aspects of cartridge behavior.

Two or Four Coil Design

Most modern moving magnet cartridges use either two coils (one for each channel) or four coils (a connected pair for each channel) to pick up the tiny magnetic field changes from the magnet(s) at the end of the cantilever. Inside each coil is a metal coil core which extends toward the magnet as a pole piece to sense the magnetic field and transmit its fluctuations to the coil windings. In two-coil designs the pole pieces extend from either end of each coil, while four-coil designs use a pole piece at one end of each coil, plus a metal strap to connect the two coil cores together.



A-T High-Efficiency Design

Most Audio-Technica Vector-Aligned™ cartridges use FOUR coils, with two to pick up each stereo signal. To achieve the highest sensitivity, A-T uses a single U-shaped part to create the pair of pole pieces and coil cores, plus the connecting strap for each channel, with both coils wound directly on the same part. This eliminates the need for soldering or welding the pole pieces, coil cores, and connecting strap together, thus reducing losses. In addition, A-T winds both coils from a single, unbroken wire which is directly connected to the output terminals, again to reduce losses by eliminating unneeded internal connections.

Hum is Cancelled

Each pair of A-T coils is also wound so that external hum and electrical fields are rejected without reducing the sensitivity to magnet motion. In this "hum-bucking" design the coils in the pair are wound in opposite directions, so that any hum appearing in one coil is cancelled by the same (but opposite) hum in the other coil. A-T cartridges are also carefully shielded to lower the strength of any external hum fields reaching the coil assemblies.

Attention to Detail

By simplifying the internal construction of Audio-Technica cartridges and eliminating usual sources of loss, high sensitivity is assured. This, in turn, provides A-T engineers greater freedom of design to provide better performance in terms of tracking, frequency response and distortion.

Good listening,

Jon R. Kelly

Jon R. Kelly, President
Audio-Technica U.S., Inc.
1221 Commerce Dr., Stow, OH 44224



audio-technica.

The World's Favorite Phono Cartridge

Despite its diminutive size, the Sony D-5 has the same specifications and many of the features of full-sized Compact Disc players.

sive vibration damping for tracking stability. The CDS-3000, at \$1,200, is an elaborate control unit, with all the usual displays and features concerning track and timing indications. It affords direct access to any point on a disc within 2 S and has a search dial permitting bidirectional scanning while listening to the reproduced sound. Two CDP-3000 players can be controlled by the CDS-3000, and up to eight selections can be programmed in any sequence and intermixed between the two players.



Sony D-5 portable CD player

Sony scored another first by introducing a portable CD player. The D-5, which costs \$299.95, measures 1½ in. H x 5 in. W x 5 in. D and weighs a mere 1 pound, 5 ounces. Such miniaturization was made possible by incorporating most of the primary digital functions on one high-density VLSI (very large scale integrated) chip and the development of a special semiconductor for the laser pickup, making it less than one-third the size of previous pickups. Six C cells will provide 5 hours of playing time, and an optional rechargeable battery is available. An optional carrying case/battery pack, costing \$49.95, permits portable use. Via a supplied a.c. adaptor, the D-5 can be used as a home CD player or, with the DCC-120 car battery/cigarette lighter type of adaptor, which costs \$36.50, in a car.

Sony D-5 and its accessories



Despite its diminutive size, the D-5 has the same specifications as full-sized players and many of their features. It can locate a desired selection by rapid forward or backwards scanning and will also permit high-speed scanning, but with the program remaining audible at normal pitch. An LCD shows battery condition, track being played, elapsed time, and number of tracks and time remaining on a disc. A CD is inserted after pushing the "Open" button on the top corner of the unit, and a special power-off safety switch automatically disengages all mechanisms during loading.

I was under the impression that the D-5 would have to be placed on a level surface in order to play properly. Incredibly, it can be played in any position, even slung over one's shoulder. Using headphones, you can really have a sort of super Walkman or, as Sony bills it, "Discman."



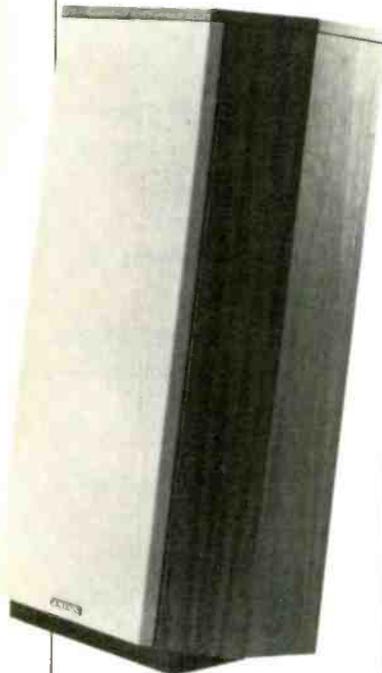
Components of JVC DS-4000 system

JVC demonstrated the DS-4000 automatic CD player/changer system, which includes an amplifier and has a capacity of 130 discs. (So far, it is only available in Japan.) The main player unit measures 22¾ x 18¾ x 11⅞ inches and weighs 60 pounds. It is controlled by a five-digit keypad connected to the player unit by a cable which extends up to 200 feet. The selections are made by pressing the five-digit code and then the entry key. JVC figures an average of about 15 selections per Compact Disc; with a 130-disc capacity, this affords a total of 1,950 selections. Each selection on each disc is individually selectable, i.e., tune 6 on disc 12 or tune 3 on disc 110, etc. The numbers of the selected tune, the tune being played, and the next tune are displayed. All "normal" CD specifications apply.

Genesis Speaker

The Genesis Model 44 is a three-way, floor-standing speaker designed by Winslow Burhoe, the company's new Director of Engineering. The 1-inch tweeter is said to operate from a crossover of 1.1 kHz up to 25 kHz, an unusually wide range for a tweeter of this size. Bass is handled by a long-throw, 8-inch woofer loaded by a 10-inch passive radiator. Price: \$700 per pair.

For literature, circle No. 100



Monster Cable Cartridge

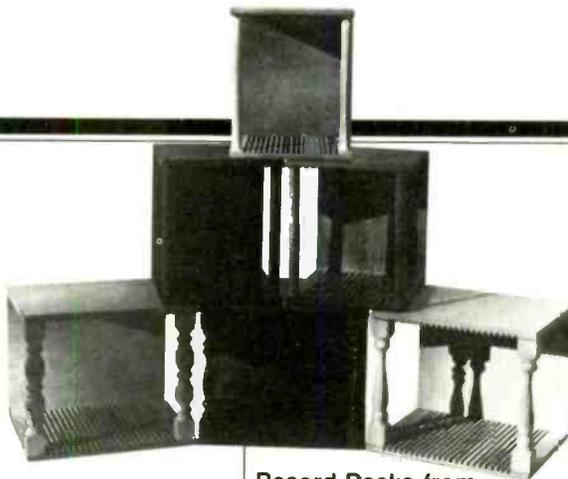
Monster Cable's second moving-coil cartridge, the Alpha 2, has a Micro-Ridge stylus mounted on a hollow-tube sapphire cantilever. The cartridge uses a "magnetic feedback control circuit" similar to that in the Alpha 1, which will remain available. Price: \$650.

For literature, circle No. 101



Record Racks from The Accessory

The distinguishing feature of these record modular racks is the grooving of their top and bottom

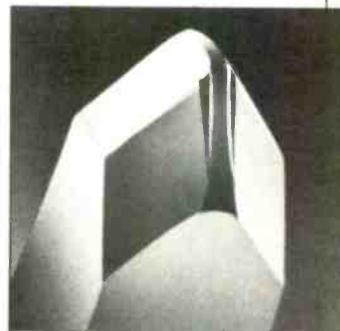


pieces, to hold records upright without warping. Each slot holds two single albums or one double album; the Mach I model has 14 such slots, the Elite has 18. Both are covered in unfinished birch veneer, and the Elite is available with Mediterranean, Provincial or Traditional styles of support posts. Both models require assembly. Prices: Mach I, \$29.95; Elite, \$49.95; \$2.50 shipping and handling for either model.

For literature, circle No. 102

Shure Styli

Micro-Ridge replacement styli are now available for Shure's older V15 Type IV and Type III cartridges, as well as for the newer V15 Type V. The VN35MR and VN45MR styli are designed to reduce tip-related distortion, track high-frequency details more precisely, and improve play of worn records by scanning portions of the groove as yet unworn. The model for the Type IV also



incorporates Shure's Dynamic Stabilizer. Prices: VN35MR, for Type III, \$58; VN45MR, for Type IV, \$58. For literature, circle No. 103

Soundcraftsmen Equalizer

Soundcraftsmen's DC4415 is a 21-band equalizer, with 15 bands spaced $\frac{1}{3}$ -octave apart from 40 Hz to 1 kHz, and six bands spaced $\frac{2}{3}$ -octave apart from 1.5 to 16 kHz. This concentrates

the third-octave controls where they are most useful, yet still provides finer than the usual full-octave equalization at the upper frequencies, without vast increases in cost. Filters are a "Smooth-Q" design, intended to minimize phase shift, and a gain-matching system is built in. Other features include a subsonic filter, an equalizable tape monitor loop, and independent controls for both channels. Price: \$599.

For literature, circle No. 104



Soundcraftsmen dealers...



FOR A DEMONSTRATION OF SOUNDCRAFTSMEN PRODUCTS VISIT NEAREST DEALER LISTED BELOW

However, many additional Dealers—too numerous to list here—are located thruout the U.S. with many models on display. If no dealer is shown near you, or you encounter any difficulty, please phone us at 714-556-6191, ask for our "Dealer Locator Operator."

ALABAMA

Huntsville
SOUND DISTRIBUTORS

ARIZONA

Phoenix
ABSOLUTE SOUND CO.
Tucson
TUCSON STEREO
Yuma
WAREHOUSE STEREO

NO. CALIFORNIA

Berkeley
HONKERS SOUND CO.
Concord
SOUND DISTINCTION
Davis
WORLD ELECTRONICS
Goleta
HOUSE OF AUDIO
Paio Alto
WESTERN AUDIO
Sacramento
NEAL'S SPEAKERS
WORLD ELECTRONICS
San Francisco
LISTENING POST
Santa Barbara
HOUSE OF AUDIO

SO. CALIFORNIA

Phone 714-556-6191, ask for
"Dealer Locator Operator."
(Insufficient space to list
all Dealers in this area)

COLORADO

U.S. STEREO STORES
Englewood
GOLD SOUND
Colorado Springs
THE SOUND SHOP

CONNECTICUT

Danbury
CARSTON STUDIOS
Newington
SOUNDS GREAT
Stamford
COUNTY AUDIO

DELAWARE

Dover
SOUND STUDIO
Newark
SOUND STUDIO
Wilmington
SOUND STUDIO

FLORIDA

Boca Raton
CAPTAIN VIDEO
Fort Lauderdale
CAPTAIN VIDEO
Fort Walton Beach
AUDIO INTERNATIONAL
Merritt Island
AUDIO MART ELECTRONICS
Miami
AUDIO PLUS
CAPTAIN VIDEO
LAS FABRICAS
Orlando
AUDIO MART ELECTRONICS
Tampa
SENSUOUS SOUND

GEORGIA

Atlanta
AUDIO UNLIMITED
STEREO DESIGNS
Columbus
WORLD-WIDE ELECTRONICS
Dalton
BROCK'S ENTERTAINMENT

HAWAII

Hilo
YAFUSO T.V. APPLIANCE
Honolulu
HARRY'S AUDIO
VIDEO LIFE
Lihue, Kauai
JACK WADA ELECTRONICS
Wailuku, Maui
ADRIAN'S ELECTRONICS

IDAHO

Idaho Falls
PHASE 4 STEREO

ILLINOIS

Chicago
MUSICRAFT
Dekalb
AUDIO PLUS
Evergreen Park
MUSICRAFT
Gurnee
OPUS EQUIPMENT
Homewood
MUSICRAFT
Lombard
MUSICRAFT
Morton Grove
MUSICRAFT
Oak Park
MUSICRAFT
Palatine
MUSICRAFT
Peoria
ELECTRONICS DIVERSIFIED
Rockford
AUDIO ACCENTS

INDIANA

Anderson
ANDERSON ELECTRONICS
Evansville
TED FINK AUDIO
Goshen
McKIBBINS SOUND
Indianapolis
SOUND DECISION
New Haven
HJS SOUND
South Bend
SIGHT & SOUND
Valparaiso
WAYNE ELECTRONICS
West Lafayette
VON'S ELECTRONICS

KANSAS

Overland Park
AUDIO ELECTRONICS
Salina
OEL'S TV
Wichita
AUDIO PLUS

KENTUCKY

Lexington
THE STEREO SHOPPE
Louisville
HI-FIDELITY, INC

LOUISIANA

Baton Rouge
NEW GENERATION
Lafayette
NEW GENERATION
Metairie
SOUND TREK

MARYLAND

Annapolis
SPACEWAYS SOUND
Baltimore
STANSBURY STEREO
Gaithersburg
AUDIO BOYS
Hagerstown
HUNT AUDIO
Lutherville
GRAMOPHONE, LTD.
Salisbury
SOUND STUDIO, INC.

MASSACHUSETTS

Brockton
AUDIO VISION
N. Dartmouth
CREATIVE SOUND SYSTEMS
Sunderland
SCIENTIFIC STEREO

MICHIGAN

Marquette
AMERICAN TV
Saginaw
LISTENING ROOM

MISSISSIPPI

Gulfport
TIPPIT'S MUSIC
Jackson
HOOPER SOUND
Meridian
HOOPER SOUND

NEBRASKA

Lincoln
LIGHT & SOUNDS FANTASTIC

NEVADA

Las Vegas
UNIVERSITY PRO AUDIO

NEW JERSEY, SO.

Wildwood
SEASHORE STEREO

NEW YORK CITY,

NORTHERN N.J.

Phone 201-947-9300, ask for
"Dealer Locator Operator."
(Insufficient space to list
all Dealers in this area)

NEW YORK—UPSTATE

Albany
SOUNDS GREAT
Buffalo
PURCHASE RADIO
Newpaltz
NEWPALTZ AUDIO
Poughkeepsie
DUTCHESS AUDIO
Rochester
SOUNDS GREAT
Syracuse
SUPERIOR SOUND

NORTH CAROLINA

Fayetteville
QUALITY SOUND
Greensboro.
High Point,
Winston-Salem,
AUDIO-VIDEO CONCEPTS
Hickory
MC LAUGHLIN'S TV
Raleigh
CREATIVE ACOUSTICS

NORTH DAKOTA

Fargo
WATTS-MORE

OHIO

Akron
OHIO SOUND
Canton
OHIO SOUND
Cleveland
B&B APPLIANCE
OHIO SOUND
Defiance
ZELLER'S SOUND STORE
Lima
HART AUDIO
Mayfield Hts.
ELECTRONIC RING
Middleburg Hts.
B&B APPLIANCE
North Olmstead
ELECTRONIC RING
Toledo
AUDIO CENTER
Warren
CUSTOM SOUND CO.
Youngstown
CUSTOM SOUND CO.

OKLAHOMA

Oklahoma City
JOHNSON TV & SOUND

OREGON

Coos Bay
PENNINGTON'S AUDIO
Eugene
BRADFORD'S HI FIDELITY
Klamath Falls
HIGH COUNTRY RECORDS
Medford
SOUNDTRACK ELECTRONIC
Portland
HAWTHORNE STEREO

PENNSYLVANIA

Chambersburg
SUNRISE ELECTRONICS
Hermitage
CUSTOM SOUND CO.
Lebanon
MARTY'S MUSIC
McKeesport
HI FI CENTER
Natrona Heights
GOOD HOUSEKEEPING
New Brighton
TV PARTS
Philadelphia
RADIO 437
SOUND OF MARKET STREET
SOUND SERVICE
Pittsburgh
AUDIUD JUNCTION
Pittsburgh
WORLD WIDE STEREO
Reading,
Shillington
PHOENIX HI FI
Willow Grove
SOUNDEX

PUERTO RICO

Puerto Nuevo
LASER SOUND

SOUTH CAROLINA

Charleston
STEREO DEN
Columbia
NORTON STEREO
Greenville
DON JONES STEREO
Newberry
THE ELECTRONIC SHOP

SOUTH DAKOTA

Sioux Falls
GOURLEY DISTRIBUTING
PRO AUDIO

TENNESSEE

Chattanooga
COLLEGE HI FI
Nashville
AUDIO SYSTEMS

TEXAS

Arlington
SOUND IDEA
Beaumont
BROCK AUDIO
Houston
HOME ENTERTAINMENT
Midland
FOLGER'S ENTERTAINMENT

UTAH

Ogden
INKLEY'S
St. George
ARROW AUDIO
Salt Lake City
INKLEY'S

VIRGIN ISLANDS

St. Thomas
ELECTRONICS UNLIMITED

VIRGINIA

Richmond
GARY'S

WASHINGTON

Bremerton
EVERGREEN AUDIO
Olympia
DESCO ELECTRONICS

WEST VIRGINIA

Morgantown
THE SOUND POST
Princeton
THE SOUND POST

WISCONSIN

Appleton
AMERICAN TV
Glendale
SOUNDSTAGE
Madison
SPECIALIZED SOUND
AMERICAN TV
Oshkosh
AUDIO PLUS
Waukesha
AMERICAN TV
Racine
BRANDT'S

**555 WATTS PER CHANNEL MOSFET STEREO AMPLIFIER,*
 < 0.05% THD, 20Hz-20KHz @ 8 OHMS...OR FOUR CHANNELS
 @ 205 WATTS PER CHANNEL @ 8 OHMS FOR BI-AMPING, ETC.**

The PCR800X2 utilizes two completely independent power supplies, dual power transformers, 2-speed cooling fans, and even dual A.C. power switches.

This newest model to incorporate our highly-advanced Phase-Control-Regulation® technology, the PCR800X2 actually consists of two PCR800s and a PC-X2 front panel. The 19" rack mount panel converts the combination into a single stereo amplifier, when used with any Soundcraftsmen DX Series Preamp, or with any preamp plus our AB-1 Bridging Adapter.*

It also converts into FOUR—205 WATT BASIC AMPS, for many other audio uses, such as bi-amping, etc.

Each channel, when operating in bridged mono mode, produces 555 watts at 8 ohms with no more than .05% distortion from 20Hz to 20KHz, and employs the latest in Power MOSFET output circuitry.

CURRENT-LIMITING IS COMPLETELY ELIMINATED in the design. Total weight is under 40 lbs. for the complete 555-watt per channel stereo amplifier.

The PC-X2 Front Panel is supplied separately. It requires only the 8 front panel mounting bolts to be removed and reinstalled through the PC-X2 mounting holes.

A Bridging Adapter, Soundcraftsmen Model AB-1, is available for use with other makes of preamps, at \$89.00.



PCR 800 @ \$449. + PCR 800 @ \$449. + PC-X2 @ \$49. =



= 555 WATTS PER CHANNEL STEREO! PCR 800X2—\$947.00*

"The PCR800 at \$449.00 is the world's smallest, lightest, most powerful continuous-power stereo amplifier! Utilizing new, advanced, State-of-the-Art POWER MOSFET output devices, the new PCR800 provides over 410 watts total output power... 205 watts RMS per channel @ 8 Ohms, 20Hz to 20kHz, with less than 0.05% THD... Soundcraftsmen's research into Digital Audio Technology has resulted in this revolutionary advancement in amplifier design—Phase-Control-Regulation®. The PCR800 is the world's first PCR amplifier, and it sets continuous performance, reliability, and efficiency standards never before possible in audiophile equipment at this low cost of only \$1.10 per watt.

Soundcraftsmen



**AMERICA'S PERFORMANCE/VALUE LEADER
 IN ADVANCED AUDIO TECHNOLOGY...**

DIGITAL QUARTZ AM-FM-FM STEREO TUNER...

AM-FM-FM Stereo Tuner with 7 AM, 7 FM Station Presets, Automatic or Manual Scanning, Active High Blend Circuitry... \$299.



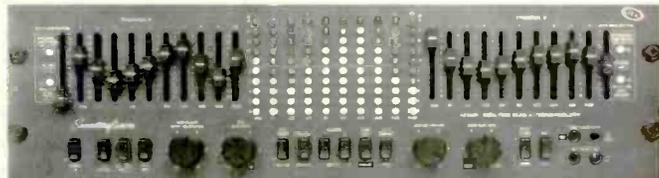
WORLD'S MOST VERSATILE PREAMPLIFIERS...

Featuring -97dB Phone S/N, Adjustable Phono Capacitance and Impedance, Moving Coil Inputs, Phono Input Level Controls, Exclusive AutoBridge® circuit for Mono Operation of Stereo Amplifiers @ TRIPLE POWER OUTPUT, Push-Button Patch Bay with Two External Processor Loops, Digital and Video/Audio Inputs, 10-octave EQ, Precision Passive Coil EQ Circuitry and Differential/Comparator® for Highest Gain, Lowest Distortion and No "Clipping" of Wide Dynamic-Range Material. 12" LP Analyzer Test Record and Charts with EQ's... from \$399.



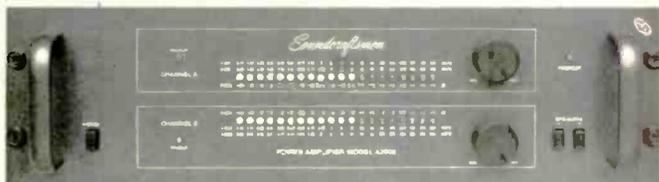
REAL-TIME SCAN-ANALYZER/EQUALIZERS AND EQUALIZERS, ACCURACY TO 0.1dB...

REVOLUTIONARY Differential/Comparator® circuitry makes possible Accuracy to 0.1dB! Automatic or Manual Octave Scanning for Fast, Accurate Analyzing and Equalizing. Precision Passive Coil Filters for Highest Gain, Lowest Distortion, Scan-Analyzer Models. With and Without Built-in Equalizers. No Calibrated Microphone necessary. 12" LP Analyzer Test Record and Charts with EQ's... from \$189.



REVOLUTIONARY CLASS "H" AND MOSFET AMPLIFIERS, 125 TO 555 WATTS P/C...

The most advanced Stereo and Professional Amplifier Models, featuring Class H Dual Signal-Tracking Power Supply, Auto-Buffer® for Continuous 2-Ohm Operation, No Current-Limiting, Power MOSFET circuitry for Highest Reliability, Calibrated LED meters, A, B, and AB Speaker Switching... from \$449.



FREE!

16-PAGE FULL-COLOR BROCHURE, \$19.95 EQ-EVALUATION KIT, includes 1-12" LP Frequency Spectrum Analysis Test Record, 2-sets of Computone Charts, 1-Connector Cable for comparison test, 1-instruction folder for use with your present stereo system, JUST WRITE TO US OR CIRCLE READER SERVICE CARD # 30 for FREE SPECIAL OFFER DETAILS.

2200 So. Ritchey, Santa Ana, California 92705, U.S.A./Telephone (714) 556-6191/U.S. Telex/TWX 910-595-2524 • International Telex: 910-595-2524/Answer back Code SDCRFTSMN SNA
 Enter No. 30 on Reader Service Card

LECTURE NOTES

I seem to have skipped one story in my continuing, occasional audiobiography, from the time when I had my first job, teaching Music Appreciation at a very square University, Ivy League, which had just established a Music Department. That was in 1935; I got there in 1936. In two words, the place was abysmally unmusical, if just fine in other departments. But at the age of 24 I was about to change all that. Via recorded music—what else? So help me, almost a half-century ago.

You may remember from previous columns (February 1982 and May 1983) the record lending library I helped to establish at the University, thanks to the extraordinary Carnegie Collection of 78-rpm records. Also the Carnegie Phonograph, that state-of-the-art monster out of Federal Telegraph. Both the machine and the records came under my care, nobody else caring very much.

Then there were the "wooden needles," cactus and bamboo, which we required for all playing, and there was my homemade amp—6L6Gs in push-pull, thanks to my new friends in the Physics Department who often borrowed my records. And the huge, plywood, flat speaker baffle in my bedroom, their idea for better subwoofer bass. There was the Professor, my boss and head of the new Department, who hated mechanized music, like most of his generation, as the earlier farmers hated the horseless carriage. But let us proceed onward to the Phonoconcert.

I doubt if I had heard of the British experience with large public or institutional phonograph concerts ("gramophone"), then perhaps just beginning, but I had produced my own already, as a fervid reaction to the sonic cruelties of my college classroom experience. I knew I was right: Given the proper treatment, music from records *could* be good to hear, even on a concert scale. You may remember my account of my recorded concert on a moonlit summer night at the edge of a lake, with people listening from its glassy surface, in canoes, to the magical sound of a symphony. This was a new experience in those days and I was filled with joy. When I landed that first job I was primed to convert the academic world to music listening of



Illustration: George Blume

the same sort. And, being 24, I hadn't the slightest doubt that I would.

But the idea was not easy for my new boss, the Professor. Indeed, it was painful. His musical ways were already 25 years old and the Music Appreciation course, the same, had been given for years at another college. It was hugely successful, all those years, without the mechanical help of the phonograph.

Why should he change? From his viewpoint, his system worked well and worked again and again as new students came along. As I have said, his lectures were of the pre-phono sort, largely illustrated, if at all, by his own piano examples—that instrument serving to dish up all kinds of music from string quartets to symphonies and even madrigals. He was good at tossing off samples of all these, like adding a dash of pepper to a good salad. But his forte was lecturing. He could make you weep over a Mozart symphony that you never got to hear at all. Did you *have* to hear it? Not necessarily.

You understand, this was the tail end of a long, wordy tradition extending back to the great orators of the 19th century and to the fiery preachers who preceded them, all splendid masters

of the art of word persuasion. Did the preacher "illustrate" his Heaven and Hell with examples in 3-D, or hi-fi? He managed much better with the power of his voice alone. Should the popular lecturer on music do otherwise?

Ah, what a difference the electric phonograph was making. This poor professor was really at sea with a new technology, his distinguished career undermined at the peak of success, his piano skills rendered mostly superfluous, his ability to cope with the new equipment at the traditional artistic zero. I feel the same today when, after 30 years of analog tape editing, I now need a \$50,000 digital editor to do even the simplest "splicing" job for me. (Yes, I'm trying to cope with a digital tape of my Canby Singers.) So I send apologies to the Professor at this late date for so brashly pestering him in my innocence. He must be all of 115 years old by now.

I told the Professor, right away, that I would like to incorporate some phonograph concerts into our music course. Brash me! "That would be quite impractical," he said. The course was already set up to the last detail (it always had been), there was no time for extras, the regular work had to be



**THE EXPERTS SAID THEY HEARD EXCELLENT FREQUENCY RESPONSE,
A HIGHER MOL, AND GREATER DYNAMIC RANGE.**

BUT NOT IN THOSE WORDS.

Wicked lows. Manic highs. Nasty passages.
It all translates the same.

Music sounds better when it's recorded
on Maxell XL-S cassettes.

That's because we've improved our crystallization process. So we can now produce magnetic particles that are both smaller in size and more uniform in shape. Which allows us to pack more of these particles on the tape's surface, in turn, making it possible to record more information within a given area of tape.

AC bias noise is reduced by 1dB. And maximum output levels are increased by 1.5dB on XLI-S and 2dB on XLII-S.

As a result, XL-S delivers a significantly expanded dynamic range. A noticeably improved signal to noise ratio. And a fuller impact of dynamic transients.

So if you want to hear your music the way it was meant to be heard, put it on Maxell XL-S.

Because recording tapes just don't get any better.

Or any badder.

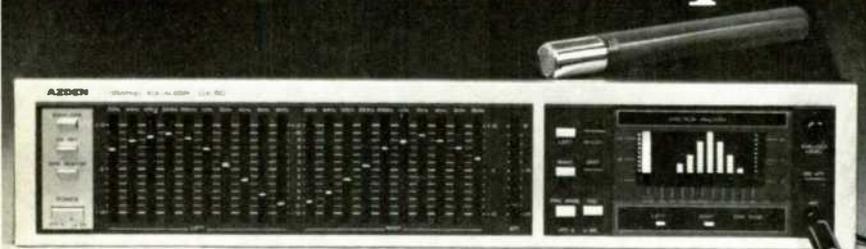


IT'S WORTH IT.

© 1984 Maxell Corporation of America, 50 Oxford Drive, Moonachie, N.J. 07074

Enter No. 26 on Reader Service Card

All graphic equalizers are not created equal!



When it comes to performance and features at a modest price, the new **AZDEN GX-50** has no equal.

- Automatic level control circuitry to assure steady levels of reproduction.
- A real-time spectrum analyzer which incorporates a built-in two-mode oscillator circuit for ideal acoustic field corrections. You can choose to display the left, right, or combined frequency characteristics.
- Pink noise generator.
- Separate high performance microphone.

For more information on the complete **AZDEN** line of equalizers, mixers, phono cartridges, and headphones write to:

AZDEN[®]
Azden is a wholly owned division of Japan-Piezo.

AZDEN CORP. 147 New Hyde Park Road, Franklin Square, NY 11010

Enter No. 7 on Reader Service Card

BRYSTON



Bryston announces . . .

a substantial advancement to the technology of audio power amplification.

Bryston has been researching the science and the art of amplification for over ten years. Recently, a breakthrough of sorts at Bryston in the application of complementary Bipolar power-delivery systems has almost perfectly optimized the output transfer-function, resulting in an amplifier more linear, less sensitive to loading, with smaller amounts of upper-order harmonic content than previously possible without class-A biasing, or other special compensation techniques.

We feel that another veil has been lifted from the amplifier's contribution to the overall audio picture. We believe you will think so too. Write to Bryston at the appropriate address (below) for a technical paper on Bryston's *newest* advancement on the state of the art, and a list of dealers where you can listen to the optimal amplifier (and, of course, our matching preamplifier).



IN THE UNITED STATES

IN CANADA

1000 VERMONT AVENUE, MARKETING LTD.
RFD #4, Berlin, Montpelier Vermont 05602 57 Westmore Dr. Rexdale, Ontario, Canada M9V 3Y6

Enter No. 9 on Reader Service Card

Did the preacher illustrate his Heaven and Hell with examples in 3-D, or hi-fi? He managed better solely with the power of his voice.

done, quizzes, exams, taken and corrected, and so on. I was crushed. But not quenched. Okay, then, I'd put on my own concerts, for *anybody*—for the whole University! I would defy my own boss. (Did I know my humble place? Decidedly not.) That man was a saint. He should have fired me the next day, ideas or no ideas. But he didn't. Good soul at heart.



So I went ahead. I do think I was unusually perceptive, for that time, as to the needs of phonograph (read hi-fi) listening, as contrasted to live music. Most of my musical elders were still of the point-it-at-the-audience-and-wince school. I did know what I was doing. But I wasn't very tactful about it. I think I put on seven or eight of my Phono-concerts before I gave up. One does not reform a University in a day.

Mostly out of our classes, I collected a small and timid coterie of students who felt that maybe I had something for them, however arty the idea might seem. That "something" was actually *listening to the music itself*, rather than to lectures thereupon. We had the music, on records, all we could use. So why not? Those kids were right. They got the new idea. They were few but they were willing to brave social anathema, in that extremely "square" environment, to listen under good and pleasing circumstances. *Not* the classroom. I admire them in retrospect.

And so we were grudgingly given a sort of cooperation (they couldn't very well say no to anything that propagated the musical faith at the college). It was in the form of a classroom, fortunately an odd one and not bad for the purpose. We didn't get it for its special acoustics—it merely happened to be vacant in the evenings, and it had a phonograph.

This was a small, separate building, sort of Victorian and octagonal, all stone and wood casements with ivy on

A small and timid coterie of students felt that maybe I had something for them. That "something" was actually listening to the music itself.

the outside. It obviously was never meant for a classroom, which was all to the good. Inside the single room were a few dozen randomly placed seats (not fastened to the floor). Up front was a sturdy table phonograph of the Magnavox sort, a wooden box with lid. Inside was a skimpy turntable and a heavy pickup, plus volume and tone controls. Below that, in the remaining small space, were a few watts of amplifier and a 4- or 5-inch speaker, also the power transformer. The thing played reasonably well at lowish volume, but, as in most such instruments, if you turned it towards loud you got distortion in the upper (low) highs and growling breakup in the bass. So we mostly kept it soft. I taught classes for three years in that room in the mornings. Now we had it for our evening concerts. How to set up?

I knew that this would be crucial. You don't just play at your audience, right in a classroom. You must look for better. I figured, quite reasonably, that since classes were always in a brightly lighted and sterile environment, with rigid rows of uncomfortable seats, I should turn the lights down for effect and randomize the chairs. How about a bit of atmosphere? Like, say, some decor, maybe even flowers on the table? In a sense I was right. Atmosphere counts.

So we carried in lamps and a few extra chairs for comfort, rearranged the placement so that the phonograph was less glaringly visible and aimed, not straight ahead, but somewhat off, towards good reflecting surfaces like those casement windows and wood-paneled walls. I think I even set out plates of cookies.

No use! We had put up posters, which I made, all over the campus. They weren't at all academic—the idea being, so to speak, to break the ice. I did my level best. At the first concert maybe a dozen students showed up, stone-faced and ready to be embarrassed. It was sheer risk for them in that squarest of universities. When I turned the lights almost out at one point, they nearly perished. It was awful. I will never forget the faces. From that point on we had audiences of five or six or three. But being me, I would not give up. Music, I really believed, would do its own job.

The end was sudden. In desperation I had a bright idea. I would invite the great and beloved Professor himself, head of the Department, to take over a Phonoconcert. That would do it. They would flock to hear him. Yes, he said to my surprise, he would talk about the Bach "B-Minor Mass," which we had complete on records, its first recording. Wow! My favorite music. I had even sung it in college.

But I had not reckoned with the gentleman. I should have known. First, I discovered that the concert would have to be in a larger place—none other, of course, than our regular and hideous concrete lecture hall. And he was right. A huge audience appeared—the man was famous, remember. The lights were up to full brightness, the Carnegie Phonograph was poised, as usual, pointing straight at the audience, and all those nice people were ready to hear the Professor lecture—what else?

Talk he did. He was at his old-time best, and they loved it—the students, by the dozens, also the ladies and gents of the faculty community who were of the sort who loved culture and cultural events, especially when the lecturer was eloquent.

But the music—the concert? The Professor waxed so eloquent, indeed, that the little matter of the music quite slipped his mind, time and again. All we got were perhaps two minutes of the usual squawks and screeches as he tried, in his endearing way, to locate a musical theme with the volume control wide open. (The Carnegie Phonograph could mow down the ears like the biggest hi-fi system today.) For me it was a dreadful, devastating occasion and why labor the point? To make my usual pun. But everybody else loved it. Squawks? Didn't all phonographs make squawks like that, if maybe not quite so loud? But such a glorious lecture! It was the end.

I never tried another Phonoconcert, until I left the place two long years later. And thereby, just perhaps, future audio and hi-fi were set back in their later development by a few short months? Who knows. Could be. In any case, I no longer try to amend my professor's ways of operation, on the grounds that it is none of my business. Except, maybe, in this column. 

Naiad Hifidelivision is a self contained video stereo system that provides the best possible way to obtain state of the art video sound.

Start with a TV and converter or VCR, and Hifidelivision will turn ordinary TV sound into a spectacular event.

Add whatever you wish; TV monitor/tuner, beta/VHS hifi, laserdisc, satellite TV, FM simulcast.

Hifidelivision is future ready™.

See it and hear it at your nearest Naiad Hifidelivision dealer.

HIFIDELIVISION®



naiad

BOX 1250 FALLS STA
MAGARA FALLS, NY
USA 14203-0260

MATTERS OF WHEEL IMPORTANCE

Once again, David L. Clark reports for us on Detroit developments (some of which come from Framingham, Kokomo, Eindhoven and elsewhere, but what the heck):

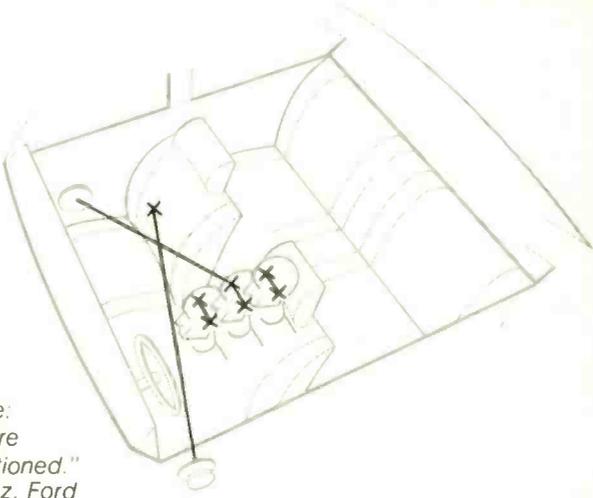
To an out of town, vast areas of Dearborn, Michigan, could easily be mistaken for a Ford Motor Company theme park. In the midst of this automotive fantasyland, a stone's throw away from the "Glass House," Ford's corporate headquarters, is the elegant Hyatt Regency Hotel. This was the location for the Congress on Transportation Electronics, which took place October 22-24, 1984. It's an annual affair organized by the Institute of Electrical and Electronic Engineers (IEEE) and the Society of Automotive Engineers (S.A.E.). This setting is a contrast to the S.A.E.'s convention in February, which takes place in an exposition hall in downtown Detroit. Management is attracted to this October conference; they send the engineers to the S.A.E. in February.

The conference theme was New Horizons in Vehicular Electronics. With managers both presenting and attending the papers, there was much speculation about the future of entertainment systems, but with some sacrifice in technical accuracy.

Philips presented a paper that started with a progress report on the adaptation of the Compact Disc to the automobile, including the CARIN car-information system. This uses the CD as a read-only memory for vast amounts of data, such as road maps.

A surprise was the announcement of Philips' research and support of a consumer digital audio tape recording system (DAT). The car CD is not a true replacement for the cassette player, but the DAT might be. Imagine making a direct digital transfer from a CD at home to a cassette-size tape to play in your car. Compared to car CDs, tape has the potential of durability in the hostile car environment, is far less vibration-sensitive and can be easily inserted into the player while driving. The cost will be much less than a CD, and the tapes will be reusable.

A number of companies (including Philips) have agreed to devote DAT research efforts to two possible formats, from which one will be chosen. The S-DAT system uses a stationary



"The automotive sound system designer has one important advantage: He knows precisely where the listeners will be positioned."
—Lawrence A. Lopez, Ford

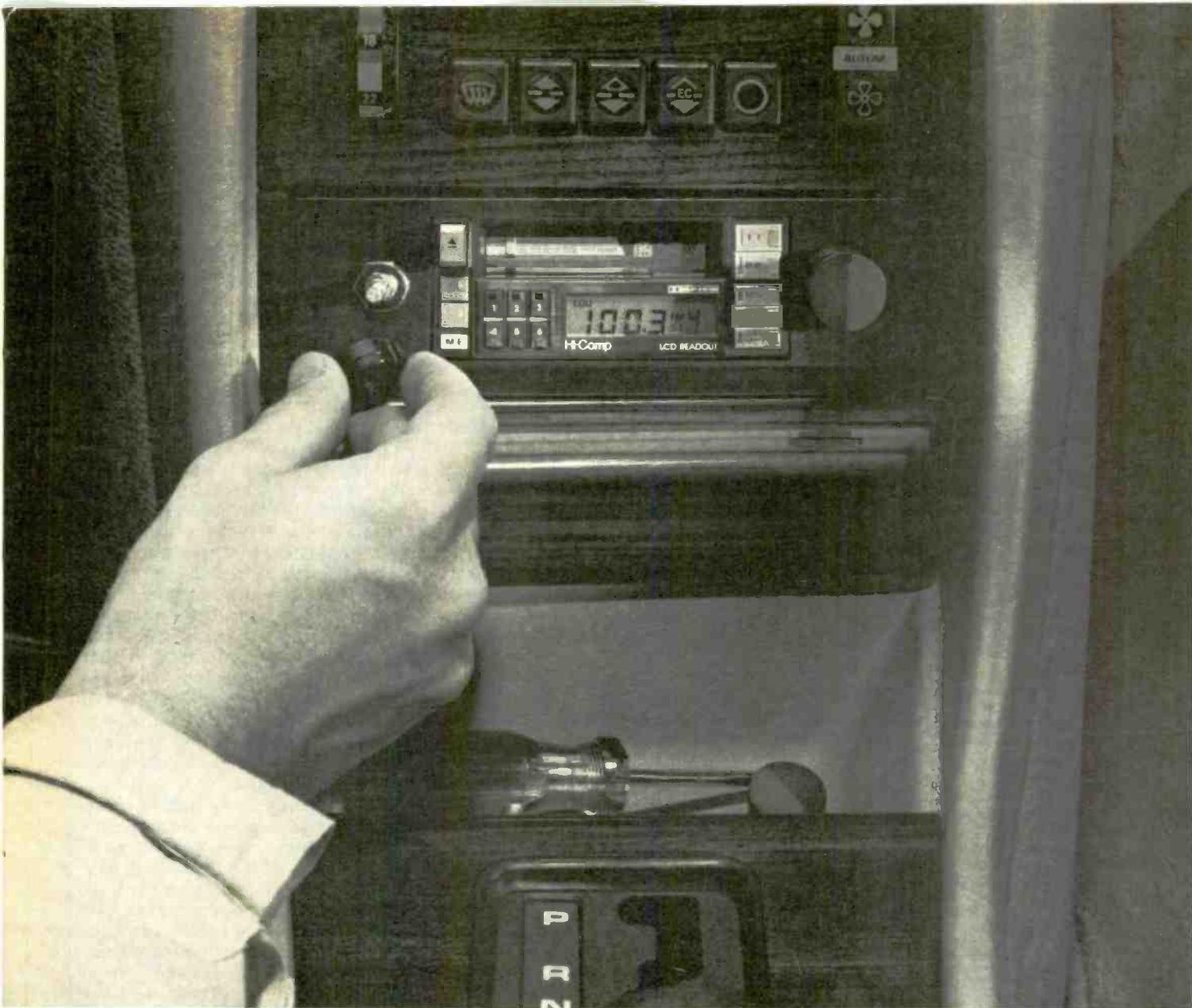
head with 20 tracks. The R-DAT system resembles a miniature videocassette recorder, using a rotating head in a helical-scan system. Both systems use 16-bit resolution of amplitude and 44.1-kHz sampling frequencies, the same as the CD standard. The choice between the formats is not an easy one. The 20-track S-DAT system (exactly the size of a conventional cassette) is mechanically simple but electronically complex. The R-DAT system uses scaled-down videocassette technology, making it mechanically complex. Since electronics has a history of coming down in price while mechanics does not, the S-DAT system may be less costly in the long run. In favor of the rotating-head DAT format is its small size—just over half that of a compact cassette, with over 2 hours of playing time. It could be argued that the compact cassette size and 1-hour time of the S-DAT system are just right.

A Clarion engineer maintained that new technologies are required for both DAT formats, not just scaled-down size. The S-DAT system's 20-track record head borrows integrated thin-film technology from the latest computer hard disk drives, and its playback head is a magneto-resistive type. Mechanics for this system are not that trivial, either. There are 20 tracks in each direction on standard 0.150-inch wide tape. A servo system is not required, but a new fixed-azimuth, edge-referenced guide system had to be developed. The rotary mechanics of the R-DAT system are required to lay

down a 12-micrometer track (that's one half of one thousandth of an inch wide) at a 6° angle to the quarter-inch tape (which runs at about 0.3 ips). The drum's scanning speed across the tape is 3.14 m/S with a $\pm 20^\circ$ azimuth offset between adjacent tracks. Needless to say, servo tape guidance is required for this system. Clarion and others are hoping for a final decision to be made between the two formats by this spring.

"Hi-Fi GM Automobiles: Today & Tomorrow," presented by Richard Stroud, Audio Systems Engineering Supervisor of Delco Electronics, was a Delco chauvinist's overview of car audio. Mr. Stroud proudly listed a series of Delco "breakthroughs" from the '60s up to the Delco-GM/Bose system. In reality, this was a grim period for them, in which increasing numbers of customers bought their cars without radios so they could put in good aftermarket systems. When GM finally did come up with an innovative system, it was Bose, not Delco, that invented it.

The most interesting part of Mr. Stroud's talk was his estimated timetable for new developments. He sees new magnet materials, flat speakers, and 100 watt/channel amplifiers to meet the current design challenge of achieving full-range sound in the decreasing space available to loudspeakers. He sees these developments, and car CD players, as just ahead. Digital audio tape, he predicts, will coexist with CDs for a while in the late '80s. He feels that by the early



Our twelve millionth sound system just found a new home.

Audiovox made the very first custom in-dash radio for audiophiles nearly 20 years ago.

Since then, we've made over twelve *million* custom sound systems for automobiles. One at a time.

Today, our top-of-the-line Hi-Comp matched stereo components produce a response so remarkable they are wooing Mercedes owners away from the most famous European system.

For instance, the Audiovox Hi-Comp HCC-1250 receiver/cassette being installed here is only 5" deep. Yet it's back-lit panel displays not only frequency and time, but all other functions just as though you had a small personal computer at your fingertips.

You get Dolby noise reduction from the deck, plus a music search system that permits scanning of cassette programs in both the forward and reverse modes. And a

further refinement is the solenoid soft-touch operating buttons usually found only on the most expensive home cassette decks.

With enormous power and the least cluttered control panel extant, this receiver/deck is designed for minimal eye movement combined with all the listening satisfactions of the home system.

But Audiovox hasn't stopped at sound systems in bringing motorists the comforts of home. Whether you're considering our new Audiote!™ mobile cellular phones or our electronic car security systems, Audiovox leads the way with a host of features the competition hasn't even considered yet. Audiovox. We've made cars more livable for a whole generation of drivers.

Audiovox Corporation, 150 Marcus Boulevard, Hauppauge, NY 11788. (516) 231-7750.

A U D I O V O X

We make cars more livable.

*natural wood
elegant design
affordable*



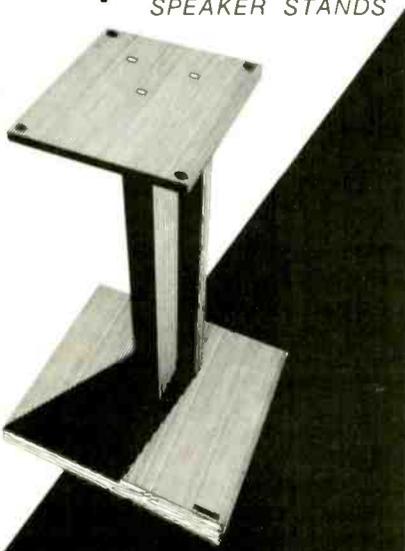
naiad
ELECTRONICS FURNITURE

BOX 1840 BRANTFORD
ONTARIO CANADA
N3T 5W4

BOX 1250 FALLS STA
NIAGARA FALLS NY
USA 14303-0260

Enter No. 36 on Reader Service Card

plateau
SPEAKER STANDS



Plateau speaker stands provide an easy and inexpensive way to dramatically improve the performance of your audio system. Designed to acoustically decouple and position the speaker, Plateau provides tighter bass, more focused mid-range and precise stereo imaging. For more information and the name of your nearest Plateau dealer, please write:

Canada
Naiad Products Inc
Box 1840
Brantford, Ontario
N3T 5W4

United States
Naiad Products Inc
Box 1250 Falls Sta.
Niagara Falls, N.Y.
14303-0260

Enter No. 34 on Reader Service Card

The background noise spectrum of a "quiet" car at 55 mph resembles the maximum output of a good subwoofer.

1990s, semiconductor memories will have increased in capacity to the point where it will be practical to record a 1-hour program on a chip or two. Certainly, the elimination of all moving parts is an attractive goal, but the largest memory chip available today holds 10,000 times less than a CD. Many people doubt that this gap can close as quickly as Mr. Stroud suggests, if ever. Hopefully, we will be spared "inaudible" data compression techniques to fudge an hour of music into whatever memory is available.

Lawrence A. Lopez, Executive Engineer from Ford Motor Company, presented a somewhat less biased overview of car sound from its humble beginnings to now. He also commented on the lack of published data on psychoacoustic studies of perception in small enclosures like car interiors. Because of this, Ford has begun to direct considerable engineering effort to this subject. Lopez illustrated the unique engineering challenges of car audio with graphs of lab data from his engineering department. For instance, the background noise spectrum of a "quiet" vehicle at 55 mph was shown to resemble a good subwoofer at maximum output. Levels reached 105 dB SPL in the range of 20 to 80 Hz—something of a problem for a 6-inch woofer to speak over! Lopez ended by offering a timetable similar to Delco's but more conservative. He also gave a hint of an upcoming Ford satellite/subwoofer system.

Panasonic presented details of a newly developed, two-chassis car CD player which they hope to sell directly to car manufacturers. The player mechanism and controls are in a standard DIN package for instrument-panel mounting, with the electronics in a remote package. The disc is inserted into a slot near the bottom, with the label down. The machine takes the disc in and pushes it halfway out after playing. With the half-out disc at the bottom, the controls can still be accessed. If the disc is not removed within a short time, it retracts back in for protection. A variety of control functions are available, but not all of them are needed. This allows the car manufacturer to customize it as he sees fit.

Dr. Amar Bose, of the Bose Corporation, gave an enthusiastic talk on psy-

choacoustics, college-professor style, using a blackboard and much arm waving. He stated that audio product development takes place in three linked domains: Physical devices, measurement of those devices, and perception of the sound. Points within each domain represent observable differences, and designers try to map from one set of points to those in another domain. The ultimate goal is to design a device that maps to a "perceived as reality" point which is two steps away in the perception domain.

Physical acoustics and engineering link devices and their measurements, while psychoacoustics links measurements and perception. Bose noted that individuals are seldom trained in both physics and psychophysics. This prevents the typical design engineer from linking measurements and perception. The psychoacoustics expert can make this jump but cannot specify new measurements or equipment improvements. For product evaluation, Bose stated he has found no substitute for individuals who possess formal training in all four of the following areas: Electronics, physical acoustics, psychoacoustics, and music.

Bose stressed the need to continuously compare any sound reproducer being developed to live music. Music has evolved and stabilized over the centuries to preferred spectral, spatial, and temporal characteristics. When untrained listeners are asked which of two sounds they prefer, they will invariably choose exaggerated characteristics over the more natural sound. After an hour or so of listening, however, their ears tire and they will become annoyed. Thus, the untrained listener will select components on initial hearing that will ultimately produce listening fatigue. The solution is to have listeners trained in the four previously mentioned disciplines evaluate the components relative to the natural musical experience.

This was the first year for an Entertainment Systems session at this conference. It got off to a great start as a vehicle for manufacturers to express long-term goals and blue-sky thinking. It was also well-timed as a prelude to the nuts and bolts presentations of the Society of Automotive Engineers in a few months.

David L. Clark



SUPER DUPER FROM TDK.



Capture all the dynamics of digital performance on your cassette deck. TDK HX-S blasts through the sonic barriers with high powered digital sound!

Its exclusive metal particle formulation reproduces a wider dynamic range and a higher frequency response to handle digitally-enhanced music sources on any cassette deck with a Type II (High-Bias) switch.

With four times the magnetic storage ability of any tape in its class, TDK HX-S virtually eliminates high frequency saturation, while delivering unsurpassed sensitivity throughout the audio spectrum. Additionally, HX-S excels in retention of high frequency MOL, which no other Type II formulation attains.

And to maintain its dynamic performance, TDK HX-S is housed in our specially

engineered, trouble-free Laboratory Standard cassette mechanism for durability and reliability—backed by the TDK Lifetime Warranty.

So for optimum results with Type II (High-Bias) and digitally-sourced recordings on your cassette deck, get the only super-duper. TDK HX-S.

 **TDK**[®]
THE MACHINE FOR YOUR MACHINE.

HIGH FIDELITY FOR YOUR EYES™

harman/kardon VCD1000 HIGH FIDELITY AUDIO / VIDEO CASSETTE DECK



VCD-1000 - Having set the sonic standards for home audio, Harman Kardon now enters the world of home video by introducing high fidelity for your eyes! Harman Kardon applied its 30 years of technical expertise to an extraordinary new home entertainment product: The VCD-1000 VHS Hi-Fi.

A breathtaking audio product with high quality video, the VCD-1000 is the perfect link to an integrated audio / video system.

As with all renowned Harman Kardon products, the critical issues of the quality of the circuitry, construction and layout of components were expertly addressed. The VCD-1000 utilizes an advanced record / playback system which FM encodes the audio signal. This FM signal is recorded and played back via high speed rotating heads (1800 rpm), resulting in wide, flat frequency response (20Hz-20kHz, ± 3 dB), virtually non-existent wow-and-flutter (0.005%), and 80dB dynamic range.

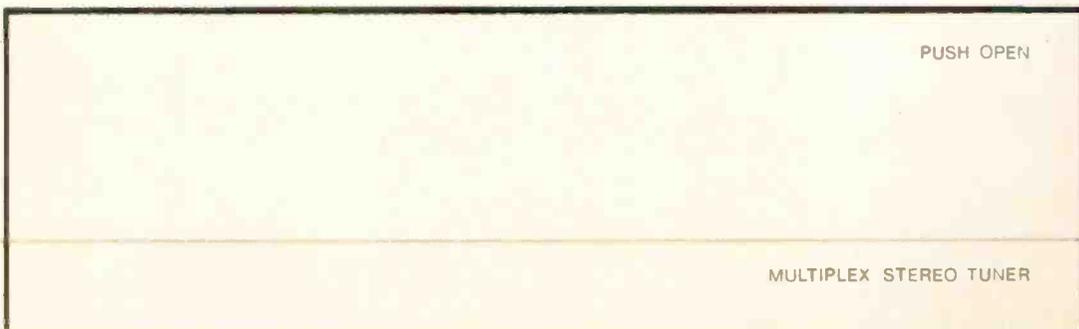
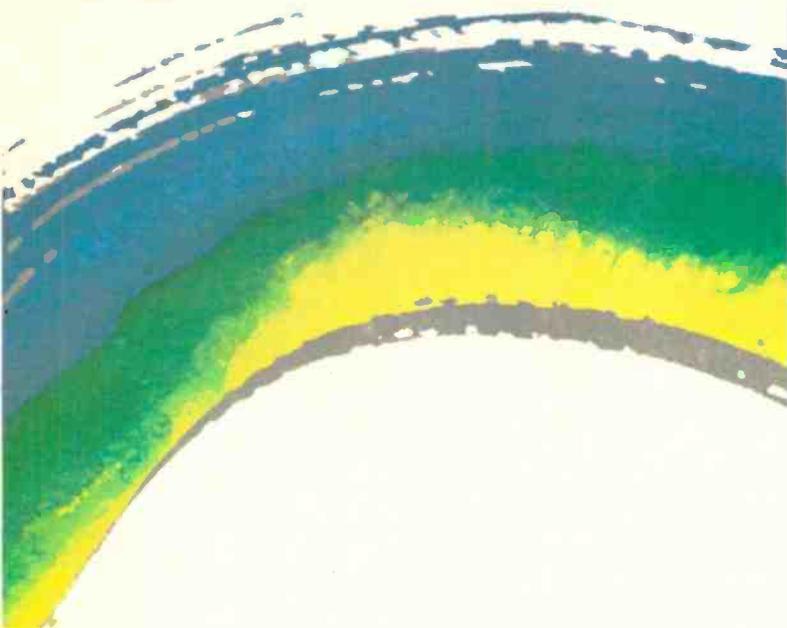
Custom-designed discrete filters are precisely tuned in pro-

duction to extend frequency response, critically align noise reduction and reduce high frequency distortion.

Applications of Harman Kardon acclaimed amplifier philosophies that are evident in the VCD-1000 are the use of discrete components for reduced distortion and the use of low negative feedback.

Stereo TV Tuner - The VCD-1000 incorporates a built-in 105 channel cable-ready stereo TV tuner, and is capable of receiving, recording and playing back high fidelity stereo TV broadcasts (with bi-lingual channel capability), even if you don't own a stereo TV yet. There is an independent audio tuner section resulting in improved sound quality from these stereo broadcasts.

The video section offers 4-event / 14-day programming; still frame; high speed forward and reverse picture search; full digital displays; slow motion and an infra-red remote control that duplicates all front panel functions.



MULTIPLEX STEREO TUNER

VM-100 Video Monitor- To further refine the audio / video vista, Harman Kardon is introducing the VM-100... a 25" diagonal, high resolution video monitor. The VM-100 combines exceptional linearity and superb transient response to deliver a picture that can only compliment the high fidelity sound.

When incorporated with Harman Kardon's unparalleled audio components, your world of high fidelity audio / video enjoyment becomes boundless.

Experience the Harman Kardon line of audio / video products... They're pure high fidelity for your eyes.

harman / kardon

MOURNFUL NUMBERS

Illustration: Philip Anderson



Numbers, Needs, and Knowledge

*Tell me not, in mournful numbers,
Life is but an empty dream!*

—Longfellow

There is a small war on among hi-fi reviewers, between the technocrats and esthetes—and a good thing, too.

The extreme technocratic right (like most extremes, largely imaginary) holds that once you've gotten the numbers that measure a hi-fi component's performance, there's no more to be said. The extreme esthetic left (a little less imaginary) holds that numbers mean nothing, and the listening is all. *Audio's* reviewers cluster near the middle of this spectrum.

There is reason on both sides of the issue. Most of us have heard, and all of us have heard of, components which did not sound as the numbers would predict, some sounding better and some worse. And we've all heard components which did sound exactly as the specs would lead us to expect.

Once upon a time, the numbers did tell us what we needed to know. When noise, distortion and frequency aberrations were common and gross, the numbers defining them could tell us at a glance which products were worth consideration. Now many of these errors have been refined away to the point where other differences stand revealed, and we have only our ears to find them with.

We wouldn't have gotten here so fast, though, if we hadn't had the numbers when we needed them. Listening to a prototype component to see if it has more or less distortion than your prior version is exhausting, and subject to subjective error. Measuring tells you relative distortion more quickly and reliably. That speeds progress—at least along the axes being measured.

We need to think about new axes of

measurement. *Audio's* Richard Heyser has given us some (such as energy-time curves and the crescendo test) in speakers. But while speakers are tricky to measure, their sonic differences are relatively gross. We need meaningful ways of measuring the subtler differences between such components as amplifiers and turntables.

By measuring, we make our judgments more reliable, and give each other some means of comparing judgments made by different reviewers. We also give designers a new tool, not just to predict how their designs will sound, but to predict how different components will interact.

And that gives listeners a useful new tool. It does little good to be told that speaker X sounds good with amplifier M but not with amplifier Q, if you happen to own amplifier Y instead. But if you knew that speaker X required an amplifier with parameters O and P to sound its best, you would know without lugging the beast home how the speaker probably would sound on your system.

What are these new numbers that we need to measure? Don't ask me. But *tell* me, if you have any to suggest. Write. Don't be afraid to offer off-the-wall suggestions if you have reasoning to back them up—just be sure to include your reasons. No prizes, except publication of the best suggestions and, if they work out, a further advance in the state of the art.

Editor's Note: One other thing, at which Ivan has hinted and which is never really spelled out in "one, two three . . ." fashion, is the relative distance between top and bottom of the quality ranking in the various categories of product. What's that mean, say you? Well, it means speaker systems sound enough

different, one from another, that no one would mistake one for another (well, hardly ever). With speakers, then, there is a large relative difference.

What product class has the next largest relative difference? Probably mikes, but most folks don't have or use them. And after that? Phono cartridges, where the difference in sound character has gotten very noticeably smaller in the past decade. Turntables are at about the same level, too, while preamps and amps have fairly small differences. Cables? Well, I've tried for about 5 years now and I've yet to hear *any* difference, though two respected listeners on our masthead cannot understand why I can't hear what is so plainly obvious to them. (I keep asking them to do their testing blind A/B . . .) On the other hand, I easily hear absolute phase and group delay with simple sources (as with Kaufman's Magic Box; see *Audio*, July 1984), where some other staff members have lots of trouble hearing any difference.

So what? Well, it means that speakers probably have more axes of measurement than any other component, that they are expected to do more things reasonably well than any other component, and that you should spend more time auditioning prospective speaker purchases than any other component and do so over a price range that may, at first, seem all too large. The quality per dollar spent varies most strongly with speakers, or—to put it another way—Beranek's Law operates most strongly in speaker systems.

For those who do not remember Beranek's Law, it states:

"It has been remarked that if one selects his own components, builds his own enclosure, and is convinced that he has made a wise choice of design, then his own loudspeaker sounds better to him than does anyone else's loudspeaker. In this case, the frequency response of the loudspeaker seems to play only a minor part in forming a person's opinion."—L. L. Beranek, *Acoustics*, McGraw-Hill, 1954, pg. 208. I am indebted to W. J. J. Hoge for calling this fundamental law of physics and human nature to my attention.—E.P.

How To Improve A Winner: The NAD 7155 Receiver.



We started with a winner: the NAD 7140. Heralded as one of the finest receivers ever, this is the product Stereo Review called "unmatched at its price."

Using the 7140 as a foundation, NAD added a newly designed phono preamp with 107 dB of dynamic range and independent listen and record selectors. We then increased the power and current delivery by more than 40%, resulting in peak power output in excess of 110 watts per channel.

We packaged this formidable amplifier section with the circuitry of our separate 4155 tuner, which Len Feldman of Audio magazine has described as "outperforming competing products costing much, much more." The result is the new NAD 7155 Receiver – another winning combination from NAD.

As our toughest critic, you are invited to visit your local NAD dealer and audition the 7155 for yourself. We're sure you will give it a rave review.

For more information on the NAD 7155 and a list of dealers, send us the coupon below.



NAME _____

ADDRESS _____

CITY _____

STATE _____

ZIP _____

NAD (USA), INC., 675 Canton Street, Norwood, MA 02062

Enter No. 28 on Reader Service Card

Much theater sound is worse than a TV set's, with voices muffled and the moving actors sounding stationary, in mono.

Mike Fright

Audio's offices are in the heart of New York's theater district, but I take my entertainment elsewhere—in concert halls and small, Off-Broadway theaters. There, you hear real voices and real instruments; on Broadway, all too often, you hear the sound of body mikes and loudspeakers instead (and pay more for it, too).

According to an article in *Playbill*, the program magazine at Broadway shows, some theater owners are aware of the problem and have hired sound consultants to improve sound quality. The article cites Abe Jacob, audio consultant to the Shubert theaters, as saying that good sound is unnoticed sound. And Jacobs



knows: *db* magazine recently quoted another Broadway engineer as calling him "The person . . . responsible for bringing high quality [sound] to Broadway."

Unfortunately, much theater sound is less realistic than that from a portable TV set. Sound may come from almost anywhere in the theater if it does come from the front, the source stays audibly fixed (the sound is mono) while the actors visibly cross the stage. Body mikes, hidden under clothing, frequently sound odd or muffled and occasionally transmit strange rustles. (Do Broadway actors starch their underwear?) When two actors come together, their voices change character—probably comb-filter effects from being picked up by both mikes simultaneously.

What brought us to this pass? Perhaps we, the audience, did. The article quotes Richard Fitzgerald, of Sound Associates, which equips many Broadway shows, as saying, "Audiences are different from 10 years ago. They're noisier, they don't listen as well, they demand amplification." And Jacobs adds: "The audiences demand it. They're used to it from their stereo and TV sets. They don't want to strain to hear."

Hum Ho

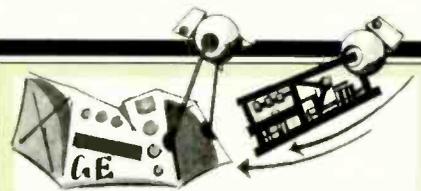
Acoustics can do funny things. For example, when I last moved, 15 years ago, I found that the AR-3a speakers I preferred for classical listening in my old home became my favorite rock speakers in the new, and vice versa for my Rectilinear IIIs.

I also discovered an acoustical peculiarity in my new apartment: With a long hall extending off to the left of the left-channel speaker, the best bass in the house was where the hall terminated, in my bathroom. Hum came through with special clarity—I guess the room resonated at 60 or 120 Hz—enough to make it obvious that the system was on, even when I couldn't possibly hear hum in the living room.

I'm probably about to move, to a new apartment with a different layout. I wonder how my system's sound will change this time.

Live End, Cat End

I'd like to use live-end/dead-end acoustical techniques on my living room. The trouble is, I have two cats, complete with claws. Any suggestions as to how to keep them from clawing my room's dead end into liveness (and shreds)?



Alphabet Soup

GE and RCA are going CD—a good omen for CD's popular acceptance. Neither company is actually making players, of course—about half the companies whose brands are on CD equipment buy them elsewhere—but they are marketing home players. (RCA's is part of their deluxe audio/video Dimensia system, and GE is even rumored to be readying a portable system with a player.)

Perhaps we may once again see America's big electronics companies get big in audio, too; GE, for instance was once a leader in magnetic cartridges, and Stromberg-Carlson (now producing defense electronics) had a complete component line, including a turntable which foreshadowed the AR turntable in several respects.

Bachward, Turn Bachward

Part of the fun of P.D.Q. Bach concerts comes from the titles of the works—"Concerto for Horn and Hardart," "Iphigenia in Brooklyn," "The Stoned Guest," "Variations on an Unusually Simple-Minded Theme," and so on. But there are other P.D.Q. works which, so I understand, the renowned Prof. Schickele has not yet uncovered. Being no music scholar, I have not discovered these works either, but I have at least found an old reference work which lists some of the missing titles: *The Annulment of Figaro*; *Barbarous Seville*; *Cafeteria Rusticana*; *Counterrevolutionary Etude*; *Critical Mass in B Minor*; *Desecration of the House Overture*; *The Dessert Song*; *Dialogues of the Caramelized*; *Dristan and Isolde*; *Flight of the Bumblebee Tuna*; *Indecent Overtures*; *Juice of Three Oranges*; *Lakme or Leave Me*; *The Magic Fruit*; *Marche Millinaire*; *Moonshine Sonata*; *Music for Unprepared Piano*; *Parsifal, Sage, Rosemary and Thyme*; *The Pines of Nome*; *Weiner Blutwurst*, and *A Wife for the Czar*.

VALUE

Introducing Karat — a new generation of bookshelf speakers from Canton.

With Karat, Canton leads the way into the digital era of sound reproduction. The result is sound so natural and free of coloration you must hear them to appreciate the acoustic achievement this series represents.

Like the entire Canton product line, from our mini-speakers to our floor-standing speakers, the Karat bookshelf series offers value. Value in sound reproduction is first and foremost: that's why every element in the Karat series is designed, engineered and manufactured at the Canton factory in Germany.

Value in terms of detailing goes into every Canton speaker as well. That's why we offer our speakers in a variety of fine finishes, like walnut and oak veneers, rich black, bronze and white lacquers and now a premium finish, gloss mahogany. For at Canton, we believe speakers should look as good as they sound.

Visit your local Canton dealer today and learn the value of a sound investment: Canton's Karat series — products of German quality and craftsmanship.

Canton North America, Inc.
254 First Avenue North
Minneapolis, MN 55401



CANTON
Die reine Musik

We asked these three experts to put a price on this edition of Dickens' DAVID COPPERFIELD.

\$12.50.



"The raised spine is a giveaway. That's quality binding."
\$30."
 KEN McCORMICK,
 Sr. Consulting Editor,
 Doubleday.



"The illustrations are superb. Excellent typography."
\$35."
 CLIVE BARNES,
 Cultural critic, New York Post.



"The paper is fine mill. The end pages an unusual design. A first-class job."
\$35."
 PHILIP LYMAN,
 Gotham Book Mart.

WRONG. WRONG. WRONG.
 The price, of course, is only \$12.50 for *David Copperfield* and every other volume of the new Collector's Library of the World's Great Books.

Again and again, Franklin Library, the world's leading publisher of fine books, has seen its remarkable new Collector's Library confound the experts.

How can these authorities be so right in their praise and so wrong in the price?

Let's take a close look and see why. Each of the fifty volumes is individually designed; each cover is a work of art, each binding distinct in size, grain, color.

(The effect in your room is uncanny. Each volume different but harmonious. A luxurious library that is a tribute to your taste.)

Each spine is hubbed in the great tradition of book binding.

Each endsheet (inside covers) is an original design.

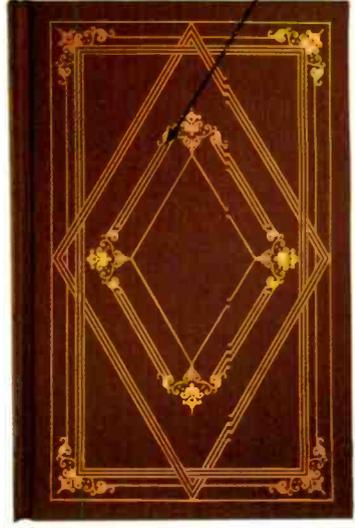
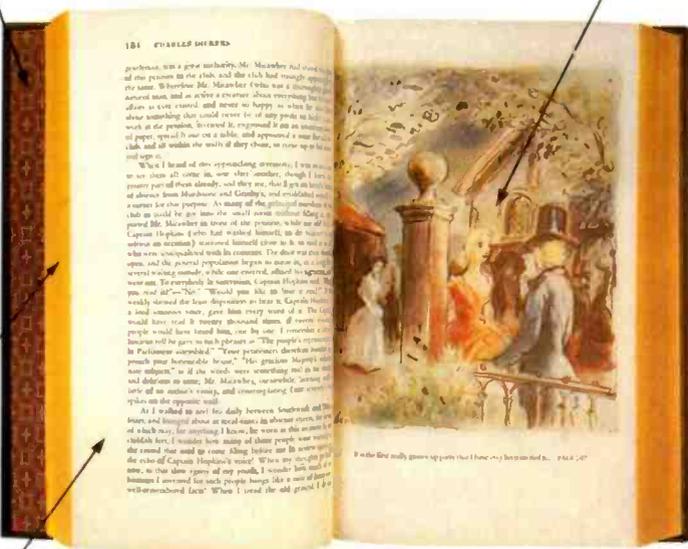
The page edges are gilded; the paper, itself, is crisp, opaque, specially milled and acid free to last for generations.

Many artists were commissioned for the project. And the illustrations are magnificent. (The color paintings by Thomas Rowlandson in TOM JONES make us tingle with pleasure.)

Distinctive endpapers, specially designed for the collection, and varied among the volumes.

Superb illustrations, many specially commissioned, including a number in full color.

Each binding is individually designed: the copper cover dies are hand finished.



Hubbing—a valued characteristic of the traditional bookbinder's art.

Page edges gilded with a tarnish-free finish for both protection and beauty.

Specially milled, acid-free paper that will endure for generations.

How did we do it?

The typography is classic, the printing first rate, the contents immortal and priceless.

Yet the price for each volume is only \$12.50, less, as you know, than ordinary hardcover books.

It is a publishing conundrum with a simple, albeit spectacular answer. Franklin Library has made a publishing breakthrough of which it is very proud.

Here is the genius of mankind.

Eternal classics, from Homer's ODYSSEY to Melville's MOBY DICK.

The chilling tales of Edgar Allan Poe. The romance of Emily Bronte's WUTHERING HEIGHTS. The earthy humor of CANTERBURY TALES by

Chaucer. The transcendent dramas of Shakespeare (illustrated by Henry Fuseli), Ibsen, Chekhov. Great English and American poetry.

Fifty volumes in all. A library of genius that belongs in every home.

Here is adventure for the mind, for yourself and for your children. Inspiration and pleasure more abiding than television, more memorable than movies. At a price that makes it almost mandatory. (And that is Franklin Library's intention.)

Subscribe without risk.

As a subscriber, you build your collection one book each month, and payment is on the same convenient basis. The subscription price is a remarkable

\$12.50 per volume.

A *guaranteed* price, if your subscription is mailed by February 28, 1985. You need send no payment now.

You may cancel your subscription at any time, upon 30 days' written notice, and return any book for any reason, within 30 days.

**The Collector's
Library of the world's
great books.**

**A revolution in
publishing.**



Frequency Contouring For Image Enhancement

Richard J. Kaufman

The brain has more ways of locating sound than are usually made use of. Here's how to use one that is often neglected in commercial products.

The brain uses three major cues to determine the direction of sound. Relative loudness and phase (including arrival-time) differences between the sounds heard by the left and right ears are well known; they were mentioned in Blumlein's stereo patents of 1931. Stereo as we now know it depends on these two effects, but loudness predominates. Recording engineers generally use relative loudness alone to mix a "stereo" recording from multiple mono tracks, and some "image-enhancement" devices use phase differences to give a wider stereo image.

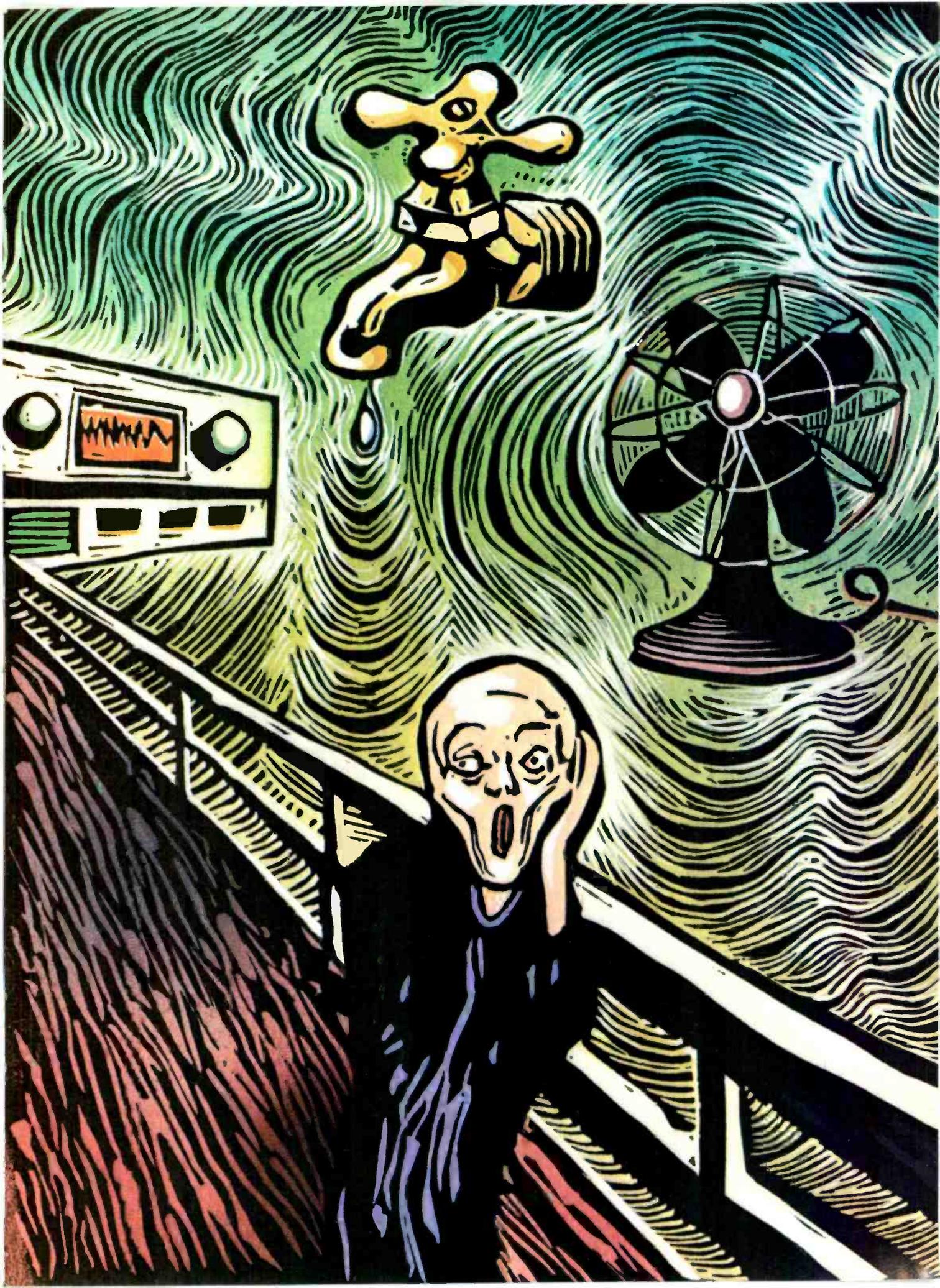
Frequency response is less well-known than phase or level differences in this regard, and has never, to my knowledge, been used by recording engineers to intentionally enhance the stereo effect. It was first brought to my attention by Denis Vaughan's article, "How We Hear Direction," in the December 1983 issue of *Audio*. Perhaps the effects of frequency response are more obscure than the other perceptual cues because the scientific work exploring this aspect of audio perception is relatively recent.

The fact is, the human ear's frequency response varies, depending on the direction of a sound's arrival. You can confirm this easily; listen to a source of

random noise, such as a fan, a running faucet or interstation hiss on an FM receiver. Block one ear, and listen with the other as you turn your head. The tonal quality of the noise will change, depending on the direction from ear to sound source. The implication of this effect suggests a definite limitation in the ability of two loudspeakers to give a realistic illusion of an acoustic event. However, it promises better sound reproduction if the principles behind the ear's localization of sound by frequency response can be refined and incorporated into the recording art.

My experiments along these lines indicate that not only is this possible, but that existing stereo recordings can be enhanced by the use of a relatively simple matrixing device and a 10-band graphic equalizer. This article will describe how to use frequency contouring to change the perceived source of a sound when played through a stereo system, and will show how to build the matrix.

Table I, reprinted from Denis Vaughan's article, shows how the ears' response varies at different frequencies, depending on the angle of arrival. (In front of your nose is 0°, directly to the side is 90°.) These response curves are said to vary little between individuals.





The sound stage need not be confined within the space between the speakers.

Table I—How the outer ear's response varies at different frequencies and sound-source azimuth angles. (After Mehrgardt and Mellert.)

Ear Canal (dB)	Frontal Spectrum (dB)	Frequency In Hz	18°	36°	54°	72°	90°	108°	126°	144°	162°	180°
0	-0.5	200	1.0	2.0	1.5	0.5	1.5	0.5	0	0	0	-0.5
0.5	0.5	500	1.5	3.0	4.5	4.5	6.0	5.0	4.5	4.0	2.5	0
1.0	1.0	700	2.0	3.5	4.5	5.5	6.0	6.0	5.5	4.5	2.0	0.5
1.0	-2.0	1k	0.5	2.0	2.5	4.5	5.5	5.0	4.5	3.5	3.0	2.0
2.0	10.0	2k	12.0	12.0	11.5	11.5	10.5	10.0	8.5	8.0	8.0	6.5
5.0	12.0	3k	13.0	14.0	15.0	14.0	11.0	10.0	9.5	9.5	9.0	8.5
12.0	5.0	4k	8.0	9.0	8.5	6.5	3.0	-0.5	-3.5	-3.0	-1.5	-0.5
12.0	-1.5	5k	2.0	2.5	3.5	3.0	2.0	-1.0	-7.0	-10.5	-9.5	-8.5
9.0	-0.5	6k	3.5	6.0	6.5	7.0	6.5	5.0	2.0	-3.5	-5.0	-5.5
5.0	1.5	7k	6.0	10.0	11.5	12.5	11.5	10.0	8.0	4.0	0.5	-1.0
4.5	-2.0	8k	2.5	6.0	9.0	12.0	13.0	12.5	10.0	5.5	1.5	0.5
8.0	-8.0	9k	-4.5	-2.5	-1.0	0.5	3.5	3.0	0	-3.5	-7.0	-8.5
11.5	-10.5	10k	-7.5	-5.0	-3.5	-3.5	-4.0	-3.5	-4.0	-6.0	-8.0	-13.0
2.5	-10.0	11k	-7.0	-6.5	-4.0	-2.5	-3.0	-2.5	-3.0	-3.5	-8.0	-12.0
-8.0	-7.0	12k	-2.0	-5.5	-3.5	0	1.5	1.0	-0.5	-3.5	-5.5	-9.5
-9.0	-2.0	13k	2.0	-2.0	-0.5	3.0	3.5	4.0	3.0	-1.0	-2.0	-6.5
-8.0	2.0	14k	8.5	4.0	4.0	4.5	4.0	3.5	1.5	-0.5	-2.0	-5.0
-7.0	3.5	15k	9.0	6.0	6.5	5.0	4.0	2.5	1.5	0	-1.5	-4.0

Fig. 1—Frequency contours for improved imaging with loudspeaker signals (see text and Table II).

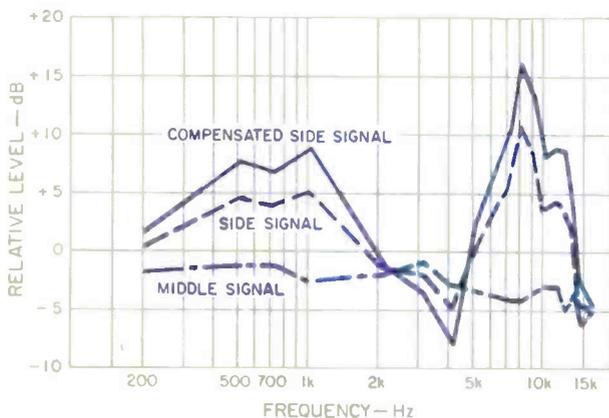
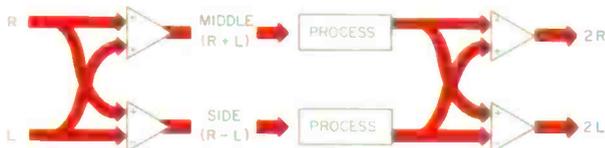


Fig. 2—Principles of the M-S (middle-side) matrix.



The usual angle subtended by a pair of stereo speakers in a normal listening configuration is $\pm 18^\circ$, or slightly greater. (This means that if the speakers are separated by 6 feet, the listener is about 9 feet from the plane defined by the speakers. A $\pm 36^\circ$ angle would place the listener closer to the speakers than the distance between them, a situation that should be avoided. Although most setups place the listener somewhat closer than a 6-to-9 ratio, the difference does not appear to be significant in this context.) With the standard speaker setup, the stereo image is usually confined to the space between the loudspeakers, and it is most accurate for instruments whose apparent location is at the speakers themselves (i.e., monophonic information in one channel). With centered, or two-channel, monophonic information, amplitude clues tell you that the sound source is centered, but you are still constantly aware of where the loudspeakers are.

Therefore, my first experiment with frequency contouring involved altering the frequency response of a mono signal to make it appear to come from dead center, with no sense of speaker position, when played through a pair of speakers. (The same equalization can be applied in a studio mix-down, as when a vocal solo is mixed equally into the right and left channels. A vocal so mixed and equalized will seem to come from dead center.)

For these experiments, I used the equalization settings shown in the "Middle" column of Table II. As Fig. 1 (a graphic representation of the information in Table II) shows, a four-band parametric equalizer might correct the response exactly. A third-octave equalizer would also be very good. Pioneer was kind enough to lend me a 2/3-octave unit, the SG-90. It was almost as effective as a third-octave equalizer, and its controls were accurately calibrated. But even a 10-band graphic equalizer can give a fairly good fit to the desired approximation—all you need do is set its bands to the levels indicated for those (or the nearest listed) frequencies in the "Middle" column of Table II.

Your equalizer may well require different settings than shown in Table II for correct results. There are two rea-

By using the proper frequency contouring, it is possible to make sound seem to come from overhead or even behind the listener.

sons for this: First, you will have to take into account the degree of interaction between adjacent equalizer bands; your equalizer's manual should tell you the degree of interaction (if not, write the manufacturer and ask). Also, the dB scales on many inexpensive graphic equalizers are not accurately marked; corrections for this are shown in Table III. The relationship between indicated and actual response shown here is typical, and is caused by the common use of linear potentiometers for what is actually a logarithmic function. Note that the discrepancy is greatest at the center of the range, with indications becoming more accurate at the more extreme settings. For this reason, if your equalizer provides a maximum adjustment of ± 15 dB, it will still be fairly close to the figures shown, over much of its range. Using a spectrum analyzer would make these adjustments easier.

Again following Vaughan's data, I tried to contour a single-channel signal so it would seem to come from the listener's side, rather than from the speaker position, using the equalizer settings in the "Side" column of Table II. This also worked, though the apparent sound position was not a true 90° , probably due to either sound reflections in the room, arrival-time differences at each ear because of the 18° speaker placement, or both. At a friend's house, with Sonex acoustic foam behind the speakers, the sound did seem to be coming from the wall at my side, rather than from the front speaker wall. (The center image was already good without the Sonex.) This same equalization, applied to both channels of a stereo recording, gives a more spacious feeling to some material. With monophonic and some other stereo material, however, the "Middle" EQ settings give the best results—you'll have to experiment.

When mixing down multi-track recordings, apply the "Side" equalization to signals such as ambience or special effects to make them sound as if they originated at the extreme right or left. (This suggests that recording engineers will have a broad range of special effects available if they explore the uses of frequency contouring. It is even possible to make sounds seem to come from overhead, or behind the

Table II—Frequency contouring equalizations for shifting apparent positions of signals from normally placed speakers ($\pm 18^\circ$ from listener).

Frequency, Hz	Contours dB		
	Middle	Side	Compensated Side
200	-1.5	+0.5	+2.1
500	-1	+4.5	+7.8
700	-1	+4	+7.2
1k	-2.5	+5	+9.0
2k	-2	-1.5	-1.0
3k	-1	-2	-3.1
4k	-3	-5	-7.6
5k	-3.5	0	+2.5
6k	-4	+3	+6.8
7k	-4.5	+5.5	+10.0
8k	-4.5	+10.5	+15.7
9k	-3.5	+8	+12.8
10k	-3	+3.5	+7.2
11k	-3	+4	+7.8
12k	-5	+3.5	+7.7
13k	-4	+1.5	+4.8
14k	-6.5	-4.5	-2.9
15k	-5.5	-5	-4.5

Table III—Indicated vs. actual settings of a typical home graphic equalizer.

Indicated Setting, dB	Actual Boost or Cut, dB
+12	+12
+10	+10
+9	+7.5
+8	+3.6
+7	+2.4
+6	+1.7
+5	+1.2
+4	+0.9
+2	+0.4
0	0
-2	-0.2
-4	-0.5
-6	-1.4
-7	-2
-8	-3
-9	-4
-10	-10
-12	-12

Table IV—Frequency contouring to prevent "in-your-head" effects in headphone listening, with and without M-S matrixing (see text).

Frequency, Hz	Center Simulation Contour, dB	Speaker Simulation Contour, dB	S-Channel Equalization	
			Normal, dB	Wide, dB
250	-2	+0.5	+2.4	+1.6
500	-5.5	-3	-1.1	+3.3
700	-5	-2.5	-0.6	+3.2
1k	-7.5	-3.5	-0.8	+4.0
2k	-0.5	+1.5	+3.1	+0.5
3k	+1	+3	+4.6	-1.1
4k	+2	+6	+8.7	-2.6
5k	-3.5	+0.5	+3.2	+2.5
6k	-7	-0.5	+3.2	+3.8
7k	-10	-1.5	+2.7	+4.5
8k	-15	-7	-2.9	+5.2
9k	-11.5	-6	-2.7	+4.8
10k	-6.5	-1	+2.3	+3.7
11k	-7	-3.5	-1.0	+3.8
12k	-8.5	-7	-5.7	+4.2
13k	-5.5	-5.5	-5.5	+3.3
14k	-2	0	+1.6	+1.6
15k	-0.5	+2	+3.9	+0.5



Frequency contouring can eliminate the "in-your-head" feeling common in headphone listening.

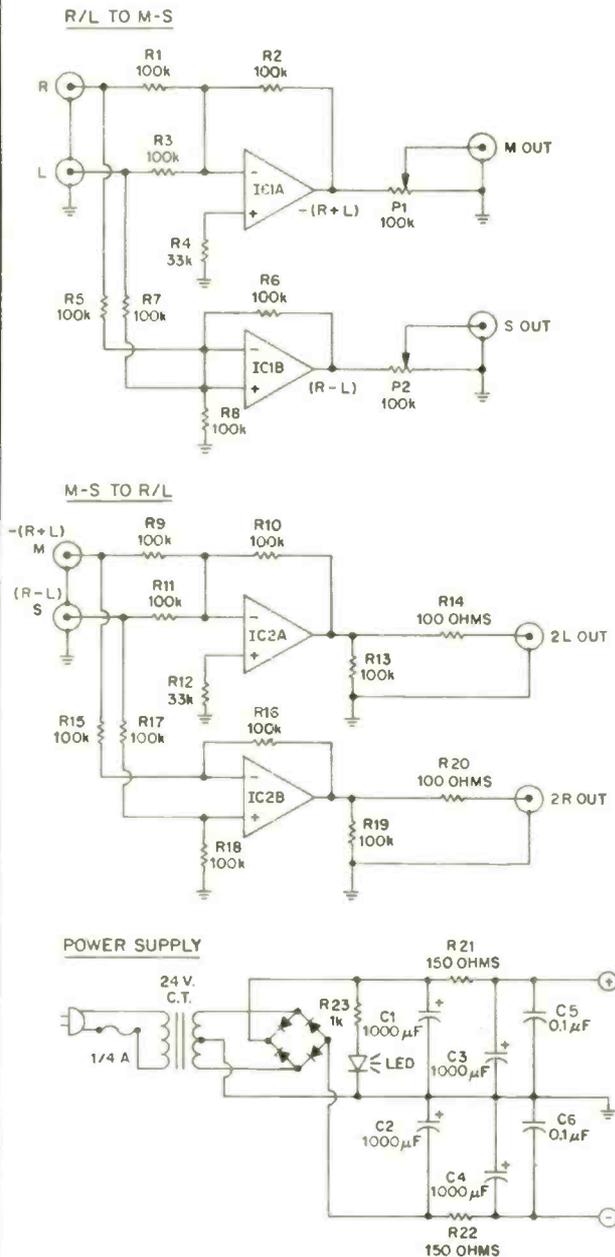


Fig. 3—Schematic diagrams for an active M-S matrix: Right-left to M-S encoder (top), M-S to right-left decoder (center), and power supply (bottom). Capacitors C5 and C6, shown in the power supply, should be mounted as close as possible to IC1 and IC2 and should be used even if a different power supply is connected.

listener, by using the proper response contouring.)

These effects are even better with headphones, although a different equalization is required (more on that shortly). Without room reflections or interaural interference, it should be possible to mix some stunning tapes for playback on headphone-equipped personal portables.

Most audiophiles do not mix their own music; a way to use frequency response contouring to enhance existing recordings is also desirable. This can be accomplished with a technique known as M-S (middle-side) matrixing (Fig. 2); Fig. 3 shows schematics for building such a matrix, for which a Parts List is also provided.

In M-S matrixing, the right and left signals are summed to give a middle (M) signal, the one we wish to contour to give the illusion of true center origination. Subtracting one channel from the other gives a side (S) signal, which we wish to shape so that it will appear to come at 90° from the sides. By properly remixing the M and S signals, separate right- and left-channel signals are again attained, but with a frequency response which provides more realistic ambience and wider imaging when played through a typical stereo system.

To do this, we apply Table II's "Middle" equalization to the M signal, and either the "Side" or "Compensated Side" contour to the S signal. Using the "Side" equalization will emphasize hall ambience but narrow the sound stage, while the "Compensated Side" contour will widen the sound stage.

What is being compensated for, in the latter case, is the interaction of the "Middle" and "Side" curves when the M and S channels are matrixed back into left and right stereo signals. Since each matrix channel includes both left and right information ($M = L + R$, $S = L - R$), the left-only and right-only signals are acted upon by both the M and S contours. When the signals are added back together, the results are not as desired. The "Compensated Side" contour includes a correction so that, when the M and S signals are added, side signals will have the proper contour for 90° localization.

If any required adjustment is beyond the range of an ordinary equalizer, use

The build-it-yourself M-S matrix can also be used to reduce noise caused by multipath interference in FM reception.

the maximum cut possible at that frequency.

Contouring for Headphones

Frequency contouring is even more effective with headphones and provides more normal sound perspective, without the typical "in-your-head" imaging problems. But headphones require different contouring than speakers, since the actual sound sources are at $\pm 90^\circ$ rather than $\pm 18^\circ$ relative to the listener. Table IV shows the contours for use with headphones to give the illusion of sounds originating from different angles.

One might expect that, due to the phones' contact with the outer ear, these figures might not be strictly accurate, because the sound is no longer acting on the entire pinna of the ear. However, for both over-the-ear and on-the-ear headphones, they work. In-the-ear phones are a different matter; a sound source in the ear would not interact with the contours of the outer ear (pinna), and would probably require a different sort of correction. (I've had no opportunity to experiment with these devices.)

For use without an M-S matrix, the "Center Simulation Contour" settings will make signals sound as if dead ahead (though with some loss of high-frequency information), while the "Speaker Simulation Contour" will place sounds as if coming from the normal $\pm 18^\circ$ loudspeaker setup. To make recordings specifically for headphone use (an attractive idea, now that headphone portables are so common), apply the "Center Simulation Contour" to both channels.

With an M-S matrix, use the "Center Simulation Contour" on the M channel and the "Normal" equalization on the S channel. Contouring the S channel with the "Wide" equalization will produce a wider sound stage; information that appears only in one stereo channel will then sound all the way to the listener's side.

Results in all cases, for both headphone and speaker listening, will depend greatly on the microphone and mixing techniques used in the original recording. When listening through speakers, results will depend upon your speakers and your room acoustics as well.

Parts List

R1 through R3, R5 through R11, R13, R15 through R19—100-kilohm resistors (exact value not critical, but must be matched within 1%).

R4, R12—33-kilohm resistors.

R14, R20—100-ohm resistors.

R21, R22—150-ohm, 1/2-watt resistors.

R23—1-kilohm, 1/2-watt resistor.

P1, P2—100-kilohm potentiometers.

C1 through C4—1000- μ F, 25-V electrolytic capacitors.

C5, C6—0.1 μ F, plastic-film (Mylar) capacitors. (Mount on same board as IC1 and IC2, as near to them as possible.)

IC1, IC2—TL072CP.

D1—Bridge rectifier.

T1—24-V, center-tapped transformer, 85 mA or more.

Miscellaneous—1/4-A fuse and holder; eight phono jacks, general-purpose p.c. board, LED, mounting hardware, and wire.

A kit of the required, 1%-matched resistors and op-amps is available from Brunswick Tape Media, 580 Eighth Ave., New York, N.Y. 10018 for \$8 (plus New York sales tax, where applicable). All other parts are easily purchased locally.

Building and Using The M-S Matrix

Figure 3 is a schematic diagram of the M-S matrix. Construction is relatively simple, and the parts count is low. Anyone who has built one of the old Dynakits or anything similar should have no difficulty assembling the device on a general-purpose p.c. board. The hardware is available at Radio Shack. The resistors, however, must be 1% tolerance, to maintain the frequency response within 1 dB of that desired. (See Parts List for availability.) You may add 4.7- μ F decoupling capacitors at the outputs if you wish; I have not found the small amount of d.c. offset produced by this circuit to

cause a problem with any equipment I've used.

I installed my first prototype in the chassis of a graphic equalizer, hooking into its power supply. You can do the same, or you can use any suitable power supply that gives between ± 6 and ± 8 V instead of using the power supply shown in Fig. 3.

An added bonus of the matrix is that it allows you to change the relative amounts of middle and side signals, and so change the balance and perspective of a recording, improving some material where the original mixing was not ideal.

Another use for the M-S matrix is for noise reduction on FM stereo broadcasts. The M-S matrix is identical to that used for encoding FM signals; most of the noise due to multipath interference is in the R - L, or side, signal. By attenuating the frequencies above 4 or 8 kHz on the side signal only, it is possible to significantly reduce noise while maintaining stereo separation in the midrange, and preserving high-frequency information in the middle signal.

M-S frequency response contouring gives broader and more localized imaging with many recordings. Center information is less blurred, more sharply focused. Side information can be so sharply defined that one thinks there are extra speakers in use; some listeners have searched my listening room, attempting to find them. With headphones, the music no longer sounds as if it were inside your head, but moves out and toward the front where it belongs, while still retaining the detail and intimacy characteristic of headphone listening. While it may not be suitable for all material, the matrix was very effective with popular and rock recordings.

Perhaps the most exciting use for frequency response contouring is not enhancing existing music, but in creating new works. I have used a computer to develop an extensive series of tables and graphs to aid in such efforts. The results are available, together with a demonstration tape, from Brunswick Tape Media, 590 Eighth Ave., New York, N.Y. 10008. Please enclose a check for \$15 (plus sales tax in New York) to cover the cost of materials and handling.

A

**Leonard Feldman
and R. Aryana**

THE DNR

How it works

Companding, noise-reduction systems, such as Dolby and dbx, may be the best-known noise reducers, but they're not the only ones. There is another type, referred to as noncomplementary or single-ended, with unique advantages of its own.

In companding NR systems, the signal must be encoded before transmission or recording, and decoded in re-

ception or playback. These systems can reduce the amount of noise a signal picks up within the encode/decode loop, but they can't reduce noise already present in the signal.

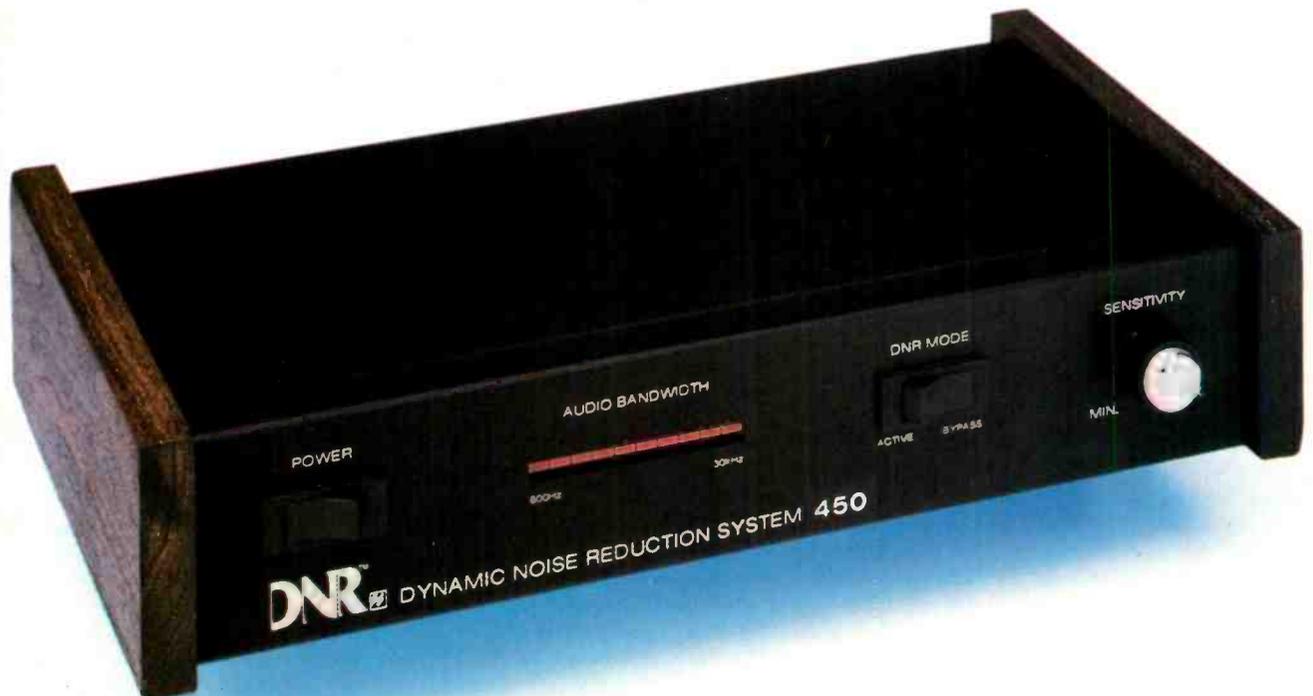
Companding NR systems (including Dolby B and C, dbx, and the one described by John Roberts elsewhere in this issue) have the most powerful noise-reduction ability, but they must trade power for compatibility. For instance, Dolby B-encoded tapes are compatible with systems lacking Dolby decoders—you need only turn the treble down to listen pleasantly—but this is the least powerful of the popular companding systems, with only 10 dB of noise reduction. Dolby C NR, with 20 dB of noise reduction, produces tapes which can be listened to reasonably well on systems equipped with Dolby B

decoders, but it is barely listenable on systems without Dolby B (again, with the treble turned down in each case). Tapes made with dbx encoding are the least compatible—they're unlistenable on systems without dbx decoders—but provide the most noise reduction (35 dB or more).

Single-ended NR systems work in playback only, requiring no special encoding of the signal. While they cannot prevent noise pickup like the companding types, they can reduce noise already present in the signal. And they can be used with any program source: AM, FM, tape, disc, VCR audio tracks, telephone, or even such nonaudio applications as medical electronics and data transmission.

Perhaps the best-known of these systems is the Dynamic Noise Filter,

Leonard Feldman is a Senior Editor of this magazine. R. Aryana is Chief Engineer of Advanced Audio Systems International in San Jose, California. Portions of this article have been adapted from "A Dynamic Noise Reduction System," an article by Mr. Feldman which originally appeared in the October 1981 issue of Radio-Electronics.



NOISE REDUCER:

and How to build it

developed by Richard Burwen. A single-chip noise-reduction system based on Burwen's, called DNR, is manufactured by National Semiconductor (See "National's New Noise-Reduction Chip" by Ralph Hodges, *Audic*, November 1981.)

How DNR Works

The National Semiconductor noise-reduction system can provide up to 14 dB of noise reduction in stereo program material and is based upon two principles. The first of those states that noise output is proportional to system bandwidth. Suppose system noise is caused solely by resistive noise (noise added by the circuit resistors). In such a system, noise amplitude is uniform over the system's frequency bandwidth. Thus, if

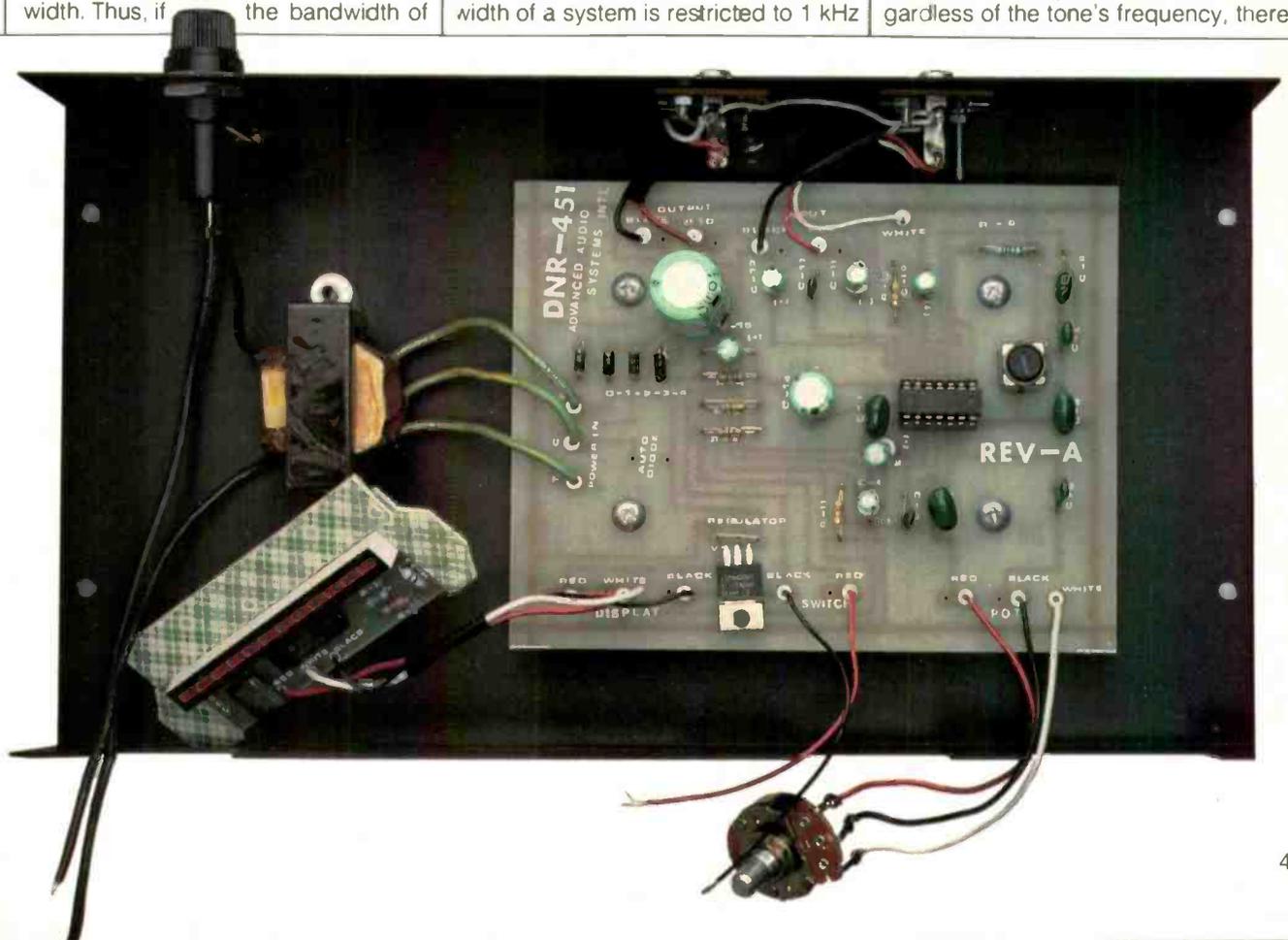
the system is reduced, the noise content is also reduced.

Unfortunately, there isn't a simple correlation between the amplitude of the noise signal and the amplitude of the noise perceived by the listener. As shown in Fig. 1, the ear is most sensitive to noise in the 600 Hz to 6 kHz frequency range. For this reason, when measuring noise content in a system, a weighting filter is usually inserted in the measuring instrument to give better correlation between the measured signal-to-noise ratio and the subjective impression of noise. When a CCIR/ARM weighting filter (commonly used when measuring signal-to-noise ratios of cassette tape and decks) is used, it will yield noise-reduction numbers of between 14 and 18 dB when the bandwidth of a system is restricted to 1 kHz

with single-pole and two-pole low-pass filters, as shown in the curves of Fig. 2.

Auditory Noise Masking

The second basic principle behind DNR is masking—that hearing one sound decreases our ability to hear another. For example, white noise (random noise containing all the audible frequencies at equal amplitude) raises the threshold of hearing a pure tone by an amount that depends on the frequency of that tone, as shown in Fig. 3. The curve shows a general trend. At a higher frequency, a tone has to be increased in amplitude (compared to a 1-kHz tone) to be heard. That is because a wider range of noise frequencies contributes to masking as the tone's frequency increases. But regardless of the tone's frequency, there



NR systems like dbx and Dolby only work on specially encoded recordings; the DNR system works on anything.

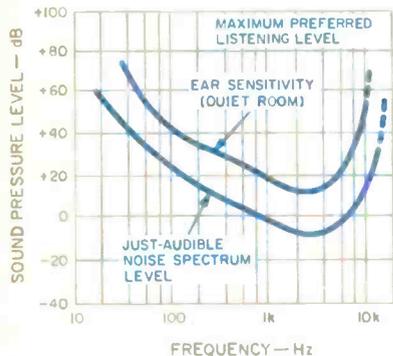


Fig. 1—The ear's sensitivity to noise varies with frequency.

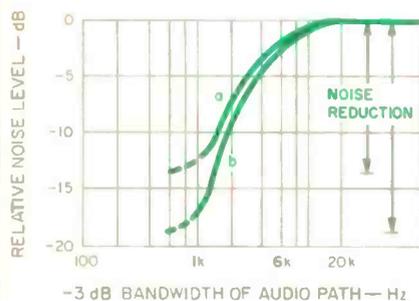


Fig. 2—How decreasing bandwidth affects noise reduction, with DNR configured as a single-pole (curve a) or double-pole (curve b) low-pass filter.

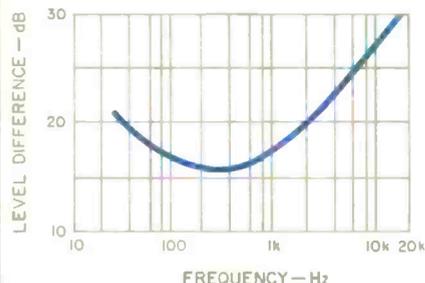


Fig. 3—Hearing thresholds above white noise for pure tone.

will be some range of noise frequencies that will be capable of masking that tone.

The results are not quite the same when we measure the ability of a single tone to mask undesired noise. Experimental results show that extremely high sound pressure levels of a single tone are required to provide masking. Even at the most effective frequencies (between 700 Hz and 1 kHz, near the natural resonance of the ear), sound pressure levels in excess of 75 dB are required to mask noise at a very low 16 dB SPL. Fortunately, those results apply only to *pure* single tones. With the complex signals that are a characteristic of music and speech, masking effects are much better. Most musical instruments produce broadband spectral components and a high concentration of energy around 1 kHz, which improve the noise-masking ability by more than 30 dB over a pure, 1-kHz tone.

From all of that, the designers at National Semiconductor concluded that if source material is at least 29 dB above the "noise floor," adequate masking can usually be obtained. Therefore, any noise-reduction system that dynamically restricts audio bandwidth will (by virtue of its previously calculated 14-dB improvement) insure a minimum perceived signal-to-noise ratio of 43 dB (29 dB + 14 dB) without audibly degrading the music program. A cassette tape recorded at a mean signal level of around -10 VU (volume units, as on a VU meter)—40 to 45 dB above the noise floor of the tape/system—will, with the aid of a bandwidth-varying noise-reduction system, be improved to a perceived signal-to-noise level of between 55 and 60 dB. If the recording was made at 0 VU, the improvement can be expected to provide an S/N ratio of better than 65 dB.

The DNR Audio Filters and Control Path

The general arrangement of the DNR system is shown in the block diagram of Fig. 4. Two low-pass filters (one for each stereo channel) are placed in the audio-signal path, their -3 dB bandwidths controlled by the amplitude and frequency of the incoming signals. Each filter response is flat below its cutoff frequency, with a smooth, sin-

gle-pole roll-off above its corner frequency for any control setting. The resulting -6 dB/octave slope produces the most satisfactory results with modern and classical music having a wide frequency range. Steeper slopes can produce greater amounts of noise reduction for a given bandwidth, but are more suited to program material that does not have substantial high-frequency content. Cascading two filters will give a -12 dB/octave slope, with noise reduction as great as 18 dB (see Fig. 2).

As Fig. 4 shows, the LM1894 has three signal paths—right- and left-channel audio signal paths and a common bandwidth-control path. The main paths include audio low-pass filters whose cutoff frequencies vary in accordance with the control signal. A single control signal is used for both channels to keep the stereo image from wandering. That signal, in turn, is derived from the output of the summing amplifier, which is then filtered and rectified.

Since the spectra of musical instruments and the ear-sensitivity curve (Fig. 1) imply that masking is most effective at relatively *low* frequencies, you might assume that a low-pass filter would be good for the control path shown in Fig. 4. However, that turns out not to be the case. Figure 5 shows the frequency versus amplitude response of the DNR IC control path. The DNR system uses a *high-pass* filter with a -3 dB corner frequency of 6 kHz and -12 dB/octave roll-off slope. An optional notch at 19 kHz is for when the source material contains a stereo-FM pilot signal that might tend to increase minimum bandwidth above 800 Hz when the detector threshold is set at the noise floor.

The control-path frequency response is weighted in that manner because program material varies substantially in harmonic content, depending both on relative loudness and on the particular instruments being played. As an example, consider the case of a French horn. Most of the energy produced by that instrument is below 1 kHz. If a low-pass filter were used in the control path, it would respond to that energy and open up the filters to full bandwidth, unmasking noise in the 2-kHz and above region.

DNR works because output is proportional to bandwidth, and because hearing one sound decreases our ability to hear another.

To avoid that, the system looks for high-frequency energy in the music source, and, not finding any higher harmonics, in the case of the French horn, the noise remains filtered out and bandwidth remains restricted. Multiple instruments or a solo instrument such as a violin, for example, may have significant high-frequency energy that will not only provide good noise masking but will require a wider system bandwidth. To summarize, then, the detection of high frequencies in the system's control path indicates that large levels of energy must be present in the critical masking-frequency range. This means that the audio bandwidth can be safely increased to prevent audible degradation of the music, since the noise will remain masked. To make up for the relatively fast decrease in spectral energy with increasing frequency, the control-path response is increased at a 12 dB/octave rate.

Attack and Decay Times

If the detector of the DNR system were allowed to respond instantaneously to any input signal, ticks or noise bursts (of short duration but with rapid rise-times) would be able to open up the bandwidth of the system without simultaneous program masking. Also, different instruments have widely differing rise-time characteristics. With that in mind, the DNR system was designed with an attack time of 0.5 mS to

Fig. 4—Block diagram of the DNR system.

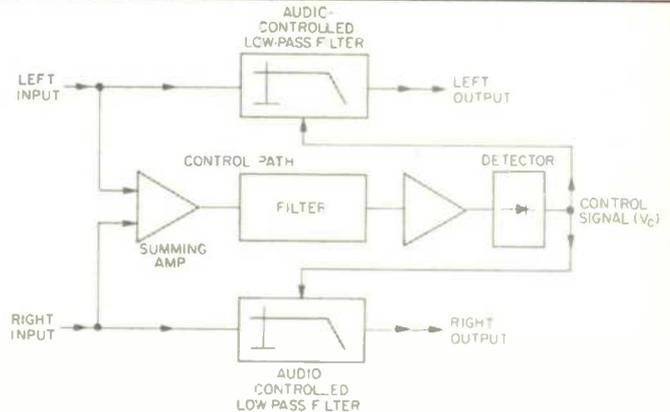
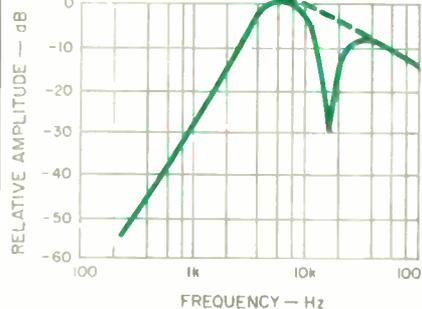


Fig. 5—Response curve for the DNR control path. Notch at 19 kHz is optional, to diminish response to FM pilot tone.



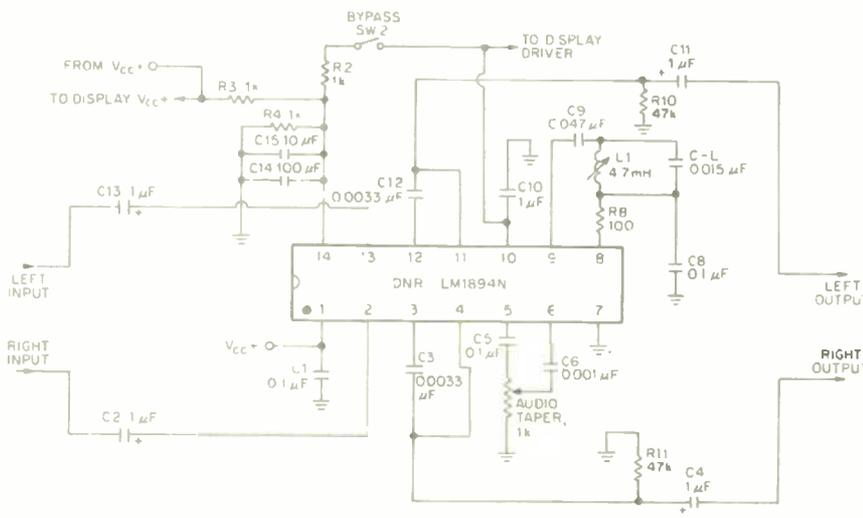
minimize potential loss of high-frequency transients. That does constitute a trade-off in that the system is susceptible to impulse-noise interference. Impulse noise, having fast rise- and decay times and quite a bit of high-frequency energy, must be eliminated using other techniques.

Once the detector has responded to a given musical transient, it must decay back to its inactive level when that transient is over. Once again, a compromise in parameters was required for the DNR system. Too slow a decay time would mean that system bandwidth would remain "wide open" for some period after the decay of the transient. A noise burst would be heard at the end of each musical transient since there would be nothing to mask it. If the decay was too rapid, on the other hand, a loss in apparent ambience would occur because harmonics occurring at the end of a transient would be suppressed. The DNR system decays to within 10% of final value in 50 mS. The ear's inability to recover sensitivity for 100 to 150 mS following a loud sound prevents the noise burst that is present at the end of each transient from being heard.

Using the DNR System

The DNR system is designed to be placed before a system's tone and volume controls. This is because any adjustment of these controls would alter the noise floor seen by the DNR control path. A sensitivity-adjustment pot is provided, which may need to be adjusted for the noise floors of different sources (e.g., tape, FM or phono). This control should therefore be left readily accessible.

Fig. 6—Schematic of the DNR system, main section.



A weighting curve adapts the control signal to the varying harmonic content of musical instruments and program material.

The system incorporates a display to assist in the proper setting of the sensitivity control. The display shows the instantaneous bandwidth of the two filters, *not* signal level (though signal level does affect it indirectly), and is logarithmic to best indicate the filters' audible effects. A bar-graph display is used instead of a meter because of the control signal's millisecond response time. The LM3915 display is recommended, as it requires only a few external parts and contains all the necessary circuitry for a 10-point, logarithmic display.

The left-hand LED corresponds to an 800-Hz bandwidth; the right-hand LED corresponds to a 30-kHz cutoff. The LEDs between these extremes each represent steps of approximately 1.5 times the frequency represented by the preceding step.

Using the Filter

The DNR unit can now be connected in the tape monitor loop of a receiver or amplifier. The sensitivity control should

be turned down completely, and source material should be chosen that does not have musical content (the groove between cuts on a record, for instance).

Under these conditions, all but the first LED should be off. The sensitivity control is then advanced until the next LED just begins to flicker. This is an indication that the filter is barely opening on the noise floor and is capable of reaching full bandwidth on musical information above this level. Alternatively, the control may be advanced until there is a barely perceptible increase in the noise level and then backed off very slightly.

The bypass switch can be toggled between the bypass and active positions to compare the action of DNR with that of a full system response. The difference should be quite dramatic, giving a subjective improvement in S/N of 12 to 14 dB. The action of the filter is most apparent between record cuts, where it removes nearly all of the annoying hiss.

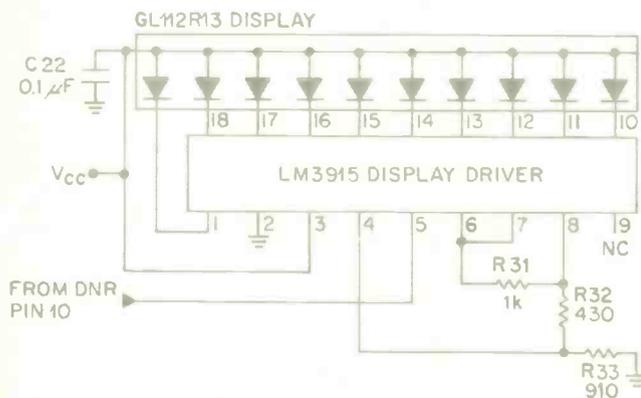


Fig. 7—Schematic of the display section.

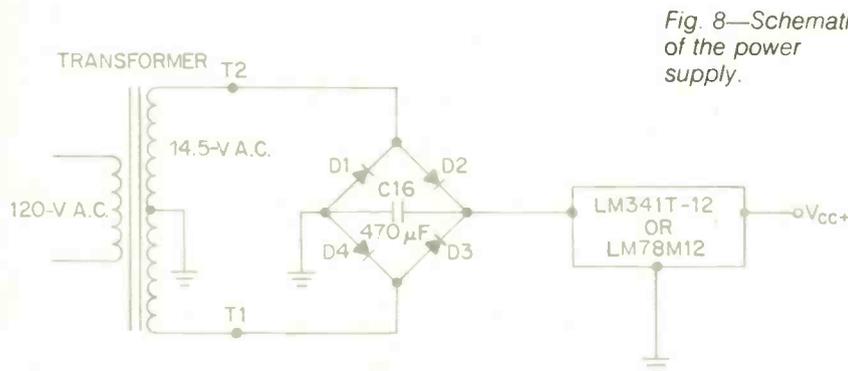


Fig. 8—Schematic of the power supply.

Parts List

Resistors

(All 5%, 1/4-watt, except R1.)

- R1—1-kilohm miniature pot, audio taper.
- R2 through R4, R31—1 kilohm.
- R8—100 ohms.
- R10, R11—47 kilohms.
- R32—430 ohms.
- R33—910 ohms.

Capacitors

- C1, C5, C8, C22—0.1- μ F, 50-V Mylar.
- C2, C4, C10, C11, C13—1- μ F, 50-V electrolytic.
- C3, C12—0.0033 μ F, 50-V polystyrene, axial-lead.
- C6—0.001- μ F, 50-V Mylar.
- C9—0.047- μ F, 50-V Mylar.
- C14—100- μ F, 50-V electrolytic.
- C15—10- μ F, 16-V electrolytic.
- C16—470- μ F, 25-V electrolytic.
- C-L—0.015- μ F, 50-V Mylar.

Semiconductors

- D1 through D4—1N4002 diodes.
- IC2—LM1894N DNR.
- IC3—LM341T-12 or LM78M12 regulator.
- IC4—LM3915N display driver.
- IC5—GL112-R13 12-element display.

Miscellaneous

- SW1, SW2—SPST rocker switches.
- L1—4.7-mH adjustable inductor, Q=35 at 19 kHz (Toko CLN20-740HM).
- PH1, PH2—Dual phono jacks.
- Transformer—14.5-V, 250-mA, center-tapped (Triad F-112X).
- Fuse—1/4-amp, slo-blow.
- Fuse-holder, line cord, p.c. boards, control knob, and miscellaneous hardware.

The following are available from Advanced Audio Systems International, 4010 Moorpark Ave., Suite 105, San Jose, Cal. 95117. (California residents, add 4.5% tax.)

- Complete kit, including silk-screened enclosure (DNR-200X) \$122.50
- Listed semiconductors and coil L1 (DNR-240X) \$35.95
- Main and display p.c. boards (DNR-280X) \$22.50

The DNR system must precede the sound system's tone and volume controls, lest they alter the noise floor it senses.

You should be aware of a psycho-acoustic effect that is common to all noise-reduction systems. The addition of high-frequency noise (such as tape hiss) to a music signal will seem to increase the high-frequency content of the music. Thus, upon first auditioning DNR using noisy source material, the user will seem to hear a degradation of the music's high-frequency content. The system's actual effect on the high-frequency information can be observed by using a quiet source and switching the filter in and out.

It should be noted that the filter is designed for an average input level of 750 mV rms. Some tape decks are capable of much larger output levels at "0 VU," and they should be attenuated accordingly to prevent overloading the filter inputs.

Building the DNR System

Construction is fairly simple, as the bulk of the circuitry is on two ICs, the

LM1894N DNR chip and the LM3915 display (Figs. 6 and 7), plus a power supply (Fig. 8).

The 19-kHz multiplex pilot tone present in all stereo FM broadcasts is attenuated by L1 and C-L. The presence of this pilot tone will limit the noise-reduction capability, since the noise filter will sense the level of the pilot tone rather than the level of the noise source.

The inductor provided with the kit of parts described in the Parts List is pre-tuned, and its adjustment should not be altered. If, however, you purchase coil L1 separately, then it must be tuned to within about ± 20 Hz of the 19-kHz pilot tone. The simplest way to obtain this reference frequency is to get it directly from the FM broadcaster. Tune your FM receiver and wait for a quiet interlude when there is no audio signal. Tune L1 for minimum noise-filter bandwidth as monitored on the front panel's LED display.

Video and TV sound can create similar problems due to the presence of strong line-scan components at 15.734 kHz. This can be accommodated by substituting a capacitor of 0.018 to 0.022 μ F for the 0.015- μ F value indicated for capacitor C-L, and readjusting L1. If both FM pilot and video line frequencies cause problems, it might be advisable to build two traps, with a selector switch. On the other hand, if neither FM nor video-sound signals are to be processed, then choke L1, capacitors C-L and C8, and resistor R8 (which forms a frequency roll-off with C8) may be eliminated.

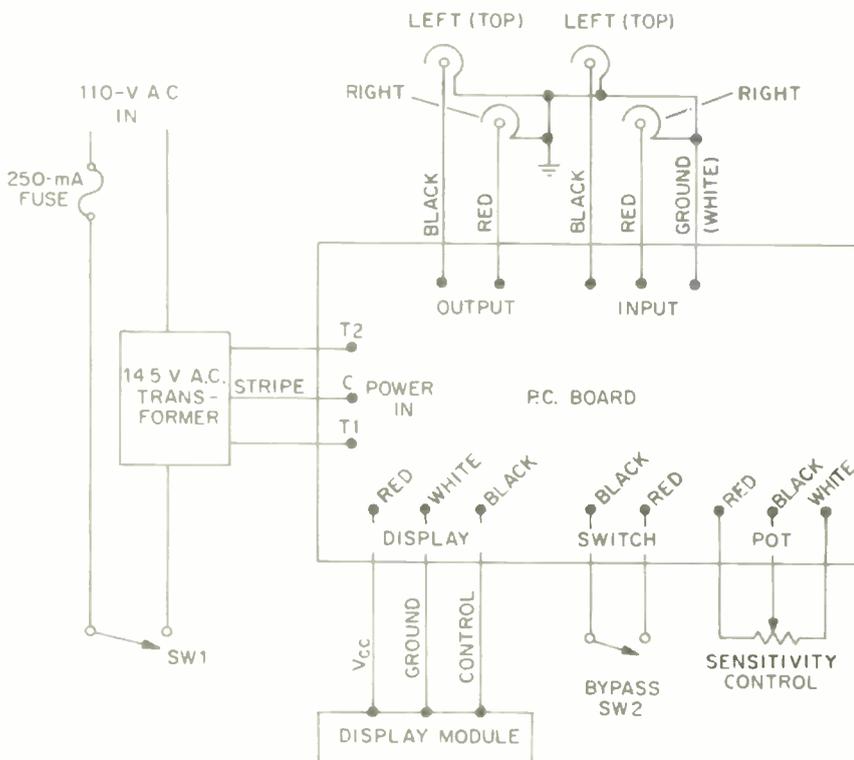
Printed circuit boards, silk-screened to show component placement and polarity, are available separately or as part of a complete parts kit. All components are mounted on these boards, except for the sensitivity control, switches, jacks, the power transformer and the fuse-holder. We recommend using IC sockets or Molex strips instead of soldering ICs in directly, to prevent possible damage to the ICs.

The component designations on the p.c. board and their explanation in the Parts List should provide all the information needed for successful board assembly. A schematic diagram (Fig. 6) is provided for technicians who feel more comfortable working from that, and for help in understanding and troubleshooting the circuit. The display and power-supply circuits are shown in Figs. 7 and 8.

Figure 9 shows how the boards and other components are wired together. Wire functions and colors are also silk-screened on the boards.

Nonetheless, mistakes are still possible. Our experience has shown that the most common assembly errors are as follows: ICs inserted backward, electrolytics installed with incorrect polarity, power diodes reversed, bad solder connections, no fuse in the fuse-holder, and failure to wire-connect one or more phono-jack grounds to a common ground on the p.c. board. But with a little care (or, failing that, a little after-the-fact trouble-shooting), you should have an addition to your system that makes a worthwhile, audible difference. Get out your old, pre-Dolby tapes and surface-noisy records, and prepare to listen to them—and enjoy them—once again.

Fig. 9—Assembly diagram, for use with p.c. board.



Build A High-Performance Noise Reducer

JOHN H. ROBERTS

Taping from high-quality disc pressings routinely tests the dynamic range of even the highest-tech cassette decks, and CDs are even more of a challenge to tape adequately. All the new, top-line decks come with such powerful noise-reduction (NR) systems as dbx or Dolby C, which help recordists handle today's very dynamic program material. But for those whose decks have no noise reduction or only Dolby B NR, I've devised a low-cost, add-on companding noise-reduction system with which their decks can handle the hottest signals, just like the best new equipment.

The theory behind companding NR stems from the observation that tape hiss is effectively masked by loud music, and is only audible during quiet passages. Companding NR (like dbx and the two Dolby systems, which work on similar principles) is a two-part, encode/decode process. A compressor circuit in the record encoder reduces gain for signals above a cer-

tain level (the circuit's unity-gain threshold, or 0-dB level), and increases it for signals below that level. This brings loud passages down below the limits of the tape deck's headroom and lifts quiet passages above the deck's noise floor. A complementary circuit in the playback decoder expands the signal back to normal, boosting the loud passages and cutting back on the soft ones. In the process, it also cuts back noise (Fig. 1). Thus, companding not only reduces tape noise but increases headroom, for cleaner and louder musical peaks.

The P-522 Noise Reducer

The Phoenix Model P-522 noise reducer, for which plans are given here, contains two simultaneous encode/decode channels (Figs. 2 and 3), allowing off-the-tape monitoring with natural dynamics when recording with three-head decks. Its operation is based on wide-band, 2:1 compression/expansion, and will deliver the same order of S/N improvement as the dbx systems (although no attempt has been made to make the two compatible).

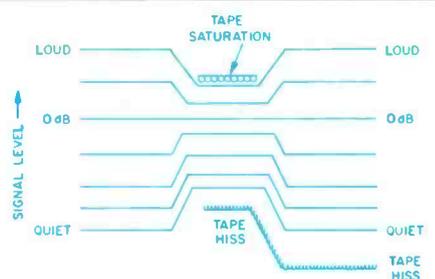
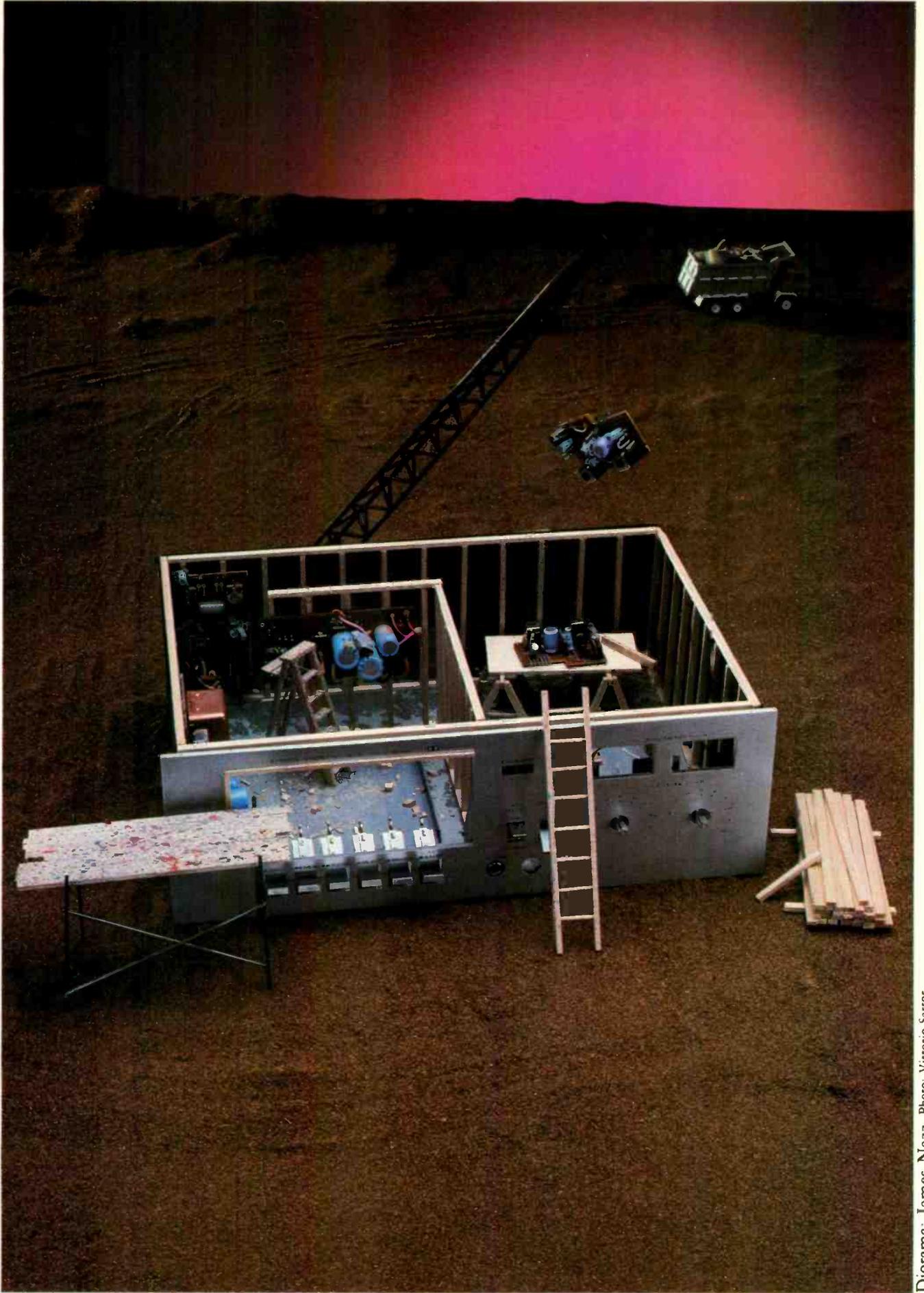


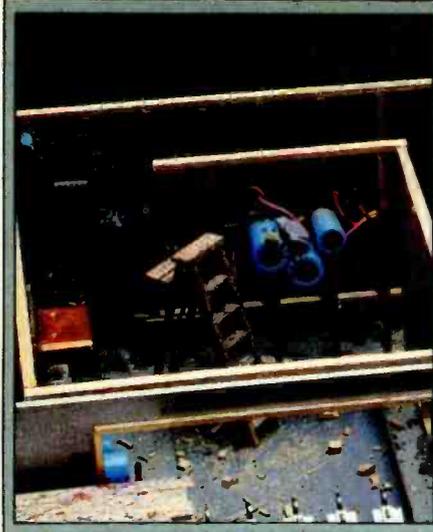
Fig. 1—How companding works.

Most companding NR systems rely on identical but inverse distortion in the playback expander to cancel out the third-harmonic distortion caused in the compressor by the audio signal modulating the gain-control voltage. The P-522 electronically cancels out this modulation at the compressor. Reducing this distortion at the source is advantageous, since imperfections in the tape record/playback process can affect the ability of conventional systems

John H. Roberts is President of Phoenix Systems, Manchester, Conn.



Diorama: James Nazz Photo: Vittorio Sartor



By building this low-cost, companding NR system, you'll get more dynamic range in your recordings.

to cancel out this distortion. However, crossing the P-522 with a conventional compander, by using one system to decode tapes made with the other, will yield higher distortion than will either system decoding its own tapes. Also, this new approach to modulation-distortion control uses different optimum attack/release time constants, so some dynamic mistracking could also occur.

For anything but noncritical applications, I do not suggest mixing different types of noise reduction. If you have an older-type NR (such as Dolby B) in your deck, just switch it out when using the new compander. Do not use them both at once, as you will get no further improvement in S/N, but you may overcompress the highs and produce a loss of frequency response.

I have, however, found that playback of P-522 tapes in the car with no decoding at all can be quite acceptable, becoming less acceptable as the car system's frequency response and dynamic range begin to approach those of a good home system.

The P-522 uses high-frequency pre- and de-emphasis to reduce the audibility of tape hiss when only low-frequency signals are present. A correction network at the input to the level sensing port prevents solo high-frequency signals from being overrecorded. In fact, the network intentionally overcorrects, so high-frequency signals when present alone will be recorded slightly cooler than low-frequency signals. This reduces tape saturation and frequency response problems commonly experienced with unprocessed cassette recordings. Dynamic tracking errors can occur if the frequency content at the input to the playback expander is much different than the output of the record compressor.

An adaptive high-pass filter in the compressor attenuates low-level, low-frequency signals caused by warped record and rumble, before they can get encoded. This is important because tape recorders generally have limited frequency response in the low bass and would not reproduce the warp signal, which has peak energy in the 5-Hz region. To further reduce this sensitivity to signals that the tape recorder can't reproduce, the input to the gain-control detector is rolled off below 38 Hz and above 20 kHz. (Note: As

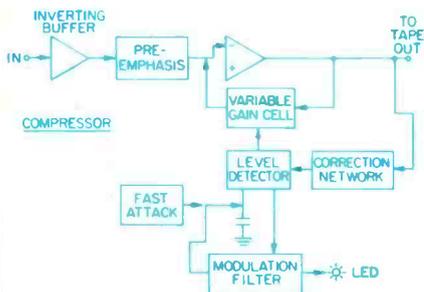


Fig. 2—Block diagram of the compressor section.

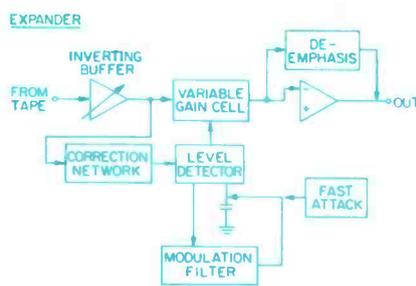


Fig. 3—Block diagram of the expander section.

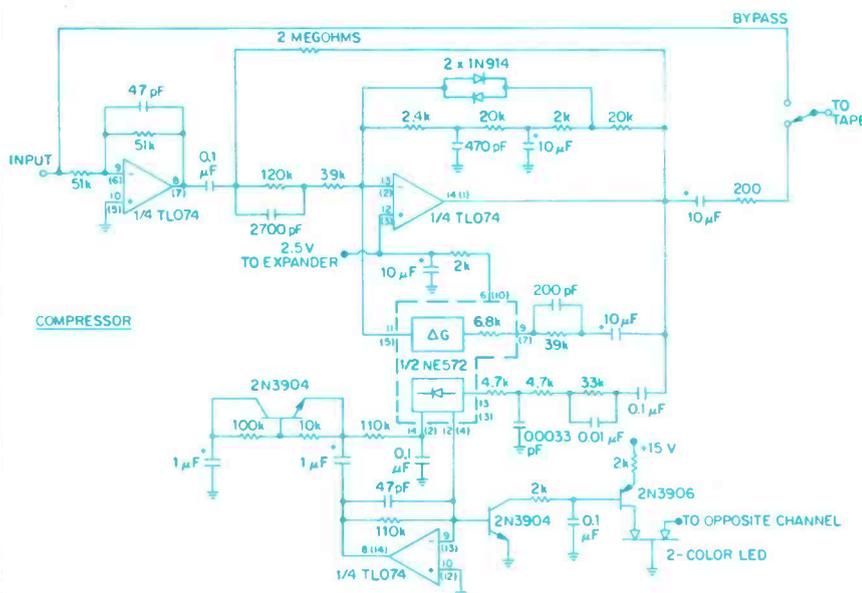


Fig. 4—Schematic diagram of the compressor section. Pin numbers shown on ICs here and in Figs. 5 and 6 are for left channel; numbers in parentheses are for right channel.

Power connections (not shown) are: +15 V to each NE572 pin 16 and TL074 pin 4, -15 V to each TL074 pin 11, and ground to each NE572 pin 8.

Dolby NR does not reduce noise at low frequencies, it will not be tricked by low-frequency response errors; however, it shows the same sensitivity to high-frequency errors as do all companding systems.)

Using the P-522

The P-522 is designed to hook up between a control preamp and a tape deck. Its only front-panel controls are on/off and in/out (bypass) switches.

Without noise reduction, setting record level is a juggling act between distortion, high-frequency saturation, and tape hiss. As the noise reduction gives you more than 20 dB of hiss reduction, the optimum 0-dB record point moves down quite a bit below meter 0 dB. I have found -6 dB to be a good setting on a few two-head machines I've worked with, but it's better (and fairly easy) to find the best recording level settings for your tape and machine by ear.

To do this, use a familiar disc with a good, clean top end (cymbals, snare drum, etc.) and record at progressively higher levels until you notice a loss of sheen or edge. Back off your recording level until full sound quality returns. You then have your optimum 0-dB level. Interstation FM hiss can also be used as a test signal for these comparisons, but it may have a bit more high-frequency content than typical discs.

When making these listening tests, be sure you are playing back at similar loudness levels. Your ear is more sensitive to high frequencies at louder levels, so don't be tricked by simple volume mismatches. Also, with two-head decks be sure to listen to the playback from the tape because the deck's output during recording will not reveal tape saturation losses.

Once you've optimized your record level, you can calibrate the P-522's internal playback gain trim. With a three-head machine, which allows monitoring off the tape, you can make this adjustment while recording. With a two-head deck, you'll have to first record a track, then make the gain-trim adjustment while listening to playback. Adjust the gain trim so there is no loudness change between the original source material and the tape playback when you toggle the tape-monitor switch on your control preamp. As a

PARTS LIST

Resistors, 1/4-Watt, 5% Value, Ohms

Value, Ohms	Quantity
10	8
200	5
2k	6
2.4k	2
4.7k	8
10k	4
20k	6
33k	4
39k	10
51k	4
100k	4
110k	8
120k	4
2M	2

Miscellaneous

DPDT push-push switch	1
4PDT push-push switch	1
Phono jacks	8
50-kilohm trim pot, 3/8-inch, square, single-turn	1
28-V center-tapped transformer	1
Line cord and miscellaneous hardware	

Semiconductors

1N914 diode	6
1N4002 diode	4
2N3904 NPN transistor	6
2N3906 PNP transistor	2
Two-color LED	1
78L15, +15 V regulator	1
79L15, -15 V regulator	1
TL074CN op-amp	3
NE572 compander IC	2

Capacitors

Value	Quantity
47 pF, 10%, ceramic disc	8
470 pF, 10%, ceramic disc	2
0.1 μF, 20%, ceramic disc	9
0.02 μF, 500 V, ceramic disc	1
200 pF, 5%, polystyrene	4
2700 pF, 5%, polystyrene	4
0.0033 μF, 5%, polyester	4
0.01 μF, 5%, polyester	4
0.1 μF, 5%, Mylar	12
1 μF, 25 V, aluminum electrolytic	8
10 μF, 35 V, aluminum electrolytic	18
1000 μF, 35 V, aluminum electrolytic	2

The following are available from Phoenix Systems, P. O. Box 628, Manchester, Conn. 06040. Prices in effect through April 15, 1985. (Connecticut residents must add 7.5% sales tax.)

Complete kit of parts with instructions, P-522-NR	\$79.00
Etched and drilled p.c. board, P-522-B	\$9.00
TL074 quad low-noise, high-speed op-amp (three required), P-TL074	@ \$2.50
NE572 dual compander IC (two required), P-NE572	@ \$4.50
28-V, c.t. transformer, P-10-T	\$6.50
Instruction set (including stat of p.c. board), P-522-INST	\$2.50

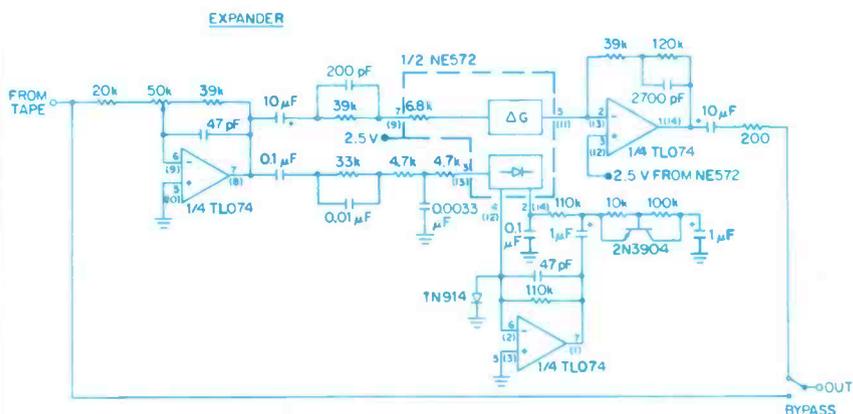


Fig. 5—Schematic diagram of the expander section.

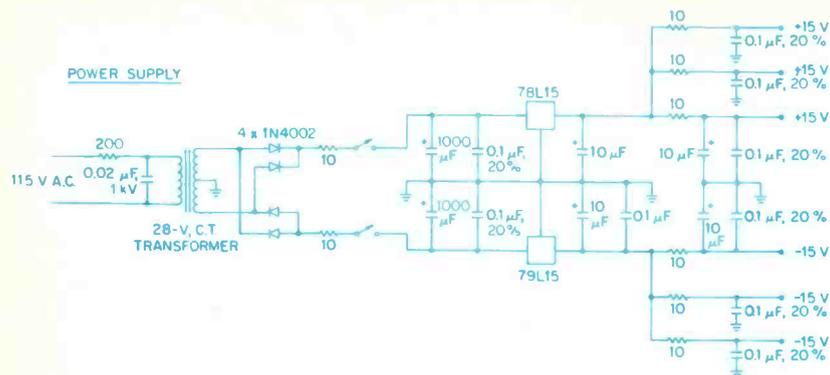


Fig. 6—Schematic diagram of the power supply. Note separate power feeds for each channel, to reduce crosstalk.

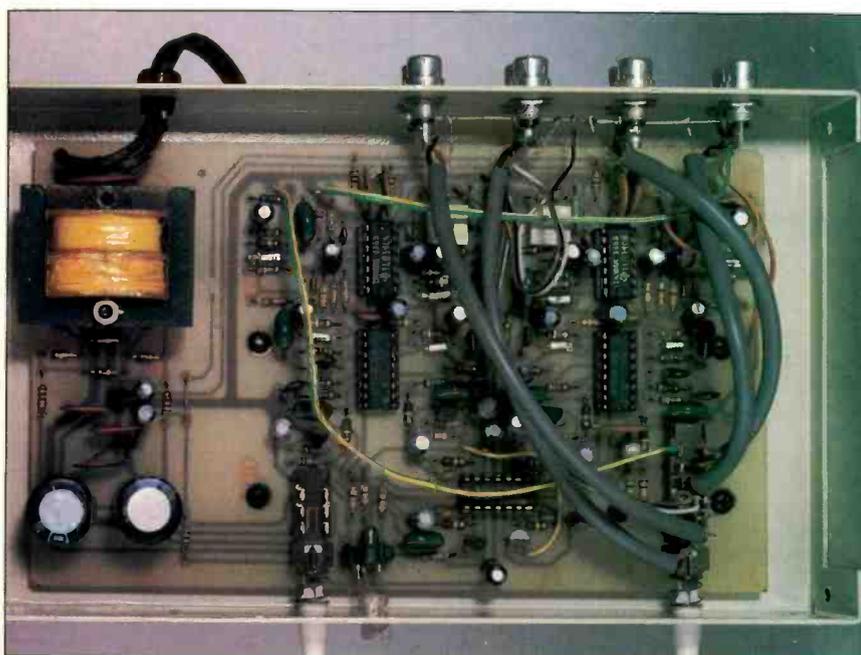
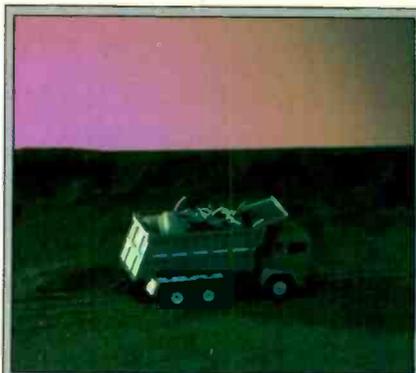


Fig. 7—Interior of P-522 noise-reduction unit, showing parts layout.



Fig. 8—Exterior of the completed unit.



This noise-reduction system takes away more than 20 dB of tape hiss and noise.

result of the new, reduced record level, some two-head decks may return a louder signal when monitoring record than during actual playback.

The P-522 has a transient-overload indicator, a two-color LED that flashes red when the right record-channel overloads and green when the left one does. It is normal for this LED to flash on momentary overloads, but it should not stay lit or flash more than a few times per second.

To record or play back tapes without companding, just switch the P-522 into bypass, and the tape deck will be connected to your control preamp. Although the P-522 uses a hard-wire bypass, the inputs to the compressor are always connected—so it may be a good idea to leave the unit powered up whenever signal is flowing in the tape-monitor circuit. Otherwise, if your preamp's tape outputs aren't buffered, the slight resulting change in impedance might introduce distortion in your main signal path. (The same is true of tape recorders, which should also be turned on whenever connected to unbuffered tape outs.)

Building the P-522

Schematic diagrams for the P-522's compressor, expander, and power-supply sections are shown in Figs. 4, 5 and 6, respectively. While I recommend use of the p.c. board I've made available (see Parts List), you should be able to realize acceptable performance with other construction techniques. Do try to follow the layout in the photo (Fig. 7) as closely as you can, especially the grounding scheme. Use care when substituting parts; wider-tolerance parts can affect frequency response and dynamic tracking errors. Substituting tighter-tolerance parts won't hurt anything but your pocket-book.



FOR THE SHEER LOVE OF MUSIC

There's a big difference between real music and "hi-fi". Unfortunately, as you spend more and more on your stereo system, all you usually end up with is more spectacular "hi-fi". This doesn't have to be the case. With a Linn/Naim system, every additional dollar spent actually results in a musical improvement.

This doesn't mean that a system that can provide *music* in your home must cost a fortune. While the Linn/Naim "Six Pack" system pictured above sells for nearly \$20,000, other Linn/Naim systems start at well under \$2,000. And, for less than a

thousand, substantial improvements can be made to your existing system.

Whether you choose to improve your current system, or start with a complete Linn/Naim system, your Linn dealer, because he fully understands that there is a hierarchy to the system, can see to it that each purchase does indeed bring you more enjoyable music, rather than simply more spectacular "hi-fi".

For additional information on Linn and Naim components and the hierarchy of a hi-fi system, contact your Linn/Naim dealer.

Distributed in the United States and Canada by:
AUDIOPHILE SYSTEMS, LTD., 6842 HAWTHORN PARK DRIVE, INDIANAPOLIS, INDIANA 46220
ALDBURN ELECTRONICS, LTD., 50 ROLARK DRIVE, SCARBOROUGH, ONTARIO M1R 4G2

Enter No. 2 on Reader Service Card

See dealer listing on page 116.

1

PIONEER CLD-900 COMPACT DISC/ LASERDISC PLAYER

Manufacturer's Specifications

CD Player Section Only

Frequency Response: 5 Hz to 20 kHz, ± 0.5 dB.

S/N Ratio: 96 dB.

Dynamic Range: 96 dB.

Channel Separation: 94 dB.

THD: 0.003% at 1 kHz.

Output Level: 2.6 V at 0-dB level.

Power Consumption: 42 watts.

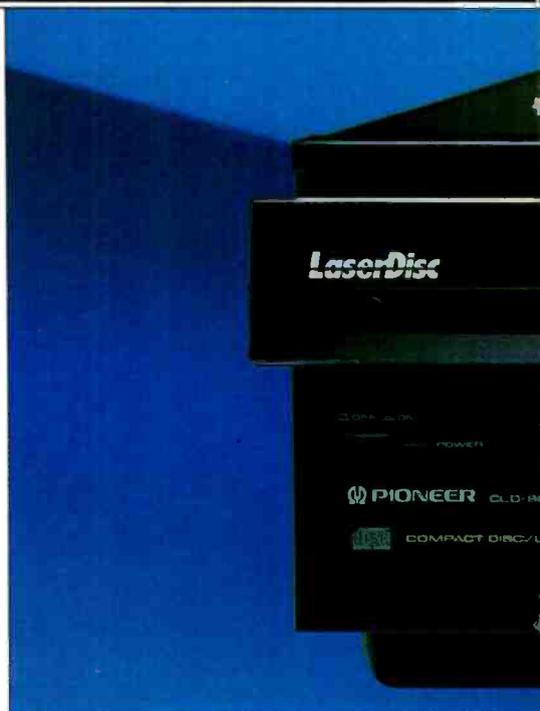
Dimensions: 16½ in. (42 cm) W × 6¾ in. (16.8 cm) H × 17-9/16 in. (44.7 cm) D.

Weight: 35 lbs., 3 oz. (16 kg).

Price: Approximately \$1,200.

Company Address: Pioneer Video, 200 West Grand Ave., Montvale, N.J. 07645.

For literature, circle No. 90



It was bound to happen sooner or later. Nearly two years ago, I was speaking to Bart Locanthi, a leading technical executive with Pioneer on the West Coast. Even then, he hinted that the presence of a common element—the laser pickup—in CD players and LaserVision videodisc players suggested that a player could be built to handle both types of program sources. At the recent Japan Audio Fair, held in Tokyo in the fall of 1984, Pioneer demonstrated the first such combination player. A month or so later, I was given a production prototype of the machine as it will be marketed in the United States early this year.

What Mr. Locanthi failed to tell me during our discussion was that it is possible to record the soundtracks on a LaserVision videodisc using the digital-audio CD format, and that such discs would become available when the combination player became a reality. Indeed, that is just what has happened. With this first combination CD/LV player I was given a videodisc which contains not only the AFM (audio frequency modulation) audio tracks which have been the standard all along (it is similar to the AFM technique used in Beta Hi-Fi and VHS Hi-Fi, and is therefore of excellent quality), but also contains CD audio, totally digital. Incorporating both kinds of audio is, of course, essential for compatibility, but on a player such as the new Pioneer CLD-900, the sound reproduction can be of the quality and dynamic range of CDs.

Pioneer has taken advantage of the more obvious similarities between videodisc and Compact Disc players, but they have gone beyond that. I was as impressed by the clever way in which they have assigned dual functions to the buttons on the supplied wireless remote-control unit as I was by the design of the actual player itself. The designers of this incredible instrument assumed (rightly, I believe) that

when playing a Compact Disc you would still have the video output of the unit connected to your TV set or video monitor. This being the case, they arranged for that video screen to display all the information sometimes found on CD players. Therefore, the front panel of the CLD-900 remains relatively uncluttered, considering the great number of operational modes it supports.

As for the LaserVision features, they are just about the same as those found in Pioneer's dedicated videodisc players, such as their Model LD-700. The same wireless remote

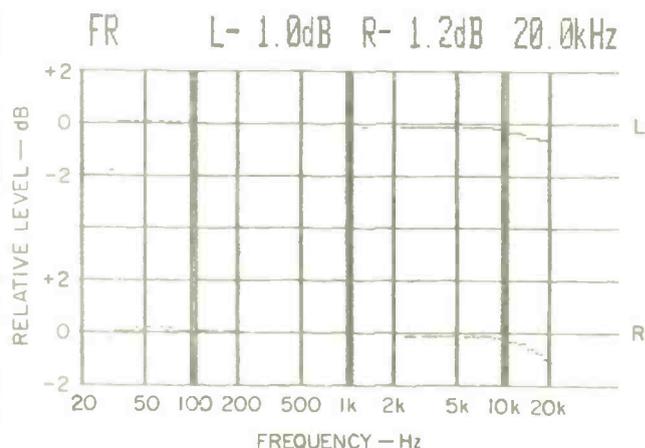


Fig. 1—Frequency response, left (top) and right channels, at 0-dB level.



Photograph: Ross Elmi

used when playing Compact Discs also controls such video special effects as freeze-frame, single-frame advance, slow motion, fast motion, and random access to individual frames by number. These effects, however, are available only with CAV (Constant Angular Velocity) discs, which play for 30 minutes per side, not with the more common, hour-per-side CLV (Constant Linear Velocity) discs. Like the LD-700, the CLD-900 is front-loading and handles either 12-inch or the newer 8-inch discs in CAV or CLV formats. Molded ridges inside the loading drawer help you to properly position both sizes of LaserVision discs as well as the 12-cm (4.7-inch) CDs before you push the drawer closed and begin play.

Control Layout

Most of the upper front panel is taken up by the disc loading drawer, which is opened by pressing the "Eject" button near the right edge of the panel or on the battery-operated, infrared remote control. Below the drawer, at the left, are a power on/off button and a stereo headphone jack. The TV video selector button is located near the center of the panel, next to the CX noise-reduction on/off switch. This form of dynamic noise-reduction circuitry, found on earlier LaserVision players, is used only when playing CX-encoded discs. The switch won't do anything if you play a future LaserVision disc with CD digital audio tracks, since no noise reduction would be needed with these already noise-free discs. Whether you are playing CDs or LV discs, a multi-function display lets you know what's happening: Numerals tell what CD track you're hearing or which LV "chapter" you are watching. Illuminated words tell you whether you are in the "Pause" or "Play" mode, whether soundtracks are digital or analog, whether you have selected one of the repeat-play features (and, if so, which one), and whether

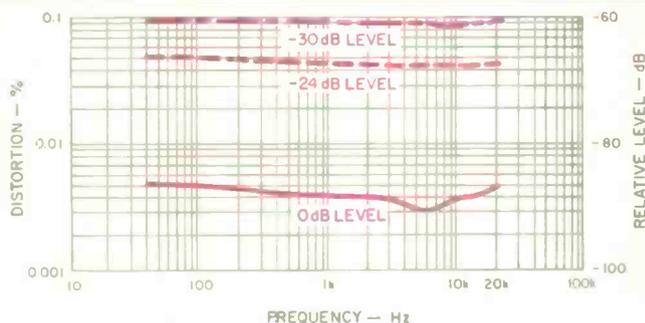


Fig. 2—THD vs. frequency at three signal levels.

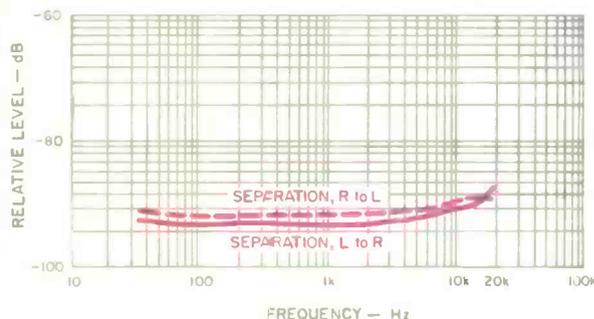


Fig. 3—Separation vs. frequency.

CD and LaserVision now have more than just lasers in common: LaserVision discs with CD-format audio tracks are coming soon.

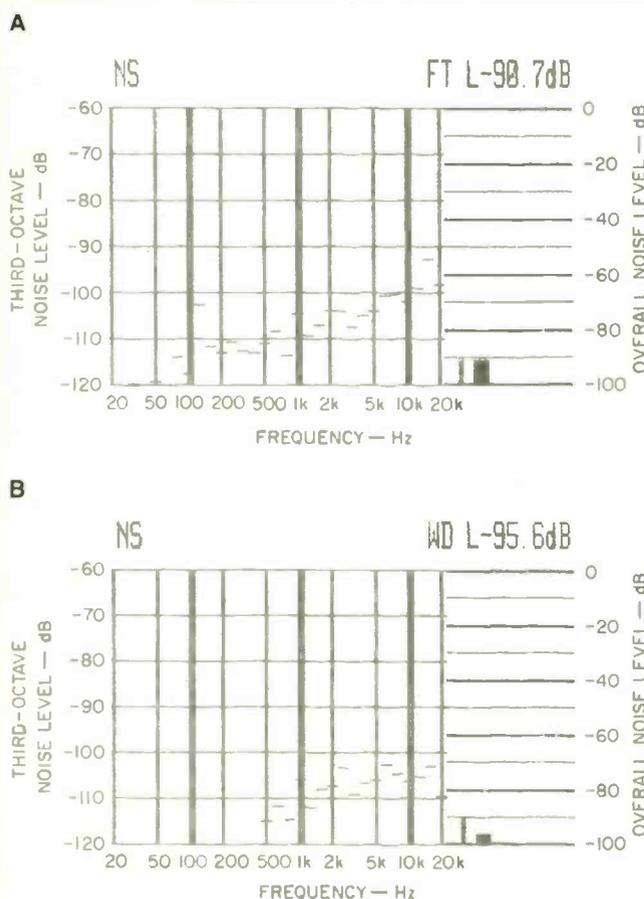


Fig. 4—S/N analysis, both unweighted (A) and A-weighted (B).

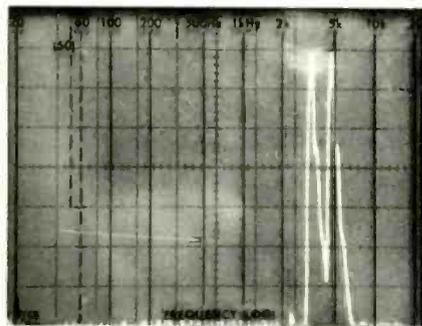


Fig. 5—IHF twin-tone IM test (14 and 15 kHz) showed 0.03% distortion—more than usual, but still minute.

audio is left-channel, right-channel or stereo. Additional small indicator lights tell the viewer whether the CX noise-reduction mode has been selected and whether or not an extended-play (CLV) videodisc is being viewed.

The more sophisticated special-effects and programming features available on the CLD-900 are accessible only via the hand-held remote control. It is this little module which lets you quickly access a specifically numbered "frame" on a videodisc (as many as 54,000 frames can fit on one side of a standard-play LV disc), choose one of several slow-motion or fast-motion viewing speeds, go into freeze-frame or frame-by-frame viewing, access a given chapter of an LV disc, quickly scan forward or backward to find the scene you want to watch, or turn on displays (superimposed on the picture you are watching) that show the chapter as well as the frame being viewed. When playing a CD (audio-only) disc, most of the touch buttons used for videodisc special effects and programming serve similar functions. You can access tracks or index points (if the latter are encoded on the disc you are playing). You can fast-scan the music (the music remains audible and does not change pitch while you scan), and of course, you can turn on the additional displays, visible on your video screen, that tell you the time into the track you are playing, the remaining time of the entire disc, and even the total time of the disc. Repeat-play, either from one point to another or for an entire track or disc, is possible both for LaserVision and Compact Discs.

Measurements

For the purpose of this report, I concentrated primarily on the CLD-900's audio performance as a CD player. I was unable to measure its audio performance with either the analog or digital soundtracks of LaserVision discs, as I was unable to obtain a suitable test disc.

As to the video performance, let me simply reiterate something that's been said by many others, many times: The LaserVision videodisc format gives you the very best picture presently available on a home video screen. Picture resolution surpasses what you can get with the best models of videocassette recorders, even at their fastest tape speeds. I would hope, personally, that now that the LaserVision's video virtues can be combined with the benefits and fidelity of Compact Discs, perhaps more people will come to recognize just how great the combination of crisp video pictures on a good TV monitor plus digitally recorded and reproduced stereo audio can be.

Having said that, let me go on to the CD player measurement results. Figure 1 shows the playback frequency response for the left and right channels. The vertical scale is 2 dB per division so as to highlight any small deviations from ruler-flat response. There were none to speak of, and, with the cursor of the graph set to read relative output at 20 kHz, the readings were only off by 1.0 and 1.2 dB for the left and right channels respectively.

Harmonic distortion at mid-frequencies, for maximum recorded level, measured 0.004%, remaining essentially at that low level over the entire audio spectrum. There was no evidence of any superaudible "beats" such as those I have found with so many other CD players. In fact, for a 20-kHz test tone, the single THD reading (which normally rises as a

This Is Nakamichi



OMS-1000
Optical Memory System

Nakamichi Digital Sound A product of the *recording* experience

Almost anyone can make a CD player. Only *Nakamichi* could produce the OMS-1000—the first magneto-optical disc recorder! The OMS-1000 is a research tool that took nearly 5 years to develop.

Now *you* reap the benefits!

Introducing the OMS-7 and OMS-5—the first CD *players* with a *recording* heritage—the first CD players with Nakamichi Sound, that ineffable clarity and natural reproduction that must be heard to be believed. Experience Nakamichi Digital Sound now—at your local Nakamichi dealer.

OMS-7

Remote control, 24-command memory, and direct access to any track and index number—advanced features for our most sophisticated CD player.



OMS-5

OMS-7 sound thanks to 4X-Oversampled Digital Filters, Dual D/A Converters, and our exclusive Direct-Coupled Linear-Phase Analog Signal Processor.

 Nakamichi

Nakamichi U.S.A. Corporation 19701 South Vermont Ave., Torrance, CA 90502 (213) 538-8150
In Canada: W. Carsen Co., Ltd., 25 Scarsdale Road, Don Mills, Ontario M3B 3G7

Since this dual-purpose player will normally be hooked to your TV set or video monitor, it displays CD information (such as elapsed time) on the screen.

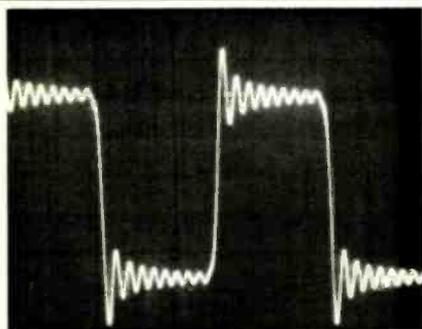


Fig. 6—
Square-wave
reproduction,
1 kHz.

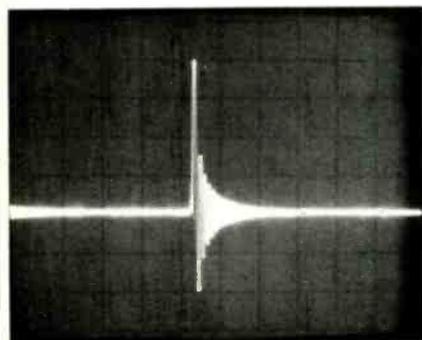


Fig. 7—
Single-pulse test.

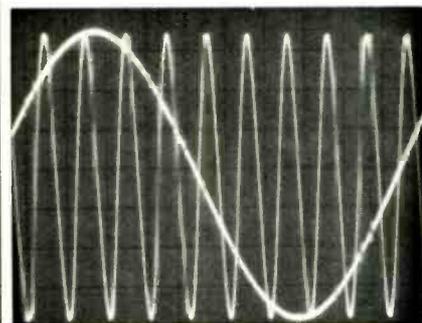
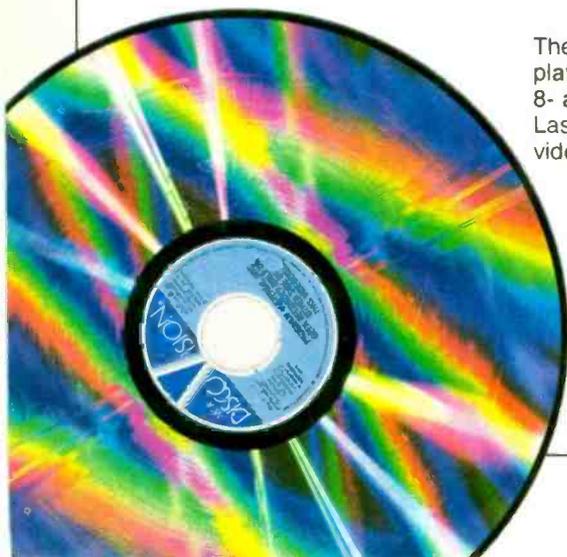


Fig. 8—
Twin-tone phase-
test signals
(200 Hz and
2 kHz) showed
negligible
phase shift in
CD player
section.

The CLD-900 plays CDs plus 8- and 12-inch LaserVision videodiscs.



result of non-harmonically related beats) remained a low 0.0045% at 0-dB (maximum) signal level. Figure 2 shows distortion versus frequency for maximum recorded level (0 dB) as well as for levels of -24 and -30 dB. As usual, the THD increases at lower output levels: At the -30 dB recorded level, THD for a 1-kHz signal measured 0.09%.

Output linearity was accurate to within 0.3 dB down to 80 dB below maximum recorded level. Stereo separation or crosstalk is shown in Fig. 3 and was extremely uniform over the entire range of test frequencies used. As with many other CD players, there was only a minimal decrease in separation at the frequency extremes. This suggests that the analog output stages of the player have been designed with good isolation between left and right channels.

Signal-to-noise ratio, measured without any weighting network, was 90.7 dB, increasing to an even higher 95.6 dB when an A-weighting network was introduced in the measurement path. An analysis of the noise content as a function of frequency distribution is shown in Figs. 4A and 4B.

The SMPTE-IM distortion was a low 0.004% at maximum recorded level, increasing to 0.012% at -20 dB recorded level. The CCIF (twin-tone) IM, using signals at 19 and 20 kHz, measured only 0.002% at the equivalent of maximum recorded level and 0.0028% at -10 dB.

I thought it more significant that I detected a small amount of IHF-IM distortion. At 0.03%, it was still minute, but on most CD players, IM is too low for my equipment even to measure. Figure 5 shows what happens when the player reproduces the IHF-IM test's twin tones. The two tall spikes represent the 14- and 15-kHz test tones, while the small spike just to their left is a spurious signal, 1 kHz lower. (The sweep here is linear, at 2 kHz per division.) The amplitude of this spike is approximately 70 dB lower than the composite of the two test tones, or 0.03%.

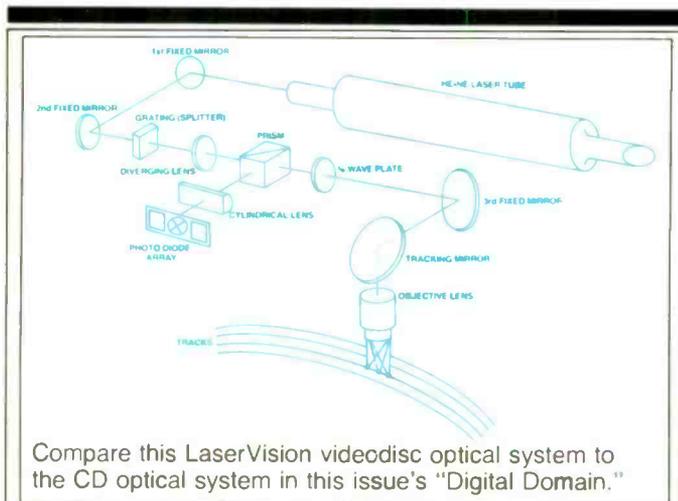
Square-wave reproduction of a 1-kHz, digitally generated square-wave signal (Fig. 6) was typical of that produced by CD players that use multi-pole, analog output filters, as was the reproduction of the unit pulse (Fig. 7). With a 200-Hz signal reproduced from the left channel and a 2-kHz signal coming from the right channel, there was little evidence of phase shift between the higher frequency and the lower one. Perfect phase relationship would be indicated by both sine waves in Fig. 8 crossing the zero axis in a positive-going direction at the same time—a condition which occurs near the right side of the 'scope photo of Fig. 8.

The CLD-900 was able to "read" through all of the built-in defects in my special Philips error-correction and tracking test disc. Specifically, it ignored 900-micron linear distances of missing information as well as 800-micron diameter simulated dust particles (actually black dots embedded beneath the surface of the test disc) and semi-opaque, simulated fingerprint smudges. This unit played the various musical tracks encoded beneath the defects without any muting and without skipping of any kind.

Use, Listening and Viewing Tests

Besides the usual assortment of favorite CDs that I use to evaluate the sonic performance of CD players, I listened to, and watched, the single LaserVision disc I had borrowed which contained digital (CD format) audio tracks and the

CX noise reduction is available for LaserVision discs encoded with it, but not for CDs or for digital-sound videodiscs, already noise-free.



AFM tracks normally found on LaserVision videodiscs. Unfortunately, the musical material on this videodisc did not provide sufficient opportunity to compare the two types of soundtracks, even though a switch on the front panel of the unit does let you select "Analog Only" sound. There were few silent passages in this particular disc, so I found it difficult to judge how much quieter the background was when I switched to the digital format.

Of course, when I played my regular CDs on the player, it performed handsomely, offering just about the same high quality of sound I have been getting from most CD players I've been measuring of late, as well as very fast access to a given point in a disc when I used the remote control for programming. As far as I could tell (I had only a Japanese owner's manual), there are no programming features on this machine. That is, you can't store a set of track or index playing instructions in any sort of memory. On the other hand, you can access a given point in a disc both by track and by index points (if the disc has been encoded with them). Audible scanning is also possible, as is scanning of videodiscs at a variety of fast- and slow-motion speeds.

I found the hand-held remote control easy to use. Color coding helps you push the right buttons for the right functions. Blue buttons are exclusively used for videodisc functions, while green buttons are used exclusively in CD operations. Buttons lacking either of these colors perform equivalent functions for both program sources.

As for the displays which are visible on your TV screen while you use the player for CD reproduction, you *don't* have to keep your TV set on for that display. Remember, the player itself tells you the track you're playing, and that's really the most important display you need when listening to a CD. Still, I found the video display to be a delightful addition, and I must confess I couldn't help gazing at it as I listened to my CDs. No doubt I would have grown tired of this feature in time, and so, probably, will you. But you're not likely to tire of the excellent video reproduction and, now, the excellent sound quality you can get from this combination player. It's been a long time since Bart Locanthi hinted that such a unit would someday be available, but the CLD-900 has been worth the long anticipation and the long wait.

Leonard Feldman

Revox B225

For those who waited.
And those who wish they had.



All Compact Disc players are *not* created equal. This much, at least, has emerged from all the hype and hoopla.

Some CD players are built better than others. Some have more sophisticated programming features. Some are easier to use. And, yes, some *do* sound significantly better than others.

The new B225, from Revox of Switzerland, excels on all counts. For those who have postponed their purchase, patience has been rewarded. For those who didn't wait, the B225 is the logical upgrading route.

First, the B225 is designed for unexcelled CD reproduction. By using oversampling (176.4 kHz) in conjunction with digital filtering, the B225 guarantees optimum sound resolution and true phase response.

For your convenience, the B225 offers programming of nearly every conceivable combination of start, stop, pause, and loop functions, in any sequence, and using mixed combinations of track numbers and times. Cueing time is always less than 3 seconds, and a single infrared remote transmitter (optional) operates the B225 as well as all other components in the Revox 200 audio system.

Finally, the B225 is a product of refined Swiss design and meticulous craftsmanship. Behind its faceplate of functional elegance, you'll find the B225 is an audio component built in quiet defiance of planned obsolescence.

Without question, the definitive CD player has now arrived. For those who waited (and those who didn't), now is the time to see an authorized Revox dealer.

STUDER REVOX

1425 Elm Hill Pike, Nashville, TN 37210/(615) 254-5651

2

TECHNICS SP-10MK3 TURNTABLE

Manufacturer's Specifications

Drive: Direct.

Motor: Quartz phase-locked control, ultra-low speed, brushless, d.c.

Platter: Copper alloy and aluminum, diecast, 12.6-in. (32-cm) diameter; weight, 22 lbs. (10 kg); moment of inertia, 1.1 ton-cm (1,100 kg-cm).

Speeds: 33.3, 45, and 78.26 rpm.

Pitch Control: Quartz-locked, $\pm 9.9\%$, in 0.1% steps, at all three speeds.

Starting Torque: 1.2 foot-pounds (16 kg-cm).

Startup Time: 0.25 S to 33 $\frac{1}{3}$ rpm.

Braking Time: 0.3 S from 33 $\frac{1}{3}$ rpm.

Speed Fluctuation Due to Load

Torque: 0% within 0.72 foot-pounds (10 kg-cm).

Speed Accuracy: $\pm 0.001\%$.

Wow & Flutter: 0.015% wtd. rms (per JIS C5521), $\pm 0.021\%$ wtd. peak (per DIN 45-507, IEC 98A weighted).

Rumble: -92 dB DIN B, -60 dB DIN A (both IEC 98A weighted).

Dimensions: Turntable, 14 $\frac{1}{2}$ in. (36.9 cm) W x 4-7/16 in. (11.3 cm) H x 14 $\frac{1}{2}$ in. (36.9 cm) D; power/control unit, 6 $\frac{1}{2}$ in. (16.6 cm) W x 3-

13/16 in. (9.6 cm) H x 16 $\frac{1}{4}$ in. (41 cm) D; optional SH-10B5 base, 22 in. (55.9 cm) W x 18 in. (45.7 cm) D x 6 $\frac{1}{4}$ in. (17.6 cm) H including dust cover.

Weight: Turntable, 40 lbs. (18 kg); power/control unit, 13.2 lbs. (6 kg); optional SH-10B5 base, 42 lbs. (19.1 kg).

Prices: Turntable and power/control unit, \$1,700; SH-10B5 base, \$800.

Company Address: One Panasonic Way, Secaucus, N.J. 07094.

For literature, circle No. 91



The SP-10MK3 is produced by Technics, a division of Matsushita Electric Industrial Co. Ltd., the Japanese company which also owns Panasonic and Quasar. Matsushita is a large, vertically integrated company, which means that it manufactures most of the parts used in the products it produces. Technics makes a full line, including receivers, amplifiers, loudspeakers and tape decks.

There has been a debate, over the years, as to the relative merits of direct-drive, belt-drive and quartz-controlled turntables. Technics makes all three types and therefore is in a unique position to make judgments about which is best. For the SP-10MK3, their top turntable, Technics has chosen to use quartz control and direct drive.

Direct drive allows very tight coupling between the motor and turntable platter, and therefore very precise control. To maintain precise motor speed, and thereby take advantage of such tight coupling, Technics uses quartz control. In this, a quartz crystal is used as a very stable control element in a high-frequency oscillator. The oscillator is then used as a reference to control the drive motor's very low rotational speed. (The exact control method can vary from one design to another.) The advantage of such an approach is in the ability to control the speed and to allow it to be changed in a very precise manner.

One very impressive thing about the SP-10MK3 is its weight. It is by far the heaviest turntable that I have ever tested, and I have had to lift some big ones! The immediate problem was to find a wide and stable platform upon which to place the SP-10MK3. Many of the turntables I have seen lately are so large and heavy as to cause the same problems as those "bookshelf" speakers not designed to fit on normal bookshelves. The Technics SP-10MK3 is much too heavy for any bookshelf I have ever seen. The weight of the SP-10MK3 turntable is 40 pounds, the control unit is 13 pounds and the mounting base is 42 pounds, for a total weight of 95 pounds! Technics obviously feels that the way

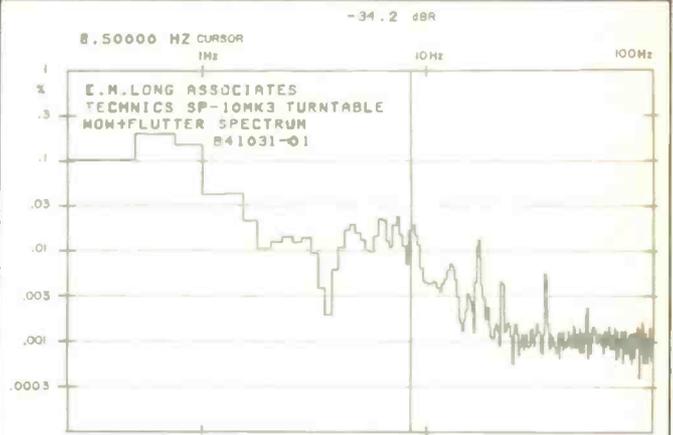


Fig. 1—Wow and flutter spectrum. Note that the vertical percentage scale has been shifted from previous Long turntable reports so that 1% is the maximum level on this scale.

to make a turntable immune to external vibrations is to make it massive. For past reports, I have placed the turntable under test on a special massive platform when I was measuring acoustical and mechanical isolation. With the SP-10MK3, I even made the listening tests with the turntable on this platform.

The electronic speed-control unit is also most interesting. There are eight control buttons plus the a.c. power switch and a large display window. Three of the buttons are for selecting the exact speeds; one is the speed lock, three more are for the plus and minus increments and a "clear" switch. The last control button is "Stop-Start." There is a rather large window on the left side of the control unit through which you can see the speed you have selected, and, if you decide to set the speed fast or slow to change pitch, you can see the percentage change in 0.1% increments as you increase or decrease the speed. If you have an interest in 78-rpm records, which I do, you will like the fact that the SP-10MK3 not only has the usual 33.3 and 45 but 78 rpm as well. The electronic speed adjustment will thus allow you to adjust the pitch of the sound to compensate for the old 78-rpm cutting lathes and tape recorders that did not always run at the correct speed.

The optional SH-10B5 turntable base includes a hinged dust cover of smoked gray plastic. The hinges can be adjusted so that the cover can be held open without raising it to its full height. Four feet are mounted on the bottom of the base, and these can be adjusted to level the turntable. The feet include heavy-duty springs which provide some isolation from external shocks. The black and silver styling of the SP-10MK3 is very clean and functional and gives the immediate impression that it is a very solid, professional turntable.

MEASURED DATA

Parameter	Claimed	Measured	Comment
Speeds	33.3 and 45 rpm	+0.19%	Excellent
Speed Stability	±0.001%	±0.17%	Very Good
Wow, DIN Unwtd.		0.21%	Very Good
Wow, DIN Wtd.		0.08%	Excellent
Flutter, DIN Unwtd.		0.12%	Very Good
Flutter, DIN Wtd.		0.02%	Excellent
W & F, DIN Unwtd.		0.28%	Very Good
W & F, DIN Wtd.	0.021%	0.08%	Excellent
Long-Term Drift		0.40%	Good
Rumble, Unwtd.	-60 dB	-68 dB	Excellent
Rumble, Wtd.	-92 dB	-90 dB	Excellent
Suspension Resonance		5.3 Hz	Well Damped

The Technics SP-10MK3 uses quartz control and direct drive to achieve very tight coupling between the motor and platter.

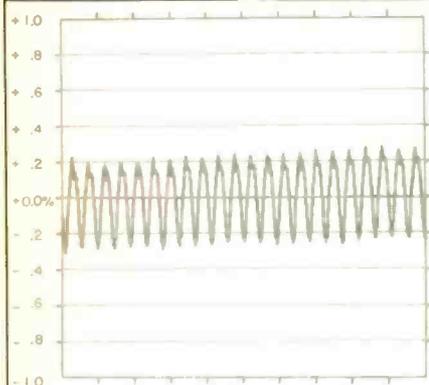


Fig. 2—Speed drift over a 41-S period. The 1.8-S cycle is 5.6 Hz and related to a single revolution at 33.3 rpm. Drift varies between +0.24% and -0.25%.

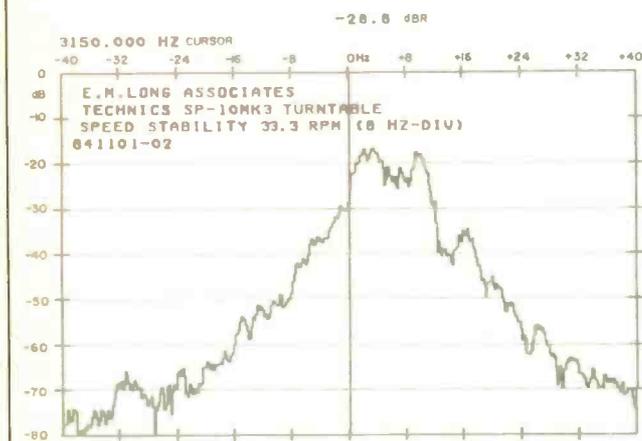


Fig. 3—Speed stability. The 0-Hz reference is to the 3,150-Hz tone on the

B & K 2010 test record. Note that speed tends to be fast.

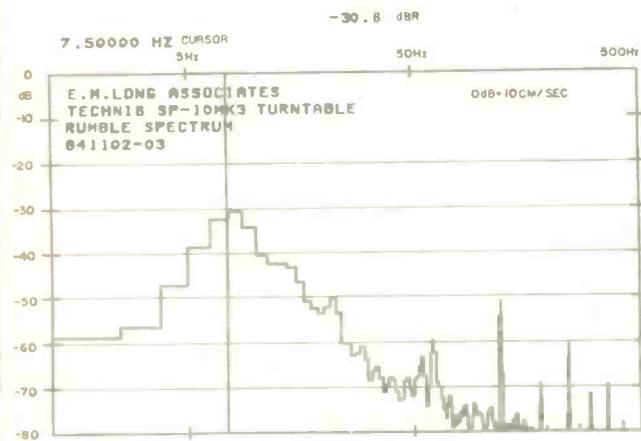


Fig. 4—Rumble spectrum, with main output at the 7.5-Hz tonearm/cartridge resonance.

Features

As mentioned before, the SP-10MK3 uses a direct-drive motor, which means that the motor drives the platter without going through any belts or gears. In the case of the SP-10MK3, the motor is part of the platter. The magnetic rotor is mounted on the underside of the platter and is driven by the electric current in the stator coils mounted on the base plate. The platter is made of copper alloy and weighs 22 pounds. Even though it must drive such a heavy turntable, the motor is capable of a starting torque of 16 kg per cm and a moment of inertia of 1.1 ton/sq. cm—quite remarkable. With such torque available, it is no surprise that Technics claims that the platter can reach stable speed within one quarter of a second. By looking at the strobe, I could see that the turntable locked in at 33.3 rpm within one-half turn of the platter. Since the platter makes one complete revolution in 0.56 S at this speed, it appears that the SP-10MK3 meets the specification.

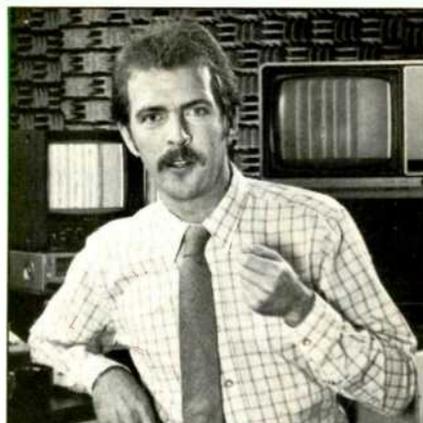
A technique called slip cueing is often used in radio stations to start records exactly. To do this, the record is held stationary while the turntable is rotated. At the desired moment, the record is released, and, since the turntable was already running, the start of the sound can be determined very accurately. The SP-10MK3 can do the same thing from a standing start. The stopping time of the turntable is also amazing, considering the mass of the platter, since it comes to a complete halt within 0.3 S after running at 33.3 rpm. The braking is both electrical and mechanical.

The speed can be locked to the standard speeds of 33.3, 45, and 78.26 rpm or it can be adjusted to $\pm 9.9\%$ of each of these speeds in 0.1% increments. The increment is chosen by holding down either the "+" or "-" button on the control unit. Technics includes a chart which will allow you to determine the percentage of change in frequency or the change of pitch in percentage points. As an example, a change of speed from 33.3 rpm by +5.9% will cause a pitch change of a half-tone sharp, and a change of -5.6% will cause a pitch change of a half-tone flat. Adjusting the speed this way allows a recording to be set to the exact pitch originally intended and also allows one to play along in tune with the recording. A "clear" key allows the speed to be reset immediately to the exact rated speed. If you place the control unit next to the turntable, you will need a surface about 29 inches wide and 21 inches deep, and there should be a clearance of about 17 inches above the turntable to allow the cover to be opened.

Mounting a tonearm to the SP-10MK3 is facilitated by the fact that separate mounting platforms are provided with the SH-10B5 mounting base. One of the two that I received had a hole for mounting the Technics EPA-100MK2 tonearm; the other was blank. After the tonearm was fastened to the mounting platform, it was secured to the turntable base by four hex-head bolts. This allows different tonearms to be preset and then changed easily.

Measurements and Listening Tests

As I mentioned earlier, all the measurements and listening tests were conducted with the Technics SP-10MK3 turntable mounted to the SH-10B5 base and with the combination placed on a very heavy and stable platform.



Getting the most from compact discs.

Can your system really keep pace with digital audio?

by J. Robert O'Connell

Recording Engineer



As an audio enthusiast, you've probably read many articles on compact discs. Most have stressed the dynamic range available, and the consistent sound quality, play after play. Both of those topics are important. But what also must be considered, and is all too often ignored, is the impact of this new format on your present audio system.

DYNAMIC RANGE: THE COMPACT DISC EDGE

Peak Output. The top two curves on the graph at right show the same piece of music played from a conventional LP and a compact disc. The peak output heard from a disc is substantially greater than that available from the LP, provided the rest of your system can reproduce it.

Noise Floor. As can be seen from the three lines at the bottom of the graph, the noise floor of the compact disc is below that of a common listening room, while a conventional LP is above it. This demonstrates that compact discs are so quiet that other factors (such as the room noise and the quality of the rest of your audio system) limit the softest sounds you can hear.

Dynamic Range. Since the compact disc exhibits both increased peak output and decreased noise floor, the dynamic range (difference between the softest and loudest sounds) is extended. But this extended range is only experienced if the rest of your audio system is physically capable of handling it.

IMPACT ON YOUR AUDIO SYSTEM

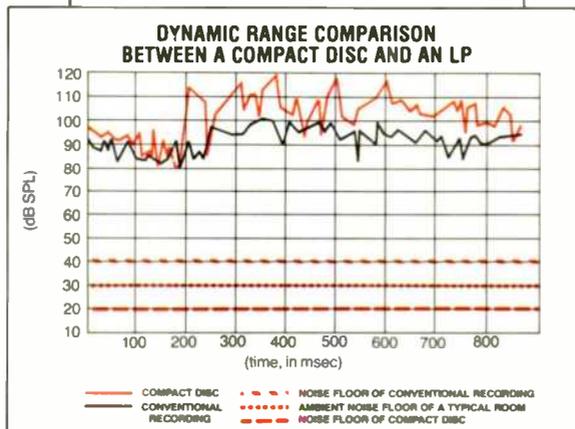
Increased dynamic range and decreased noise floor places new demands on your audio system. Remember that each 3 dB of additional dynamic range requires *double* the amplifier power

speaker if the result will be "blown" tweeters rather than a more enjoyable experience. Finally, and perhaps most importantly, the speaker must be able to create the lifelike impact and flawless clarity captured by the disc.

At Bose®, we've invested 20 years developing Direct/Reflecting® speaker systems to deliver spacious, lifelike sound. We've also designed them to meet the demands of lifelike recordings, such as the compact disc. So, our 901® Series V system, for example, is rated for unlimited power handling. But the only way to evaluate our speakers, or anyone else's, is to listen to them. For help in properly evaluating speakers, we refer you to article #2 in this series, "Why didn't they sound like that in the showroom?" by John Carter, Chief Engineer.

For reprints of article #2, as well as more information on Bose products, please write: Bose Corporation, Dept. AU, 10 Speen Street, Framingham, MA 01701. ■

J. Robert O'Connell is manager of Bose Audio Visual Services.



to reproduce it. So, compared with conventional recordings, compact discs require higher amplifier power. But amplifier power is only one of the criteria which determines the quality of compact disc sound reproduction.

Extended dynamic range also places previously-unheard-of demands on your speakers. And, after all, speakers, more than any other component, determine the quality of sound you actually hear from a compact disc. The higher the speaker's sensitivity, for example, the less the necessary amplifier power to reproduce the peaks in source material captured by a disc. Further, to reproduce the incredible dynamic range available from compact discs, a speaker must also have high power handling capability. There's no sense feeding a higher level signal to a



The total weight here is 95 pounds! Technics feels this is the best way to make the table immune to external vibrations.

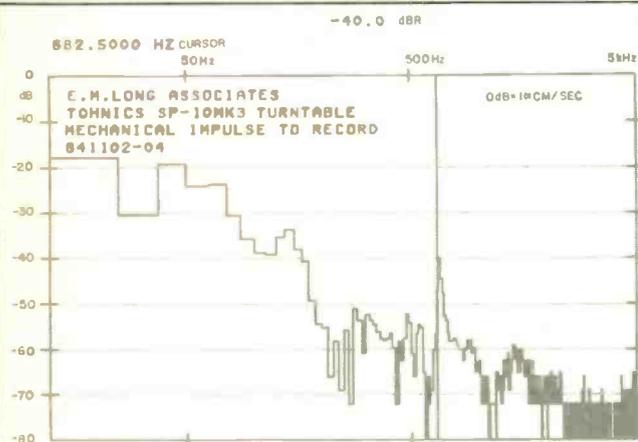


Fig. 5—Spectrum to 5 kHz due to a mechanical impulse applied to the edge of a stationary record with the stylus in a quiet groove. The cursor

is at 662.5 Hz, which is the main ringing frequency of the platter and where the output is -40.0 dB below 10 cm/S.

Fig. 6—Output vs. time of the impulse used to obtain the spectrum in Fig. 5. Total period is 0.205 S.

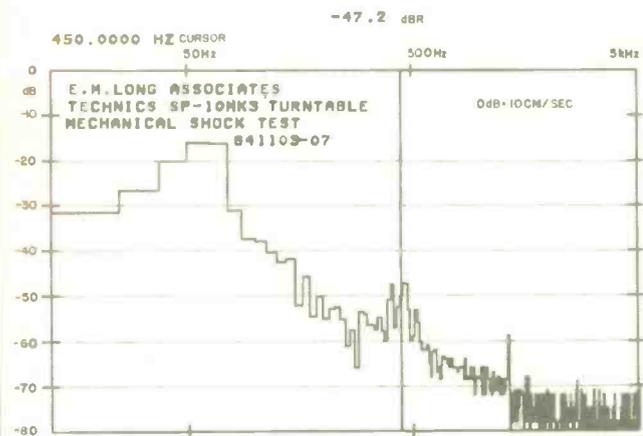
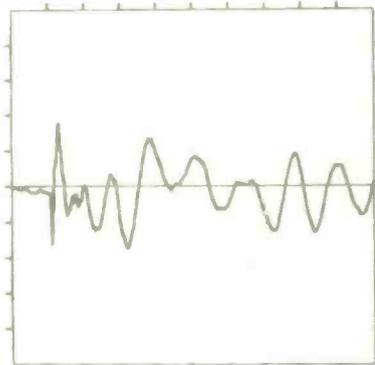


Fig. 7—Spectrum to 5 kHz due to mechanical shock applied to the massive platform upon which the

turntable and base rested during tests. Resistance to such shock was very good.

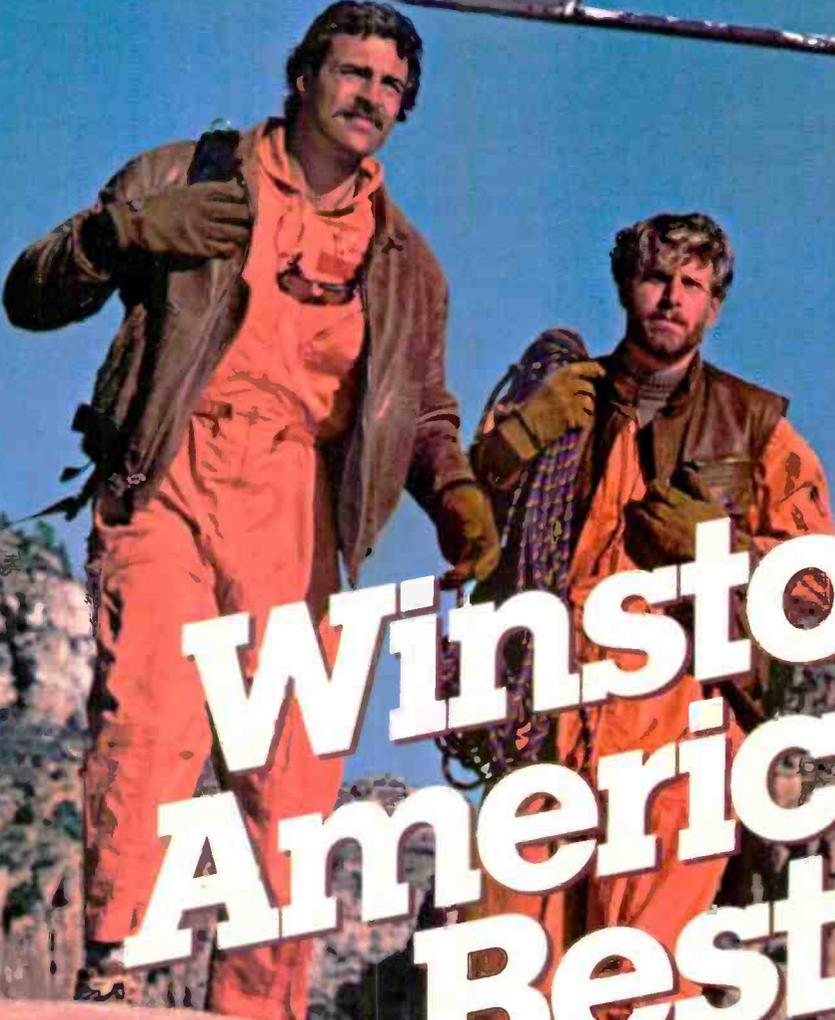
The wow and flutter was measured with a W&F meter and also by recording the component spectrum using the Nicolet 660-2D Fast Fourier Transform (FFT) Analyzer. Figure 1 shows the spectrum of the wow and flutter from the FFT. Most of the components are below 0.03%, and the cursor indicates -34.2 dB, which is 0.02%, at 8.5 Hz. The main component of the wow and flutter spectrum is at about 0.5 Hz. When the record groove is not perfectly centered, the stylus will read the signal at 0.56 Hz, which is the frequency of rotation at 33.3 rpm. This causes the wow modulation seen in Fig. 1, and the accuracy of centering the record has a definite effect upon the amount of wow. The "Measured Data" table shows that the unweighted wow and flutter is 0.28%, while the weighted wow and flutter is only 0.08%. Since the weighting has the effect of reducing the effect of wow and flutter below 20 Hz, this corroborates the data presented in Fig. 1.

The drift in speed over a 40-S period is shown in Fig. 2, a digital storage oscilloscope plot. There is an indication of a little "hunting" by the servo when the speed increases above +0.2%. This might be the reason for the components which appear at frequencies above 10 Hz in Fig. 1. Drift, displayed in Fig. 2, is minor and indicates that overall rotational speed is slightly fast. During the listening sessions, there were no comments regarding the sound that could be directly linked to lack of stability in tone when compared to the reference system. It is rather difficult, however, to be absolutely certain that a record is perfectly centered during listening tests, at least to the degree possible. I did try a separate experiment to check this. I offset the record slightly on one turntable while I carefully centered a duplicate on the other. When I did this, there was one comment from a panel member about a difference in clarity. I heard a difference also, but I discount my own conclusions to a great extent because I was aware of the test conditions. This might be a clue to explain a phenomenon reported by reputable persons that they have heard an effect upon clarity when the record is rotated to a different position relative to the platter.

Figure 3 shows the spectrum due to playing a recorded 3,150-Hz tone and indicates that the SP-10MK3 is running slightly fast in the 33.3 rpm quartz-locked mode. This is shown as +0.19% in "Measured Data." What this means is that a record which should be exactly 60 minutes when played at 33.3 rpm, will take 59 minutes and 53.2 seconds. This is excellent long-term stability and could be made almost perfect by setting the speed back two clicks to -0.2%. Precise control of speed is very important for timing broadcasts, but it is also handy when copying a record to tape because it can be used to avoid running out of tape at the end of a piece of music. The cyclical variation in speed, shown in Fig. 3, is not the best I have measured, but it is more a function of record eccentricity than of actual speed variations in the turntable itself. Still, the performance here is very good and translates to the $\pm 0.17\%$ shown for speed stability in "Measured Data." The claimed spec of $\pm 0.001\%$ may be a typographical error since it is easy to mix decimal points and percentages. I know, because I tend to fall into this trap myself!

The rumble spectrum is shown in Fig. 4. Most of the

Warning: The Surgeon General Has Determined That Cigarette Smoking Is Dangerous to Your Health.



Winston America's Best.

Excellence.
The best live up to it.



The Technics SP-10MK3 is certainly among the best turntables presently offered by anyone. It's a rugged, heavy-duty unit for daily use.

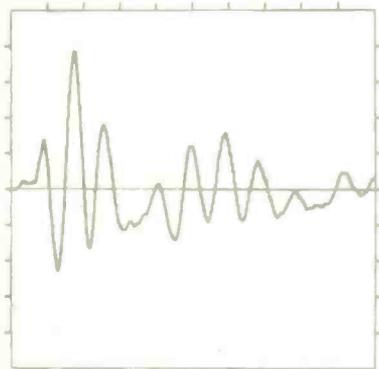


Fig. 8—Output vs. time of the impulse used to obtain the spectrum of Fig. 7. Total period is 0.205 S.



Fig. 9—Spectrum to 100 Hz due to a 100 dB SPL acoustic field at the record surface with the stylus in a quiet groove

near the middle of a stationary record. The acoustic isolation is excellent.

rumble is at the 7.5-Hz tonearm/cartridge resonance frequency. The unweighted and weighted rumble specs are shown in "Measured Data" as being -68 and -90 dB, respectively; Technics claims values of -60 and -92 dB. The rumble is so low that only the most sophisticated equipment and techniques will allow it to be measured with any accuracy, and it has to be rated excellent.

Figure 5 shows the averaged spectrum produced by a series of mechanical impulses. These impulses were applied to the edge of a stationary record while the stylus was resting in a quiet groove near the middle of the record. Figure 6 shows the output versus time caused by one of the mechanical impulses picked up by the stylus. Technics doesn't supply any type of record clamping device, so I didn't use one on the SP-10MK3 for these measurements. During the listening tests, no clamping device was used on either the SP-10MK3 or the reference turntable. The stock platter mat doesn't appear to be anything special, but it is effective in suppressing the ringing of the metal platter at 662.5 Hz. During the listening tests, comments were made about differences in tonal balance between the SP-10MK3 and the reference turntable. It was felt that these differences might be related to differences in the spectrum of the energy in the record. For example, the sound of acoustical guitar seemed a bit fuller from the SP-10MK3, which shows more energy in the range below 200 Hz than the reference turntable.

The isolation of the SP-10MK3 from external shock is indicated by the spectrum shown in Fig. 7. The cursor is at 450 Hz, and the energy rise at this frequency is down -47.2 dB. The greatest amount of energy is concentrated below 100 Hz. The suspension resonance of the SH-10B5 is at 5.3 Hz and very damped, but the great mass of the system can be energized by external shock. Therefore, care was taken during the listening sessions to avoid any mechanical coupling between the loudspeakers and the turntables. Figure 8 shows the output versus time for the mechanical shock which produced the spectrum shown in Fig. 7.

Figure 9 shows the spectrum of the electrical output of the cartridge with the stylus resting in a quiet groove while an acoustical signal produces a level of 100 dB at the surface of the record. This signal is a very slow sweep from 20 to 100 Hz. The system's degree of isolation from this acoustical signal is excellent.

Conclusions

The SP-10MK3 is offered by Technics as being the best turntable that they make; it is certainly among the best turntables presently offered by anyone. If you are in the market for a rugged, heavy-duty turntable which will hold up well in day-after-day use and has broadcast-type professional features, you should check it out. The overall sound quality is only slightly below that of a few top audiophile turntables, and the SP-10MK3 is as good as the best of them with regard to acoustical isolation. In order to achieve this performance, you will have to place the turntable and its base on a very solid platform. The precise control of speed and the ability to change tonearms easily are great features which should interest both musicians and audiophiles.

Edward M. Long

The separate control unit is used to select speeds and vary the pitch, with speed change shown in 0.1% increments.



3

SIGNET TK10ML PHONO CARTRIDGE

Manufacturer's Specifications

Frequency Response: 5 Hz to 35 kHz; 20 Hz to 15 kHz, ± 0.5 dB.

Tracking Force: 1.2 grams (1 to 1.5 grams).

Channel Balance: 0.5 dB.

Channel Separation: At 1 kHz, 35 dB; at 10 kHz, 26 dB.

Output Voltage: At 1 kHz and 5 cm per S, 2.2 mV.

Stylus: Nude-mounted, natural-diamond MicroLine.

Cantilever: Boron.

Vertical Tracking Angle: 20°.

Resistance: 240 ohms d.c.

Inductance: 85 mH.

Impedance: 550 ohms at 1 kHz.

Recommended Load Impedance: 47 kilohms.

Recommended Load Capacitance: 100 to 200 pF.

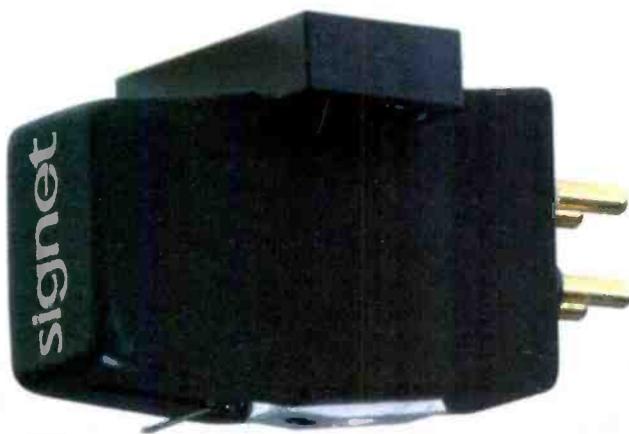
Weight: 7.5 grams.

Replacement Stylus Assembly: TKN10ML.

Price: \$380.

Company Address: 4701 Hudson Dr., Stow, Ohio 44224.

For literature, circle No. 92



When Signet introduced the TK10ML moving-magnet phono cartridge, it was the first in the United States to utilize the MicroLine diamond stylus. The design of this stylus is claimed to surpass all others in virtually every aspect of performance. The MicroLine has a scanning radius of only 2.5 microns, half that of other small, thin stylus tips. This permits the tip to trace modulations too finely cut for conventional styli. The length of this 2.5-micron ridge is 210 microns, compared to only 67.5 microns for elliptical tips and 143 microns for van den Hul tips. Signet calls the MicroLine's scanning radius and vertical contact dimension the narrowest and tallest "footprint" ever achieved by a cartridge manufacturer, and claims that its longer vertical contact line minimizes stylus pressure on the groove wall, even after taking the narrow scanning width into ac-

count. The end result, according to Signet, is wider frequency response, lower distortion, and less stylus and record wear.

Audiophiles with heavily played record collections should seriously consider the MicroLine stylus, because its extremely long footprint will contact parts of worn records' grooves which have never been played before. Thus, there should be a considerable reduction in surface noise and a cleaner sound—somewhat like that of a new record. However, to function properly, the stylus must be precisely aligned with the groove walls.

The stylus is made from a whole, natural octahedral diamond. It is grain-oriented and ground with a square shank to fit the laser-cut hole in the cantilever precisely, for perfect alignment and positioning.

The cantilever is made of boron,

Perfect bass...Perfect treble... Perfect sound...forever

ROTEL introduces a refreshing new range of audio equipment designed exclusively to appeal to hi fi enthusiasts. Its acceptance in the UK, where Rotel was designed and conceived, is overwhelming.

HI FI TODAY says "Rotel have engineered some outstanding products which offer amazing sound and remarkable value".

NEW HI FI SOUND says "The sound was open, lively, detailed and enjoyable to listen to, and as for the RA820B amplifier, well, it was a real gem".

WHAT HI FI says "The most obvious ability of Rotel is the way it allows music to live and breathe".

HI FI CHOICE says "The Rotel system stands out in its ability to play records properly. The stereo soundstage is well defined, and with a good cartridge there is clarity, precision, and evenness of reproduction that allows the music to sound lively and vivid...Quite clearly, its performance is something special".

Listen to Rotel yourself and let's hear what **YOU** have to say.



ROTEL

P.O. Box 653, Buffalo N.Y. 14240 U.S.A. (416) 297-0599

See dealer listing on page 125.
Enter No. 39 on Reader Service Card

The Signet's extremely tall "footprint" can contact parts of record grooves in worn records never played before—making them sound like new.

among the most rigid and acoustically dead materials known. This rigidity eliminates spurious resonances, assuring smooth response within the audible range.

The Signet Twin-Flux generator system utilizes two completely discrete magnet/coil systems, one for each groove wall, each precisely aligned at a right angle to one of the walls. Each of these two samarium-cobalt magnets, along with its associated laminated ring core and toroidal coil, makes up an independent electrical generator that reproduces only the sound information on its own stereo channel. This results in very high stereo separation. The omega-shaped coils themselves are of 99.9% pure, oxygen-free copper, and are wound on a unitized core/pole piece made up of six wafer-thin metal laminations for the highest possible flux density. To eliminate crosstalk from one side to the other, a mu-metal shield is placed between the two coil assemblies.

The TK10ML is packaged in a plastic container. Besides the phono cartridge, the usual stylus brush, screwdriver and mounting hardware are included. The plastic container is boxed in a Styrofoam case which, in turn, is packaged in a reasonably good-looking display box.

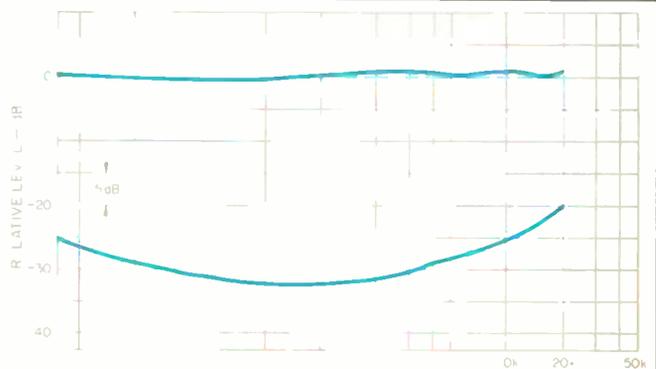
Measurements

The Signet TK10ML moving-magnet phono cartridge was mounted in an EDS S-shaped tonearm, on an EDS 25F turntable. The TK10ML weighs 7.5 grams, and the headshell 6.9 grams, for a total weight of 14.4 grams. Each channel was terminated with 47 kilohms resistance and 180 pF capacitance. The Dennesen Geometric Soundtractor was used to orient the TK10ML in the headshell and tonearm.

All laboratory tests were conducted at an ambient temperature of 72° F (22.22° C) and a relative humidity of 55%, ±3%. The tracking force for all reported tests was set at 1.25 grams and the anti-skating force at 1.7 grams. As is my practice, measurements are made on both channels, but only the left is reported unless the two channels differ significantly, in which case both channels are reported for a given measurement.

The following test records were used

Fig. 1—Frequency response and separation (JVC TRS-1007 test record).



in making the reported measurements: Columbia STR-100, STR-112, and STR-170; Shure TTR-103, TTR-109, TTR-110, TTR-115, and TTR-117; Deutsches HiFi No. 2; DIN 45.549 and 45.542; JVC TRS-1005 and TRS-1007; B & K QR-2010, and Ortofon 0002 and 0003.

Frequency response, measured from 40 Hz to 20 kHz with the JVC TRS-1007, was among the flattest I've ever measured: +0.8, -0.25 dB (Fig. 1). Separation, using the same test disc, was 32 dB at 1 kHz, 26.5 dB at 10 kHz, 23 dB at 15 kHz, and 21.5 dB at 20 kHz. The frequency response from 30 to 50 kHz using the JVC TRS-1005 was -3 dB at 30 kHz, -5 dB at 45 kHz, and -7 dB at 50 kHz. The frequency response beyond 30 kHz was not remarkable. The 1-kHz square wave is quite flat, with no overshoot (Fig. 2).

The arm/cartridge low-frequency lateral resonance for either channel measured a surprisingly low 6.5 Hz at +7 dB. The vertical resonance was also 6.5 Hz. Given such a low arm/cartridge resonance, the measurement was repeated using a Technics EPA-A250 tonearm, with its anti-resonance device defeated. Again, the arm/cartridge resonance in both planes measured 6.5 Hz. Based on this, it seems that the TK10ML phono cartridge should be mounted in either a very light or a heavily damped tonearm.

Using the Dynamic Sound Devices DMA-1 dynamic mass analyzer, the arm/cartridge dynamic mass was measured at 16.5 grams, and the dynamic vertical compliance at 35×10^{-6} cm/dyne at the vertical resonant frequency of 6.5 Hz. The harmonic-distortion

components of the 1-kHz, 3.54-cm/S rms, 45° velocity signal from the Columbia STR-100 test record were: 1.12% second harmonic, 0.5% third harmonic, with less than 0.2% higher order terms. The vertical stylus angle measured 22° at the tracking force of 1.25 grams.

Other measured data are: Wt., 7.5 g. Opt. tracking force, 1.25 g. Opt. anti-skating force, 1.7 g. Output, 0.51 mV/cm/S. IM distortion (200/4000 Hz, 4:1): Lateral (+9 dB), 0.6%; vertical (+6 dB), 2.2%. Crosstalk (using Shure TTR-109): Left, -24 dB; right, -27 dB. Channel balance, 1 dB. Trackability: High frequency (10.8 kHz, pulsed), 30 cm/S; mid-frequency (1 and 1.5 kHz, lateral cut), 31.5 cm/S; low frequency (400 Hz and 4 kHz, lateral cut), 24 cm/S. The Deutsches HiFi No. 2 300-Hz test band was tracked cleanly to 114 microns (0.0114 cm) lateral at 21.50 cm/S at +12 dB and to 55.4 microns (0.00554 cm) vertical at 10.32 cm/S at +5.86 dB. In repeating the test using

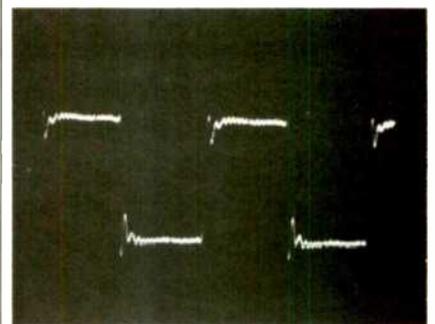
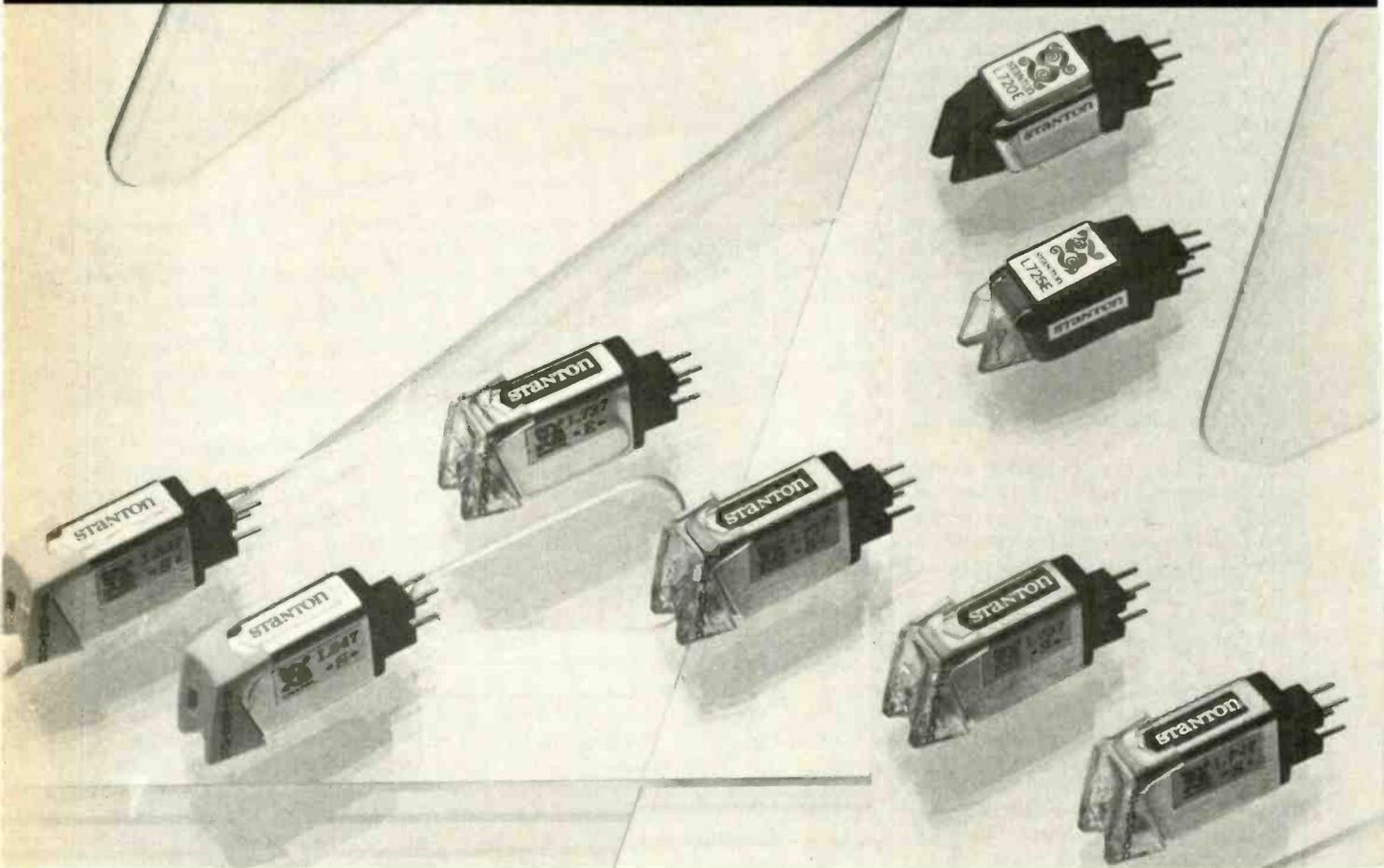


Fig. 2—Response to a 1-kHz square wave.

Stanton quality for your P-Mount Turntables from Stanton – “The Choice of the Professionals”™



Stanton Magnetics presents its new generation of cartridges – the P-Mount series. This unique series offers nine design levels that will perfectly match your customers' needs – from the simplest to the most sophisticated system. *All available with universal mounts.* For further information write Stanton Magnetics, 200 Terminal Dr., Plainview, NY 11803.



STANTON
THE CHOICE OF THE PROFESSIONALS™

After 40 hours of listening to every kind of music, I judged the Signet TK10ML one of the best and most natural-sounding MM cartridges available.



The tall, thin "footprint" of the Signet's MicroLine stylus scans fine details well.

the DIN 45.549 test record, the TK10ML tracked to 120 microns in the left channel and 100 microns in the right channel.

The Signet TK10ML encountered no difficulty in tracking all the test bands on the Shure Obstacle Course Era III and Era IV musical test records as well as level 6 of the Shure Era V trackability tests.

Since commercial analog records rarely have peak recorded velocities exceeding 15 cm/s, the Signet TK10ML would be able to track any audiophile records, such as those issued by Sonic Arts, Telarc, Sheffield, Reference Recordings, RCA Point 5 or Mobile Fidelity.

One cautionary note: The MicroLine stylus must be kept pristinely clean at all times; otherwise, the music will sound somewhat muddy. Undoubtedly this occurs because the stylus' extra-small scanning radius acts as a super scoop, penetrating deep into the record's groove and scraping dust and dirt particles from the groove's very bottom.

Use and Listening Tests

As usual, listening tests were performed both before and after laboratory tests. The following equipment was used: EDS 25F turntable and arm, Technics EPA-B500 tonearm assembly along with an A-250 S-shaped tonearm mounted on a Technics SP-10MKII

turntable, Audio-Technica AT666EX vacuum disc stabilizer, Amber Model 17FF preamplifier, two VSP Labs Trans-MOS 150 amplifiers (each used in the 300-watt mono mode), and a pair of B & W 801F loudspeakers. Speaker cable, interconnecting cables, and the wall foam for the live-end/dead-end (LEDE) listening room were from Discrete Technology.

Some of the super audiophile records I used to evaluate the Signet TK10ML were Gershwin: *Rhapsody in Blue*, *An American in Paris* (List, piano; Cincinnati Symphony, Kunzel, Telarc DG-10058), Saint-Saëns: *Symphony No. 3, "Organ"* (Zamkochian, organ; Boston Symphony, Munch, RCA Red Seal Point 5 ATL1-4039), *Adam Makowicz, Jazz Pianist* (Sheffield Lab 21), Vivaldi: *La Primavera, Opus 8, No. 1, etc.* (H. Ohyama and the Cremona Chamber Ensemble, Sonic Arts LS-8), Schubert: *Four Works for Violin and Piano* (Matoušek, violin; Adamec, piano; Denon OX-7141-ND), *Wild Bill Davison and Eddie Miller Play Hoagy Carmichael* (M & K RealTime Records—Digital Recording RT 306), and David Foster, *The Best of Me* (Mobile Fidelity MFSL 1-123).

At no time did I hear any coloration present except when the stylus of the TK10ML was dirty. Both applause definition and transient response were excellent. As expected, the TK10ML reproduced very high velocity cannon shots on the Telarc 1812 (matrix 2) with no apparent difficulty. The Bösendorfer piano, as well as the singing voices, were reproduced realistically. Both stereo imaging and depth were superior to the average phono cartridge. I found the bass sonically well-defined and tight.

Although the Signet TK10ML was put through the wringer, playing just about every type of music record commercially available, there was none it did not reproduce flawlessly.

After more than 40 hours of listening to the Signet TK10ML play practically everything, I judged it one of the best and most natural-sounding moving-magnet phono cartridges available today. Those enamored with the mystique of the vaunted moving-coil phono cartridges would undoubtedly find it ear-opening to audition this extraordinary phono cartridge. *B. V. Pisha*

MUSICALLY ARTICULATE
LOUDSPEAKERS FOR
OVER A DECADE

ROOSTERS

BRITISH  HIGH-FIDELITY

FOR MORE INFORMATION CONTACT

naiao BOX 1860 BRANTFORD, ONTARIO, CANADA N3T 5W4
BOX 1260 FALLS STATION NIAGARA FALLS, NY, USA 14303-0260

Freedom of Choice

What else could we offer? AudioSource has already given thousands of audio enthusiasts the freedom to choose the way they listen to their favorite music with the EQ-One Graphic Equalizer/Spectrum Analyzer. Now, with the purchase of the

system that will make your favorite records sound as if you were hearing them for the very first time.

For a limited time only, AudioSource lets you choose a free audiophile recording to complement your newly transformed system, allowing you to fully enjoy its increased performance level. Available on Compact Disc, Metal Tape, or Master Recorded LP, these stunning Proprius



critically acclaimed EQ-One Series II, you get the freedom to choose either a Compact Disc, Half-Speed Mastered LP, or Metal Tape Cassette. Free!

Achieving Sonic Pleasure

With its on-board, real-time analyzer, the EQ-One Series II visually 'reads' the response of your listening room, providing you with an exact display of its characteristics. The dual ten-band graphic equalizer allows you to correct for room resonances while shaping the music to suit your own personal taste. The result is a dramatic improvement in any sound

recordings are the perfect match for your new EQ-One Series II . . . and the 'new' sound of your old system.

This offer is good from participating dealers only. Choose from "Jazz at the Pawnshop" or "Cantate Domino."



AudioSource®

1185 Chess Drive, Foster City, CA 94404, 415 574-7585

©1984 AudioSource

4

HITACHI DA-600 COMPACT DISC PLAYER

Manufacturer's Specifications

Frequency Response: 5 Hz to 20 kHz, ± 0.5 dB.

S/N Ratio: 95 dB.

Dynamic Range: 95 dB.

Channel Separation: 92 dB.

THD: 0.003% at 1 kHz.

Output Level: 2.5 V, variable.

Number of Programmable Selections: 15.

Power Consumption: 23 watts.

Dimensions: 17 $\frac{1}{8}$ in. (43.5 cm) W x 3 $\frac{1}{4}$ in. (8.3 cm) H x 10 $\frac{1}{8}$ in. (26.4 cm) D.

Weight: 13 lbs., 3 oz. (6 kg).

Price: \$700.

Company Address: 401 West Arteria Blvd., Compton, Cal. 90220.

For literature, circle No. 93



CD players have come a long way since I tested Hitachi's rather boxy-looking first model, the DA-1000, more than two years ago. I did not give it a rave review. In fact, I went through two samples before I got one that worked properly. How times have changed! This latest Hitachi CD player deserves high marks for performance and features, as well as for style. It allows you to program up to 15 selections in

any order, using a numeric keypad. There's an audible fast-search mode which helps you find the exact musical moment you want to hear. A repeat-playback feature lets you listen to a specific program over and over again, or you can repeat-play specific tracks. It's even possible to find specific points on a disc by keying in tracks as well as index numbers, if the particular disc has been encoded with such

The DA-600 is amazingly versatile for a player with such simple controls, because its five keypads have double functions.

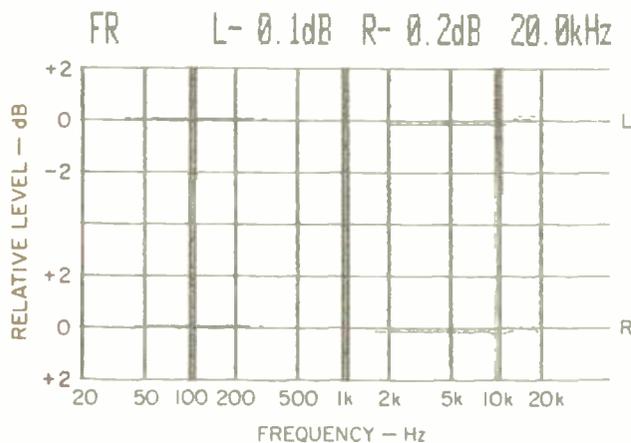


Fig. 1—Frequency response, left (top) and right channels.

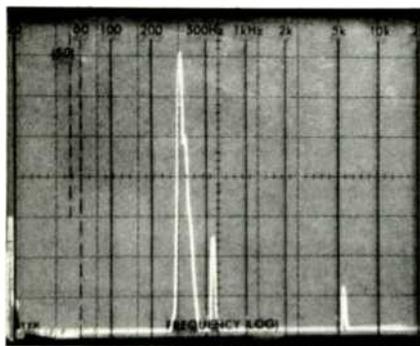


Fig. 2—Spectrum analysis of 20-kHz test signal (large spike) shows inaudible beat tone at 24.1 kHz, approximately 50 dB below the desired output. Horizontal scale: Linear, from 0 Hz to 50 kHz.

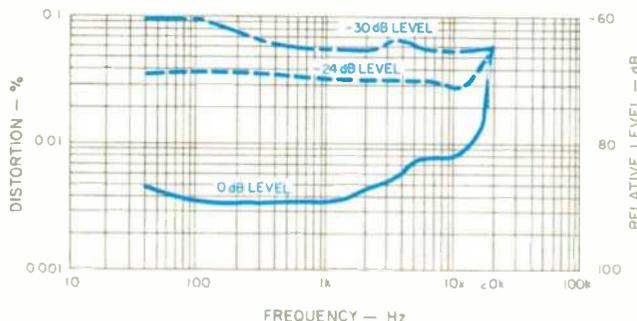


Fig. 3—THD vs. frequency at three output levels.

index points. Perhaps best of all, a supplied wireless-remote control lets you handle all player operations except power on/off, drawer open/close, and output-level adjustment from the comfort of your listening location.

According to Hitachi, the low, slim look of the DA-600 was made possible in part by the firm's development of several LSIs which incorporate a great deal of circuitry into a few small chips. Hitachi also stresses that its CD players employ a three-beam laser-optics system for accurate tracking, though I'm not convinced that this approach offers any real advantages over the single-beam laser found in other, equally good players.

Control Layout

Like most latter-day CD players, the DA-600 uses a front-loading, retracting drawer that holds the CD to be played. Below the drawer is the power on/off switch, and to its right is an open/close button. Further to the right is a fluorescent, multi-purpose display which indicates the track and index numbers being played, the time into the track (as well as the total recorded time of the disc just after it is loaded), and the selected mode. "Play," "Repeat," "Pause," "Open," and "Program" lights illuminate at appropriate times to tell you exactly what's happening. When a disc is first loaded, the display shows the total number of tracks on that disc. Below the display area are 10 small numeric keys used for manual track selection or for random-access programming. The "Memory" key for this programming and the "Repeat" key are positioned alongside the numeric keys.

The turntable's amazing versatility of operation is achieved using only five keypads. When used singly, these pads handle play, pause, stop, fast-forward, and fast-reverse functions. The fast-motion buttons, when pressed during play, advance the laser pickup rapidly, allowing you to reach a desired musical moment quickly. If the fast-forward or fast-reverse button is pressed while holding down the play button, the pickup quickly advances to the start of the next track or returns to the beginning of the current one. The stop button also serves a second function, clearing the program from memory. Doubling the functions of these control pads simplifies the look of this player, making it less intimidating than some others I've encountered that belong to the airplane-cockpit school of control-panel layout. Despite its clean simplicity, the DA-600 offers all of the operating features of those more complicated-looking models.

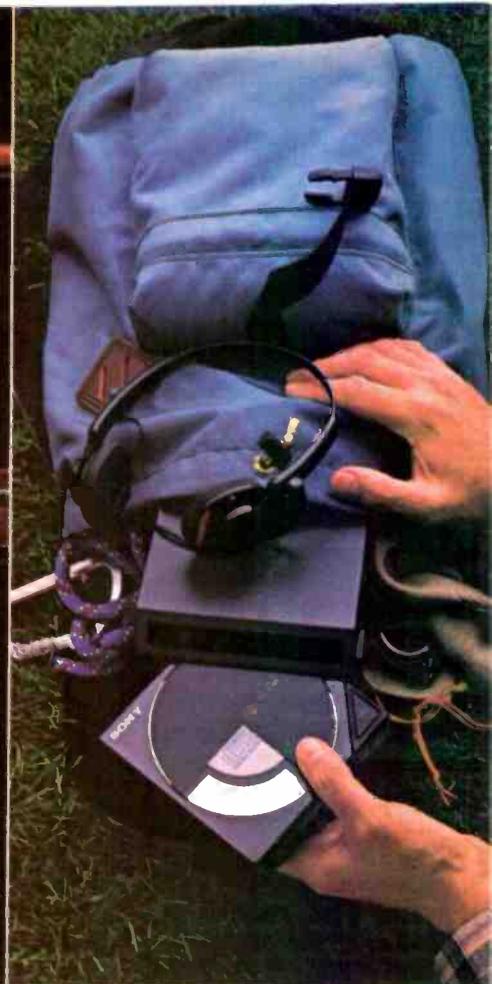
An output-level control and a stereo headphone jack are at the extreme right end of the front panel. The level control adjusts both line and headphone output levels.

The five major function buttons, the "Repeat" button, and the 10 numeric keys are all duplicated on the wireless remote control, permitting you to remotely program the tracks (and index numbers) you want.

Line outputs for connection to the left and right high-level inputs of a preamplifier, integrated amplifier, or stereo receiver are found on the rear panel.

Measurements

Figure 1 shows the playback frequency response for the left and right channels of this CD player. The vertical scale is 2 dB per division, the better to highlight small deviations



Sony revolutionizes the compact disc revolution.

If there are still a few among you who have any lingering doubts as to who the leader in digital audio really is, consider the following:

On October 1, 1982, Sony* set the music industry on its ear with the creation of the world's first compact digital audio disc player.

Today, with over 30 companies joining the revolution, Sony is starting another. The Portable Compact Disc Player,* and coming this winter, the Car Compact Disc Player.

Combine that with the fact that the CDP-111, shown above, represents another addition to the world's largest family of

home compact disc players, and one thing should become abundantly clear:

While other companies are claiming advanced circuits, Sony has taken a somewhat different course.

Advanced products.

SONY.
THE LEADER IN DIGITAL AUDIO.™

*Initial supplies may be limited. © 1984 Sony Corp. of America. Sony is a registered trademark of the Sony Corporation, 1 Sony Drive, Park Ridge, NJ 07656. Optional headphones and battery pack case may vary where purchased.

The DA-600's A-weighted signal-to-noise ratio was 104 dB, one of the best I've ever measured for a Compact Disc player.

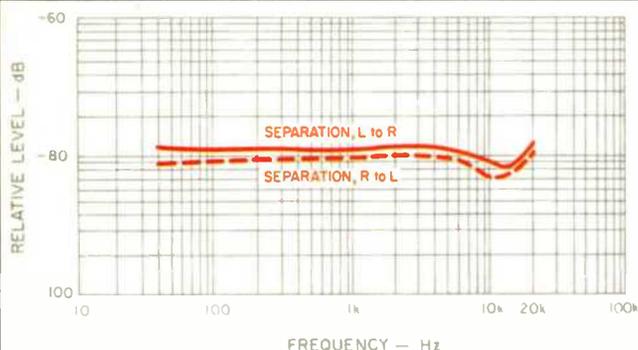


Fig. 4—Separation vs. frequency.

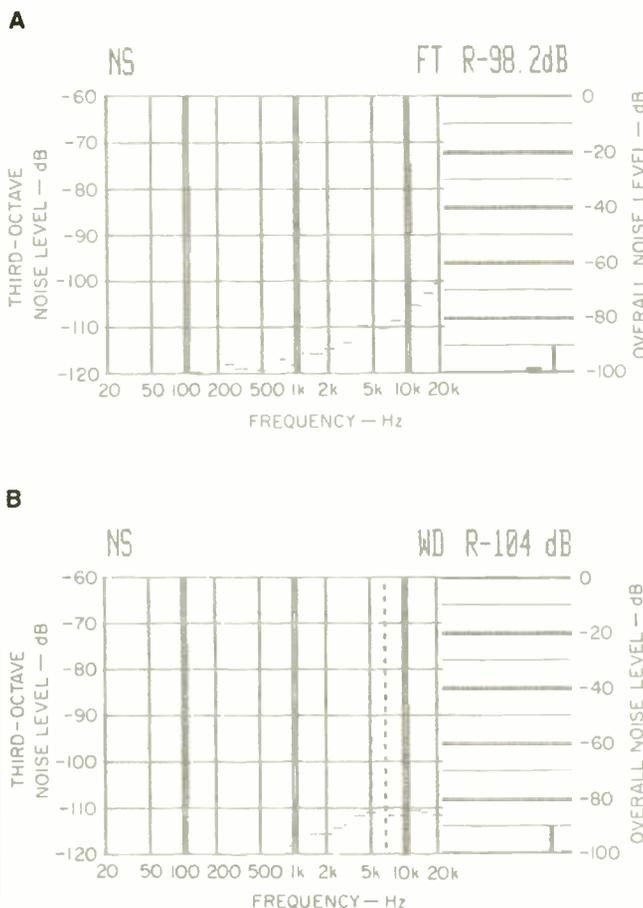


Fig. 5—S/N analysis, both unweighted (A) and A-weighted (B).

from ruler-flat response. There were none to speak of, and, with the cursor of the graph set to read relative output at 20 kHz, the readings were off by only 0.1 and 0.2 dB for the left and right channels!

Harmonic distortion at mid-frequencies, for maximum recorded level, measured 0.004%, rising to 0.008% at 10 kHz. Above that frequency, I ran into the usual apparent increase in THD, caused not by higher order harmonic components but by an out-of-band "beat" between the 44.1-kHz sampling frequency and the frequency read from the test disc. In Fig. 2, the tall spike represents a desired output at 20 kHz. In this spectrum-analyzer photo, the sweep is *linear* from 0 Hz to 50 kHz, in 5-kHz horizontal divisions. The 24.1-kHz spike caused by the beat phenomenon is roughly 50 dB below the desired output; you can also see a shorter spike just above 40 kHz in this 'scope photo. Neither of these spikes, of course, is audible, since they are beyond the highest frequency of human hearing.

Figure 3 plots distortion versus frequency for maximum recorded levels as well as for recorded levels of -24 and -30 dB. As usual for CD players, the THD increases at lower output levels. At the -30 dB recorded level, THD for a 1-kHz signal measured 0.06%.

Output linearity was accurate to within 0.1 dB down to 60 dB below maximum recorded level, and to within 0.4 dB down to 90 dB below maximum recorded level. Stereo separation, or crosstalk, shown in Fig. 4, was extremely uniform over the entire range of frequencies tested and did not decrease at the frequency extremes, as it does on so many other CD players. This suggests that the analog output stages of the player have been designed with good isolation between left and right output stages.

SMPTE-IM distortion was a low 0.01% at maximum recorded level, increasing to 0.03% at -20 dB recorded level. CCIR (twin-tone) IM, using signals at 19 and 20 kHz, measured only 0.002% at the equivalent of maximum recorded level and 0.0027% at -10 dB. The signal-to-noise ratio, measured without any weighting network, was an impressively high 98.2 dB, increasing to an even more impressive 104 dB when an A-weighting network was introduced in the measurement path. This is one of the best readings I have ever measured for a CD player. An analysis of the noise content as a function of frequency distribution is shown in Figs. 5A and 5B.

Square-wave reproduction of a 1-kHz, digitally generated square-wave signal was typical of that produced by CD players using multi-pole analog output filters (Fig. 6), as was the reproduction of the unit pulse (Fig. 7). With a 200-Hz signal reproduced from the left channel and a 2-kHz signal coming from the right channel, there was little evidence of phase shift of the higher frequency with respect to the lower one. Perfect phase relationship would be indicated by both sine waves in Fig. 8 crossing the zero axis in a positive-going direction at the same time—a condition that occurs near the right side of this 'scope photo.

Although the Hitachi DA-600 was able to track my special "error-laden" test disc to dropout lengths that exceed the minimum requirement called for in the CD standard (400 microns), it was not able to play through the widest portion (900 microns) of the test disc's opaque wedge, though it did

TO MAKE CASSETTE DECKS SOUND MORE LIKE OPEN REEL, YOU HAVE TO KNOW HOW TO BUILD OPEN REEL DECKS.

An audio cassette should be really no more than two miniature open reels in a case. It follows, therefore, that extracting "open reel-like" performance from cassettes will involve miniaturized open reel technology.

Denon has been producing open reel tape and tape recorders for over 25 years. Not simply 1/4" machines, but 24-track 2" studio machines. This open reel technology helped Denon become one of Japan's largest recording companies and a prime supplier of equipment to Japanese recording studios and radio stations.

It also led to the Non-slip Reel Drive Motor and Closed-loop

Dual Capstar technologies found on Denon's DR-M33 and the DF-M44 Three-head Cassette Decks. Similarly, the outstanding audio performance of these decks can be attributed to Denon's electronics experience building the world's finest hi-fi components.

The net result is the most advanced in the series of cassette decks considered by serious recordists to be "the most musical cassette decks available at any price." Proof that no matter how much anyone tells you or charges you, there simply is no substitute for experience.



DENON

D E S I G N I N T E G R I T Y

Denon America, Inc., 27 Law Drive, Fairfield, N.J. 07006 (201) 575-7810

Enter No. 17 on Reader Service Card

The Hitachi DA-600 CD player and its less costly cousin, the DA-550, are up-to-date units that look as good as they sound.

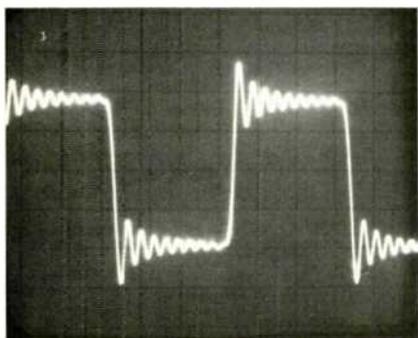


Fig. 6—Reproduction of 1-kHz square wave.

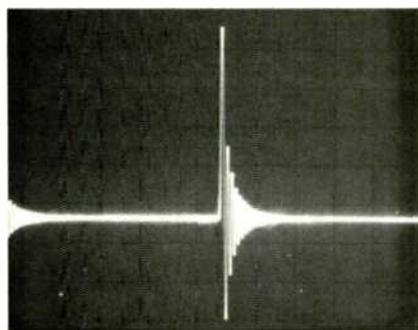


Fig. 7—Single-pulse test.

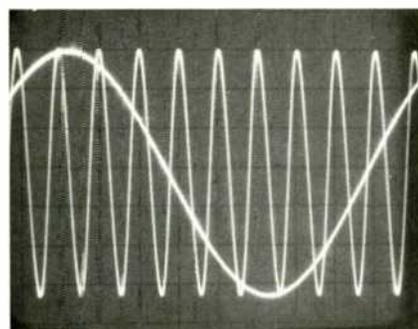


Fig. 8—Phase error check using tones of 200 Hz (left channel) and 2 kHz (right channel).

get past the 800-micron point. No trouble was encountered getting through the simulated dust spots (black dots on the test disc's surface), the largest of which is 800 microns in diameter. Nor did the simulated fingerprint present any problems for the DA-600's laser-optical pickup or servo-tracking system. Resistance to shock and mechanical vibration was better than average. In general, second- and third-generation CD players have been better in this respect than the first players, and the Hitachi DA-600 is no exception.

Use and Listening Tests

I'm getting to the point where I can usually distinguish between CD players that employ steep analog filters and those that use digital filtering (i.e., oversampling of one form or another plus gentle-sloping analog filters). The Hitachi DA-600 belongs to the former category; as such, it offers sound quality not unlike that delivered by players from Sony, Denon, Sanyo, Technics, Onkyo, and Pioneer. As I have stated on previous occasions, I cannot say with finality that CD players using multi-pole analog filters sound inferior or superior to players employing the alternate D/A configuration. I *can* say that I hear a difference between these alternate approaches. But more significant is the program source material. Its musical quality determines—to a far greater degree—how natural the reproduced sound seems, and even how appropriate the stereo separation and apparent depth of imaging seem.

I listened long and hard to the Hitachi DA-600, and, given no other frame of reference than my own memory for music performed live, I could not fault its ability to deliver lifelike sound from well-recorded CDs. Circuit-wise, I suspect that the only thing that distinguishes this machine from Hitachi's less-expensive DA-550 is the headphone output and level-control feature and the availability of the infrared remote-control unit. So, if these features have little importance to you, you may want to consider the lower-cost DA-550 and save yourself an additional \$100 or more. In either case, you'll be getting an up-to-date CD player that looks every bit as good as it sounds.

Leonard Feldman



The five keypads of the DA-600 perform dual functions, simplifying the player's appearance and enhancing its versatility.

To Find Out Where Audio Is Going, You Should Know Where We've Been.



Over the last ten years, Onkyo has been responsible for many audio innovations that have since become industry standards.

Tuner technology, for example. Onkyo pioneered affordable Quartz digitally synthesized tuning in 1975, and followed it two years later with Quartz & Servo locked tuning. Last year, we developed our Automatic Precision Reception System, an on board microprocessor that automatically controls all critical tuner functions, and introduced the first receiver, our Integra TX-85, with dbx¹ and

Dynamic Bass Expander.

In cassette decks, Onkyo technology has always been at the forefront. We introduced the first cassette decks with bias adjustments (Accubas) to insure perfect recording with any tape formulation. Subsequently, we were first in the industry with high speed dubbing decks, real time counters, cassette receivers, and a deck with all noise reduction systems—Dolby B-C, HX Pro^{*}, dbx¹.

Amplification has, in recent years, become another Onkyo hallmark. Our Super Servo, Linear Switching

and Delta Power Supply circuitries created the first amplifiers with wide dynamic range and low impedance drive capability. Soon to be introduced in 1985 is our new *Real Phase Amplifier Technology*, which utilizes *main and secondary power transformers to facilitate distortion-free handling of any speaker impedance load, even down to 2 ohms.*

Onkyo is proud to be celebrating ten years of sound achievements. Experience superb Onkyo performance for yourself by visiting your Onkyo dealer today.

Artistry in Sound

ONKYO

200 Williams Drive, Ramsey, NJ 07446 (201) 825-7950

^{*}Dolby is a registered trademark of Dolby Laboratories, Inc.
¹dbx is a registered trademark of dbx Inc.

Enter No. 31 on Reader Service Card

CELESTION SL-600 SPEAKER

Company Address: P.O. Box 521,
Holliston, Mass. 01746.
For literature, circle No. 94

Finding the proper perspective from which to evaluate the Celestion SL-600 loudspeaker makes this an exceptionally difficult review to write. On one hand, this is an excellent loudspeaker in many ways. On the other hand, I cannot totally decouple my review from the issue of value for money. The Celestion SL-600 is a small (15 x 8 x 10 inches) two-way system selling for \$1,380 a pair and requiring, almost absolutely, a heavy, rigid stand of the proper height. Celestion sells stands that match the SL-600 for an additional \$350 per pair, which adds up to \$1,730 for the system, while for \$120 per pair, one can obtain from Celestion wood stands that are decidedly less rigid and heavy. I have reservations about how well the \$350 stands match the speakers, as I'd prefer a stand whose speaker mounting plate precisely conformed to the speaker's size (this stand's edges protrude beyond the speaker) and whose height could be adjusted. However, Celestion intends to provide new stands, with properly sized mounting plates and, possibly, a lower price. And they feel that the stands' 18-inch height is precisely optimized for the speaker's vertical polar response.

In addition, I cannot in good conscience omit mentioning some of the other fine small monitors which achieve excellence at only a third the price of the Celestion. These include two that are directly competitive in terms of what the SL-600 does best, the SPICA TC-50 (\$450 per pair) and the Dayton Wright LCM-1 (\$499 per pair). Further, I should not ignore the fact that some of the best three-way systems I know of sell for less than, or close to, the final cost of the SL-600 including stands. Among these are the Thiel 03A and CS3, the Vandersteen 2C, the Phase Diametrics Fuselier 3.3, and the Magnepan MG-III.



I also can't ignore several real-world limitations inherent in any small monitor speaker. The potential advantage of a design like the SL-600's doesn't lie in its small size. If you select a small monitor, you're paying for coherence, imaging, a focused sound stage and uncolored sound from about 80 to 120 Hz. It will perform at its best only if put on a stand, placed at least 18 inches from a rear wall and 24 inches from a side wall, and so that no major pieces of furniture are between it and the listening position. I do not, therefore, believe a small monitor of this type saves space. A much larger three-way system will fit into any room where you can properly place this speaker.

A small monitor also cannot generate the bass power of a large speaker, and this is audible in the lower mid-range as well as the bass. The 1-meter, on-axis, measured bass response doesn't adequately indicate the true

bass power delivered to the ear. Design after design has shown that it takes a big woofer in a much larger cabinet to do this, regardless of woofer excursion, etc. This means that a small monitor always sounds slightly unbalanced. The much-praised LS-3/5A, for example, has a boost at about 120 Hz to make up for its lack of deep bass. It relies on illusion rather than accuracy.

In contrast, small monitors with flat frequency responses tend to sound bright and constricted. The Proac Tablette is a good example of a very small monitor speaker without enough bass power to be musical unless you add a subwoofer. The Tablette is "high fi," but I find it unacceptable as a stand-alone unit in terms of musical balance compared to any speaker with even adequate mid-bass. The old Spendor mini-monitor had better bass than the Tablette, but it made a fascinating contrast with the Rogers LS-3/5A. The flat

"Sherwood products offer excellent performance at very reasonable prices."

Leonard Feldman, *Audio Magazine*



The occasion of Mr. Feldman's comment was his review of our S2680-CP top-of-the-line receiver. His statement was sparked by the fact that, while quite affordable, the S2680-CP, like all Sherwood receivers, is designed and built with the care, precision and innovation which have become Sherwood trademarks.

A tradition of affordable quality. More than three decades ago Sherwood was founded on this philosophy: Through innovation, make quality audio equipment more affordable. That philosophy has been nurtured throughout Sherwood's history and is the foundation of our newest line of receivers.

We never cut corners on sound. All five Sherwood receivers deliver true high-fidelity performance. Even our budget-priced S2610-CP sounds better than many separate components. And the entire group is laced with features that can make significant differences in your listening enjoyment. Ultra-low-bass EQ, multi-deck dubbing, auto-scan digital tuning and discrete phono preamp circuitry are standard on several

Sherwood models, yet missing from many other brands, regardless of price.

Certified Performance. Sherwood is the only manufacturer to test and certify the performance of each individual receiver. On the outside of every carton you will find a certificate showing the measurement details of the power amp, phono preamp and FM tuner sections of each receiver. These are not just the rated specs; these are the actual measured performance data of the individual unit, *so you know exactly what you're buying.*

Find out what the experts say. Get the whole story on why Sherwood receivers—in Mr. Feldman's words—"...offer excellent performance at very reasonable prices."

To get your own copy of his review of the S2680-CP and to find out just how much quality and innovation you can afford, visit your nearest Sherwood audio specialist today. To find him, call (800) 841-1412 during west coast business hours.



Sherwood
Quality and Innovation You Can Afford.

13845 Artesia Blvd., Cerritos, CA 90701 In Canada: The Pringle Group, Don Mills, Ontario

Enter No. 41 on Reader Service Card

Something special about its timbre may suit your taste in a way no comparably priced speaker can, especially on voice and small musical groups.

bass in the Sendor simply didn't have the impact to compete with the bass hump in the LS-3/5A. This may help explain why Sendor now licenses and produces the less "accurate" (or flat) LS-3/5A.

The SL-600 seems to use a variation of the LS-3/5A technique. It appears to have a rising bass characteristic, rather than a peak, down to the point where its bass response falls off. This provides a relatively flat apparent mid-bass and much better upper bass than most small monitors, and does so up to moderately loud listening levels, provided the SL-600 is driven by a "stiff," high-quality power amplifier. The SL-600s really should not be used with ordinary receivers or integrated amplifiers. Ideally, they need an amplifier on the order of the Krell or Threshold or, at least, the Belles Research, Hafler DH-220 or PS Audio IIC+. Even then, the SL-600 won't display the bass power, naturalness or the smooth bass-low midrange transitions of the best three-way systems in this same price bracket. You give up some important musical information to buy this speaker.

And yet, I have to say the SL-600s are worth considering, even with their high price and sonic compromises. Small monitors do offer some compensating advantages for what they give up. They provide a fairly close approximation of an apparent point source, and this can mean exceptional imaging and sound-stage stability. The SL-600s largely meet this test. They don't furnish the depth of some competing, high-priced, full-range speakers, but the sound stage is wide and generally well proportioned. The imaging is stable and has a good spread of instruments, rather than "dual mono." You can listen from a relatively wide range of listening positions, and the net effect is that the SL-600s provide a bigger and more natural sound stage than many much larger speakers which lack superior driver and phase alignment.

I also have to say that there is something special about the timbre of this speaker that may suit your taste in a way no other comparably priced speaker can. The SL-600s are as musical a speaker in reproducing male voice above the bass range, and female voice below upper soprano, as I have ever had the opportunity to re-

view. Guitar and flute, small wind and string groups, small jazz combos (those which do not rely heavily on a bass line for impact), and other music whose size and sound seems natural to a home-sized room can also take on a musicality that competes directly with the best loudspeakers in the price range.

I'm not entirely happy with this musicality. I've read through the technical literature on this speaker in some depth, and it is well written and generally convincing. Nevertheless, I seem to hear irregularities and a lack of data in the transition area from lower midrange to midrange that I don't hear in my Quad ESL 63s or in similarly priced competition like the Thiels or Vandersteens. I cannot object to the sound on most music, but I have the feeling that the SL-600s' magic is at least partly the result of euphonic coloration, rather than flat response.

The SL-600s do handle fast musical changes with exceptional naturalness, and without the apparent treble rise which characterizes many small speakers that seem fast and image well. Their upper midrange and lower highs seem closer to those of electrostatics than to those of dome or cone units. They are definitely the strongest aspect of the SL-600 and may ultimately justify its cost. They're easily the equal of the upper midrange and lower highs of loudspeakers costing twice as much.

Equally important, the SL-600s do not "etch" or emphasize the upper octaves, except perhaps the top octave. I prefer the more recessed top-octave response of my Quad ESL 63s, but this is a matter of taste. There's no question that the SL-600s add a touch of top-octave air and extension to a great deal of music—but the excitement, air, and transient detail come about without adding hardness or bringing you too close to the performance.

As for power response, bigger speakers produce bigger sound. Nevertheless, you can use high-power amplifiers and the SL-600s won't give up in distress. I threw the power of the Conrad-Johnson Premier Fives, the Futerman OTL-3s, and the Audio Research D160B at the SL-600s, and drove them to the maximum listening levels I consider natural. The bass was

a bit iffy, but the midrange and treble stayed fast and clean.

I did find the SL-600s to be speaker-cable and placement sensitive. You need a good, fast speaker cable, very tight connections (try the Monster Cable Xterminators instead of banana plugs), and careful attention to the rest of your system. I would recommend cables of the Powerline II, Livewire, Straightwire, Randall, and Discrete Technology caliber. Ordinary Monster Cables, or moderate quality speaker cables, don't seem to have the speed and upper-octave purity to get the best out of them.

As for placement, I ended up using a stand a friend had built, which had a sand-filled column, adjustable height, and heavy, adjustable baseplate. I found that height and speaker angle make a difference. The SL-600s seem to have a proper height for a proper listening position at which they lock in and really perform their best. They also merit "tweaking" in terms of altering angle of the speaker's face towards the listener, but this is not compulsory. You may well find that keeping soft furniture as far away from the sides of the SL-600s as possible, and minimizing coffee tables and other clutter between the speaker and the listener, will give you outstanding results. The SL-600s will provide a good, stable sound stage without this kind of purism, but if you want the best from a \$1,400+ pair of loudspeakers, you're going to have to pay close attention to your listening room.

In short, the SL-600s are a fairly esoteric choice. At \$500 a pair, I could quickly recommend them, but at \$1,380 plus the cost of the stands, everything depends on whether you feel they have that special magic that suits your taste. If you favor voice or small musical groups, you may well feel the SL-600s are just what you want; oddly enough, you may also feel this way if you like rock. The SL-600s' bass may be slightly restricted, but this actually benefits that large amount of rock material where poor monitoring and recording drown everything with one-note bass. When I say this speaker merits careful listening, I am not reciting a cliché. At the price, its value depends on your ears, and not mine.

Anthony H. Cordesman

**Audio Research Announces
The Introduction of
Two New State-of-the-Art
Vacuum Tube Audio Products**

M100

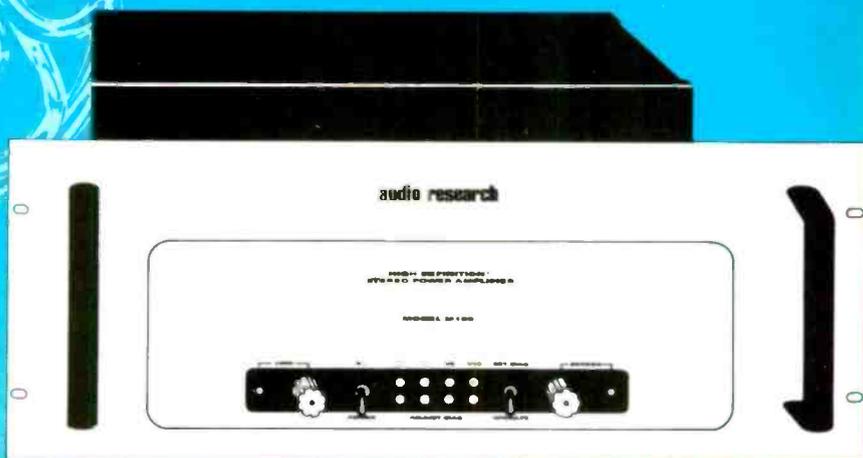
A Monaural Amplifier For The Music Lover and Perfectionist.

Rated 100 watts, 4, 8, 16 ohms, but with the most energy storage/watt of any Audio Research amplifier.

Many deluxe features including automatic servo DC balance, front panel bias and indicators, with direct-coupled driver-bias circuitry electronically regulated.

Large driver headroom.

See your authorized Audio Research dealer.



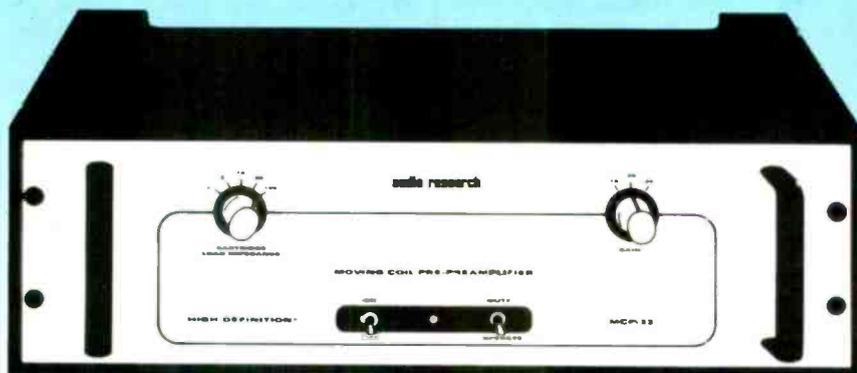
MCP-33

A Pre-Preamplifier For The Music Lover and Perfectionist.

New Patent pending circuitry provides low level amplification with near "0" microphonics, impeccable musicality and accuracy, and adequately low noise for MC cartridge with output between .2 mV and 2 mV at 5 cm/sec, and requiring from 1 ohm to 100 ohms loading.

Electronically regulated for power line immunity between 90 and 135 volts.

See your authorized Audio Research dealer.



**audio research
corporation**

6801 SHINGLE CREEK PARKWAY
MINNEAPOLIS, MINNESOTA 55430
AREA CODE 612 / 566-7570
TELEX: 290-383

MICHAEL TEARSON
JON & SALLY TIVEN

THE KING, FOR THE RECORD

Illustration: Rick Tulka



Elvis—A Golden Celebration: Elvis Presley
RCA CPM6-5172, six-record set,
\$49.98.

Sound: Variable Performance: A+

To mark Elvis' 50th birthday, RCA has assembled this boxed set of his performances. Given their track record, and the shoddy way in which RCA has treated Elvis over the years, no one had a right to expect the treasure trove they've released. It contains no fewer than 59 previously unreleased performances. What they are and their dates are the big story.

Side one is made up of outtakes from Elvis' monumental Sun Records sessions in 1954 and 1955. Sides two and three include all of his performances on six nationally televised Dorsey Brothers Stage Shows from early '56.

Side four contains the newly crowned king's TV appearances in the spring of '56 on the Milton Berle and Steve Allen shows.

Sides five through seven are recordings of live concerts at the 1956 Mississippi/Alabama Fair and Dairy Show in Elvis' home town, Tupelo, Mississippi. The voltage increases on sides eight and nine with his Ed Sullivan Show appearances from later '56 and early '57, just prior to his induction into the Army. Side 10 has five songs which

were home-recorded while he was stationed in Germany ('58 to '60). The most curious stuff of all appears on side 11 in the form of five demo recordings discovered in a shoebox in Graceland, the

Presley mansion in Memphis. The set closes on side 12 with a generous 26½ minutes of the jam sessions done as part of Elvis' 1968 comeback television special.

In short, this set features the real Elvis Presley: Young, hungry and happening, with the emphasis on live performance. There is a lot of song repetition, multiple performances of "Blue Suede Shoes," "Heartbreak Hotel," "Hound Dog," "Don't Be Cruel" and "Love Me Tender." However, in '56 to '57 these were the basis of the Presley explosion, the big hits. They would have to be played on TV for the exposure; it's what the fans wanted. Still, you can hear Presley grow up right before your ears and become the King.

Just consider the Dorsey Brothers performances, his first six shots at national exposure. On the first show his voice is high and pinched—from nerves, no doubt. But he is electric nonetheless, igniting squeals from the audience. The next week he is all there, in control and a star. By the time of the third week's show, Elvis is a sensation and the guys in the band are obviously fans. They join in on a killer-hot jam on the TV debut of "Heartbreak Hotel," featuring a blistering Tommy Dorsey trombone solo. Elvis just gets better as he gets more sure of himself. History before your ears.

When next he appears, on the Milton Berle Show, he does the meanest, dirtiest "Hound Dog" ever to grace the small screen. Presley slows it down, way low down, at the end. (Now wouldn't a video collection of all these network appearances be a swell development?)

Sound quality varies wildly as the source varies. The live shows in Tupelo have very poor sound, very rough and scratchy. Considering that the very existence of these tapes is something of a minor miracle, any sound at all is a plus. You do get to hear the man bantering with people who know him well. The '50s TV sound is a very pleasant surprise, clearer and more present than I expected. The '60s TV sound is surprisingly poor, though the side it's on runs 26+ minutes, it is muddier than it should be. The tapes made in Germany are rough but charming, as leisure tapes might be; the Graceland tapes are similar in nature.

As an interesting adjunct to the boxed set, RCA has some other Presley reissues: His first four albums—*Elvis Presley*, *Elvis*, *Elvis' Greatest Hits*, and *50,000,000 Elvis Fans Can't Be Wrong*—with their original, glorious mono sound digitally rerecorded from the original tapes and pressed on virgin vinyl. You don't need me to tell you how great those albums are.

Then there is *Rockers* (AFM1-5182) with 12 finger-popping, foot-stomping, rock 'n' roll gems from 1956 to 1957, all in glorious mono. My only complaint is that they must have thought "Heart-break Hotel" was too slow to include. They were wrong. It would have fit perfectly. Otherwise, it is an Elvis Presley album about which one can fairly say that if you are only going to own one Elvis Presley album it might as well be *Rockers*. And that says a whole lot.

Really, it is long past time for RCA to give royal treatment to Elvis Presley with proper reissues. All credit is due to Gregg Geller, who supervised the whole project and did it right.

Michael Tearson

Big Bam Boom: Hall and Oates
RCA AJLI 5336, \$9.98.

Sound: A- Performance: B+

This record is impeccably recorded, well sung, and the songs are (on the whole) pretty good. They got Arthur ("New Edition") Baker in to add some of his dance savvy to the tracks, but allegedly he didn't last long in the studio with these two. The first cut is a clever revisit of a Motown-styled tune ("It's the Same Old Song"). Some of the stuff is pretty infectious, but there should be more rock, guts and soul here. But it's still pretty good for a pop record.

One would guess from the aural evidence in these grooves that the band itself is playing more of a subservient role in the studio; it also sounds like none of the musicians were in the studio at the same time. As Hall and Oates become more successful, their craft becomes less and less dependent upon the contributions of others. Personally, we miss the talents of the band (Mickey Currey on drums, T-Bone Wolk on bass, G. E. Smith on lead guitar, and Charlie DeChant on sax); there's not one tune that really

rocks. *Big Bam Boom* is not particularly different from their last record, except that everything is absolutely metronomic. As a dance/pop album it may have a bit of an edge on its predecessors, but the rock element is gone.

Jon & Sally Tiven

Valotte: Julian Lennon
Atlantic 80184, \$8.98.

Sound: B Performance: B

Julian Lennon is the son of John Lennon and Cynthia Lennon, an inescapable fact which inevitably colors perception of his debut album, *Valotte*. Comparisons with father John are simply unavoidable. Even the cover photo maximizes familial resemblance. The record inside, tastefully produced by the very

classy Phil Ramone, is calculated to sound as much like a John Lennon record as possible. Indeed, the resemblances are eerie.

The pleasant surprise is that the project has turned out well. Julian's songs are often quite fine, most notably "Too Late for Goodbye." He doesn't always have great depth in his ideas, but the lad is still very young, and time has a way of deepening people. *Valotte* is a better start than anyone would have had reason to expect.

Michael Tearson

Arena: Duran Duran
Capitol SWAV-12374, \$9.93.

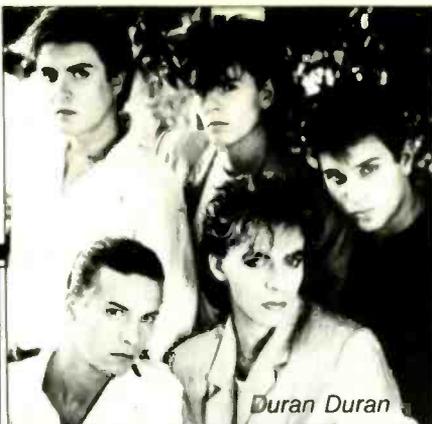
Sound: C+ Performance: C

Arena is a valentine from Duran Duran to their fans. It is a live album which includes their newest single, "The Wild Boys," that was co-pro-



John Oates and Daryl Hall

Clearly, the whole purpose of *Arena* is to mark time while Duran Duran tries to avoid becoming last year's sensation.



duced by Nile Rodgers with the band. Clearly, the whole purpose of *Arena* is to mark time while Duran Duran tries to avoid becoming last year's sensation. Many of my friends revile Duran Duran as bubble gum, yet I've always enjoyed their sunny music. This release won't change any minds in either direction.

Michael Tearson

Go Insane: Lindsey Buckingham
Elektra 60363-1, \$8.98.

Sound: B Performance: B

As a member of Fleetwood Mac, Buckingham is responsible for the lion's share of songwriting, most of the production, a great deal of the singing, and much of the instrumentation. In other words, you'd be hard pressed to call him anything but the main creative force in the group, so you'd expect his solo albums to be similarly commercial fodder. Instead, he's delivered yet another quirky collection of tunes that are incredibly sweet and quite melodic, yet

defy convention. Although you've got to admire Lindsey for taking risks like this time and again, his melodic strengths are much more listenable when balanced against the creative rhythm section of Mick Fleetwood and John McVie (check out "Go Your Own Way" for a perfect example). The album is as top-heavy as it is bottom-light—all the instruments were played by Buckingham and the drums are all electronically generated.

Lindsey Buckingham claims to take most of his cues from Brian Wilson, but the difference is that Wilson spent most of his formative years as The Beach Boys' bass player. This allowed him to analyze how the bass and drums worked together to bring that extra element of accessibility into a song. This

album is laden with guitar overdubs and vocal layering, not to mention the sounds of the digital age, but the most basic element—the rhythm section—is neglected. This was also true on most of his first solo album, save for one outstanding cut, "Trouble" (on which Fleetwood played drums, if memory serves us right). This album is spacier, with the only obviously current influence being The Talking Heads, and the playing is beyond reproach, guitar-wise. But the songs all sound like they could have grown enormously within the context of a group arrangement, and Lindsey could have left a few more open spaces if there were a great drum and bass carrying the song.

But for some people, this is what the solo album is all about. They don't have to put up with an ornery rhythm section when they strike out on their own, and so they think they can do it all themselves. Lindsey, baby, they don't call it Fleetwood Mac for nothing.

Jon & Sally Tiven



INTRODUCING THE HOME DECK FOR THE ROAD. IT EVEN GOES INTO REVERSE AUTOMATICALLY.

Ever notice that tapes you've recorded at home don't sound as good when you play them in your car? That's because a car's acoustics are vastly different from a home's. That same tape that sounded great at home may now sound muddy, hollow, lifeless.

CAR EQ

Press this button to automatically compensate for the acoustic variance in most cars.

Happily, there's a quick, simple, effective remedy. The car EQ button on our new K-600 cassette deck. Push it in and record. The typical frequency response characteristics of your car are automatically compensated for.

So the bass and midrange sound full and natural. Without boominess. And the highs come through loud and clear.

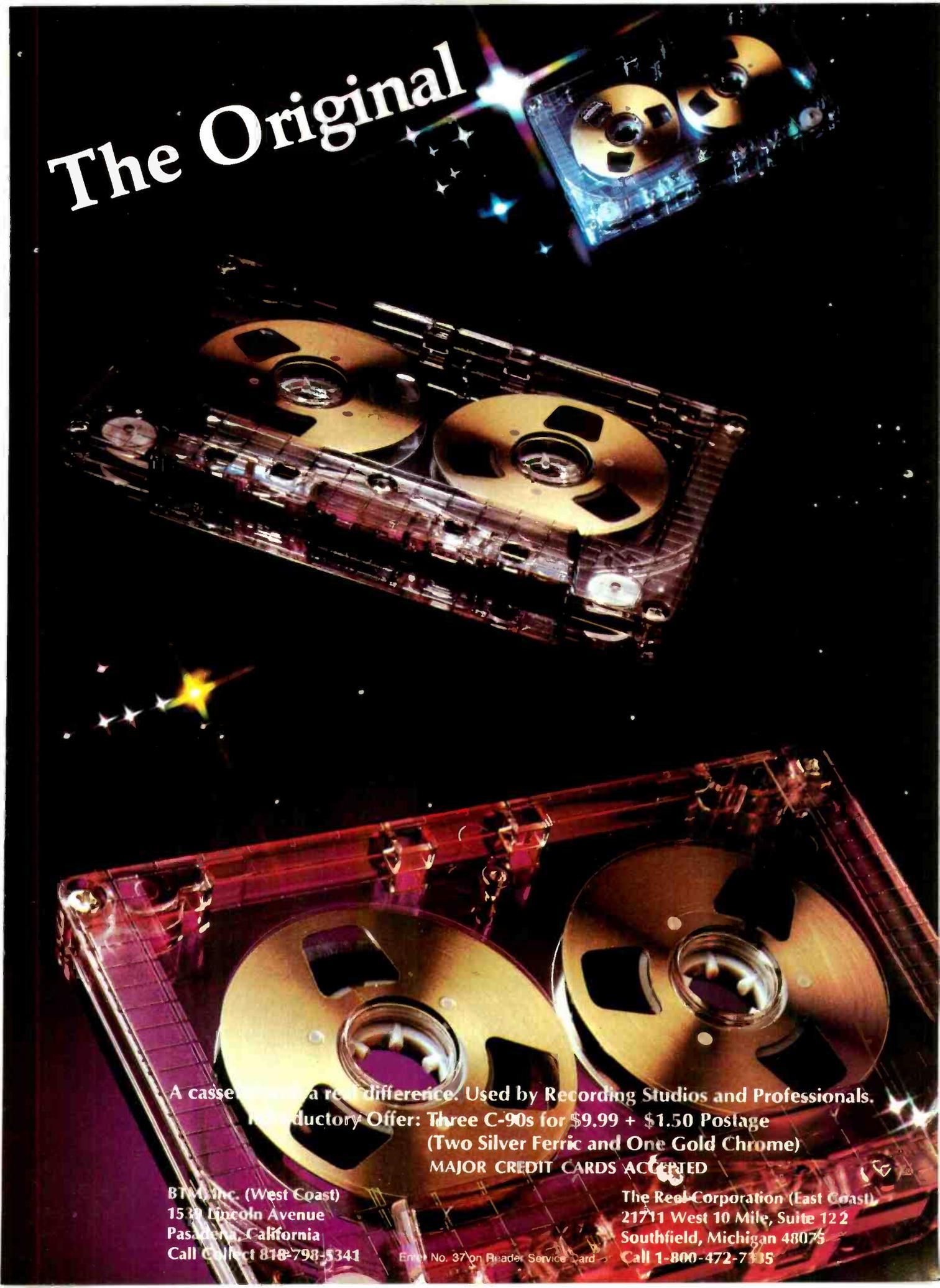
It's also uniquely easy to make recordings on the K-600. Use its Auto Fade Out and Auto Reverse functions, and you won't have to worry about ending Side One in the middle of a song. You'll get smooth, natural fade-outs (and fade-ins) in both directions. Automatically.

So test drive the K-600 at your Yamaha dealer. It's one home cassette deck that can add to your driving pleasure.



Yamaha Electronics Corporation, USA, P.O. Box 6660, Buena Park, CA 90622

The Original



A cassette with a real difference. Used by Recording Studios and Professionals.

Introductory Offer: Three C-90s for \$9.99 + \$1.50 Postage

(Two Silver Ferric and One Gold Chrome)

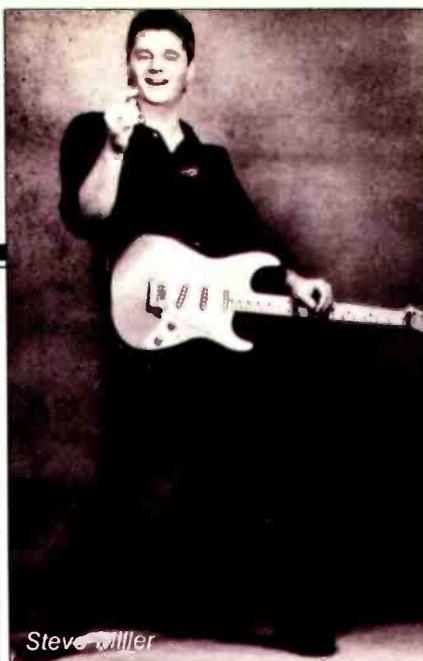
MAJOR CREDIT CARDS ACCEPTED

BTM, Inc. (West Coast)
1520 Lincoln Avenue
Pasadena, California
Call Collect 818-798-5341

The Real Corporation (East Coast)
21711 West 10 Mile, Suite 122
Southfield, Michigan 48075
Call 1-800-472-7335

Enter No. 37 on Reader Service Card

Steve Miller's *Italian X Rays* has absolutely superb digital recording of some of the silliest, most vapid songs ever.



Steve Miller

Italian X Rays: Steve Miller Band
Capitol SJ-12399, \$9.98.

Sound: B+ Performance: D

Italian X Rays is filled with some of the silliest, dumbest, most vapid songs heard in a long time. However, it has absolutely superb digital recording of some of the silliest, dumbest, most vapid songs ever. It's proof positive that all the technology in the world can't guarantee you inspiration.

Michael Tearson

Santa Ana Winds: Steve Goodman
Red Pajamas RPJ 003, \$8.98. (Available from Red Pajamas Records, P.O. Box 233, Seal Beach, Cal. 90740.)

Sound: B Performance: A+

Last month, when I wrote that the late Steve Goodman had another record in the can waiting to join *Artistic Hair* and *Affordable Art*, little did I know how close to release *Santa Ana Winds*

actually was. Now that it is out, I can report that for his last record Steve Goodman made his best one. His songs are eloquent, by turns sad and funny and wise, sometimes all at the same time. I have no doubt that his tribute to the late Carl Martin of Martin, Bogan and Armstrong, "You Better Get It While You Can," placed as the album finale, sums up his own philosophy as well as it does Martin's. For Steve

Goodman was always a good-time performer who was tireless when it came to pleasing an audience.

From the wry ("Telephone Answering Tape" and "Hot Tub Refugee") to the tender ("The One That Got Away" and the lovely "I Just Keep Falling in Love"), Steve had a wonderful way with a song that could take a mundane cliché and turn it inside out into something fresh and new. Probably the best example of that touch on *Santa Ana Winds* is his arrangement of "The Big Rock Candy Mountain," the only song here he did not have a hand in writing. The verses are terse and tart, with guitar and harmonica switching to a deliriously dreamy, jazzy feel for the choruses behind Jim Rothermal's sweet sax part. An old chestnut lives anew.

So, too, does Steve Goodman with *Santa Ana Winds*. I miss Steve a lot. The album goes a long way toward filling the gap, but of course it can't. The best thing I can do is to let you know how fine it is. Michael Tearson

THE FINE SCIENCE OF COMPONENT CABINETRY

HIGH PERFORMANCE: Audio science and the craft of fine cabinetry are married in the CWD modular component cabinet system. Designed to the sound principles of audio and video performance, all CWD cabinets are hand-crafted from select hardwoods and lovingly hand-finished.

A SYSTEM THAT GROWS WITH YOU: Start small; add as you need. The *completely* modular design allows you total flexibility. Add on, arrange and rearrange for virtually any configuration. Easy to tailor, our cabinets fit both your lifestyle and your audio/video components, even big screen. Add a wine rack, drawers, stunning glass doors... they're all part of the fine science of the CWD system.

REMARKABLE QUALITY: You won't find a better cabinet for the money. From the precision hardware to the natural oiled finish, every CWD cabinet is a fine piece of furniture you'll cherish for years. But see for yourself.

CALL TOLL FREE 1-800-323-2159 for the dealer nearest you, (in Illinois call 312-563-1745).



All CWD cabinets and accessories available in contemporary Natural Oak (shown here), handsome Dark Oak (shown below), and classic Natural American Walnut (not shown).

High performance modular furniture that keeps pace with your electronic system



CWD®

CUSTOM WOODWORK & DESIGN INC.
BEDFORD PARK, ILLINOIS 60638

Introducing the New Ohm Walsh® 3

The Newest Addition to a Family of Speakers Devoted to Giving You the Best Stereo Imaging for Your Money

Walsh® Stereo Imaging

Walsh speakers create an exceptionally effective stereo image because of the unique patented design. It's an inverted cone with sound radiating from it in a single coherent wavefront designed to cover the entire listening area. This means there are no hot spots from the narrow dispersion common to most speakers, and you get the full sound of both speakers as you move around the room. *The New York Times* described the result as "A spacious acoustic ambience linked with precise stereo imaging creating a 'reach-out-and-touch-it' realism that this listener has experienced rarely and only with the very best speakers. What's more, the effect is maintained over a broad listening area, so you are not confined to a particular listening position for best results." And since the wavefront is coherent it is devoid of phase distortion so the sound is crisp and clean. This along with an extremely even frequency response is responsible for the sound that Norman Eisenburg said makes "you sense you are listening to a performance rather than to one being reproduced by machinery; this impression which one may get from a few other top quality speakers does not lessen with prolonged listening. The full musical spectrum is easily spanned with authority and fine tonal balance. Detailing of inner instrumental choirs is

excellent and so too are the fuller splashes of massed ensemble effects. Titanic dynamic impact comes across when required, yet there is no tonal dropout of the subtler nuances of chamber music."

Walsh Value

If you compare speakers capable of equal sound quality with Ohm Walsh speakers you'll find that you have to pay much more for sound as good, and that equal quality in stereo imaging is hard to get at any price. One Walsh owner concluded that his Walsh speakers are "head

and shoulders above the other higher priced systems I compared them to" and *Audio* magazine judged them a "best buy."

Walsh 3 Control

The Walsh 3 puts you in control. You can balance frequency response with both a high frequency control and our exclusive Sub Bass Activator control. And with our perspective control you choose your position in the audience from the front row to the back of the house. Add all this control to dispersion designed for easy placement and you can match the sound to your room, your music and your tastes.

Walsh 3 Power

Another plus for the Walsh 3 is its power capability. It can handle 200 watts rms and can effortlessly give you lifelike volume levels. The power extends into deep bass, delivering not just sound but feeling.

Now that there are four Walsh models to choose from it's easy to find one with the features you want. Just get information on the whole family of Ohm Walsh speakers and details on buying directly from Ohm by calling us today, toll free.

(800) 221-6984

Ohm Acoustics Corp.

241 Taaffe Place, Brooklyn, NY 11205



We make loudspeakers correctly.



Specifications	Ohm Walsh 1	Ohm Walsh 2	Ohm Walsh 3	Ohm Walsh 4
Frequency Response	48Hz to 18kHz ± 4dB	45Hz to 16kHz ± 4dB	39Hz to 16Hz ± 4dB	32Hz to 17kHz ± 4dB
Weight	24 lbs.	29 lbs.	48 lbs.	63 lbs.
Sensitivity	87dB at 1 meter with a 2.83 volt input	87dB at 1 meter with a 2.83 volt input and all controls at maximum	87dB at 1 meter with a 2.83 volt input and all controls at maximum	87dB at 1 meter with a 2.83 volt input and all controls at maximum
Finish	Genuine walnut veneer	Genuine wood veneer, walnut and oak standard. Scandinavian rosewood and black or white lacquer on oak finishes available on special order.	Genuine wood veneer, walnut and oak standard. Scandinavian rosewood and black or white lacquer on oak finishes available on special order.	Genuine wood veneer, walnut and oak standard. Scandinavian rosewood and black or white lacquer on oak finishes available on special order.
Inputs	Press connectors accepting "banana plugs" or bare wire up to 12 gauge	Press connectors accepting "banana plugs" or bare wire up to 12 gauge	Press connectors accepting "banana plugs" or bare wire up to 12 gauge	Press connectors accepting "banana plugs" or bare wire up to 12 gauge
Controls	None	2 — low and high frequency each with 3 positions	3 — low, high and perspective each with 3 positions	3 — low, high and perspective each with 3 positions
Power requirement on Music	20 watts minimum 90 watts maximum	30 watts minimum 120 watts maximum	35 watts minimum 200 watts maximum	50 watts minimum 500 watts maximum
Impedance	8 ohms	4 ohms	8 ohms	8 ohms
Price per Pair	Under \$595, depending on finish	Under \$995, depending on finish	Under \$1395, depending on finish	Under \$1895, depending on finish

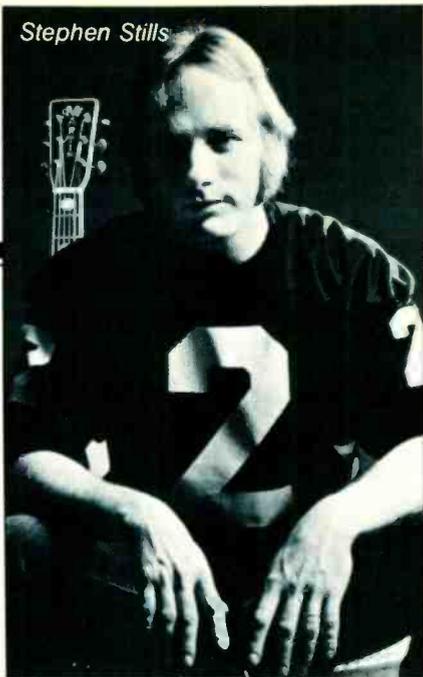
© 1984 The New York Times

© 1984 Ovation Magazine, reprinted by permission

© 1984 Audio Magazine

Enter No. 29 on Reader Service Card

Stephen Stills' album, *Right By You*, has lots of the Latin flavor that has been a trademark of his for some time.



Right By You: Stephen Stills
Atlantic 80177, \$8.98.
 Sound: B Performance: C+

Divided into an upbeat side and a romantic, softer side, *Right By You* is a more or less standard, slightly better than average Stephen Stills album. The up side has lots of the Latin flavor that has been a Stills trademark ever since Buffalo Springfield. Some parts have real fire, notably "50/50" with its big horn sound, terrific percussion sound and a lead guitar part by Jimmy Page, one of three he contributes to the album. The percussion vitality is due in no small part to digital mixing. Energy is way up all through the side.

The second side, the softer one, I don't find quite as involving as the first, but "Grey to Green" has an intriguing melody line and an interesting lyric line about how a lady friend's eyes change color as she changes moods. This side is mostly covers, with a rather ordinary "Can't Let Go," a light stab at old-mate

Neil Young's "Only Love Can Break Your Heart" and a straightforward country run at The Carter Family chestnut, "No Hiding Place." Throughout the album Stills gets vocal support from Graham Nash and keyboardist Mike Finnegan.

Somehow I doubt that *Right By You* will be a major hit. It is a nice piece of work that just doesn't feel at all indispensable. *Michael Tearson*

Cypress: Let's Active
I.R.S. SP-70648, \$6.98.
 Sound: C Performance: B-

Let's Active is a trio consisting of Mitch Easter, Faye Hunter, and Sara Romweber. Easter is also noted for his production of R.E.M.'s output to date. Let's Active actually fits into the same part of the ballpark as R.E.M., as they make rough-hewn, instinctive rock music out of songs which are simultaneously goofy and profound and have titles which are often only marginally related to the lyrics.

By "instinctive," I mean that the band doesn't seem to be interested in formula or emulation in their music. Instead, they appear to follow their own muse without a lot of thought about how they might fit into the marketplace. Clearly they are not about to put Culture Club or Prince out of work, but there is real charm to Let's Active. Adventurous ears should give a listen.

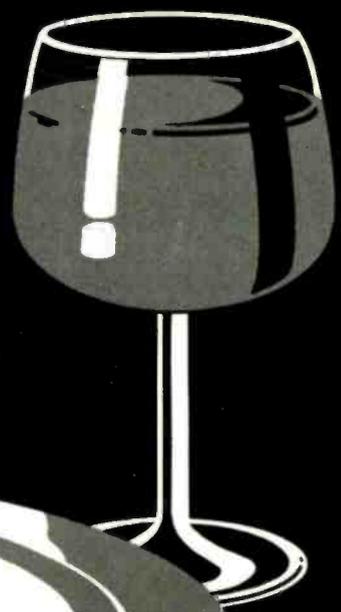
Michael Tearson

Cassette decks eat less and sound better with Discwasher® CareSet.™

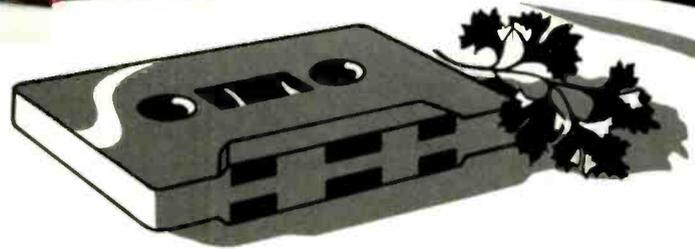


A dirty cassette deck hungers for attention. If you ignore it, it may make a meal of your favorite cassette.

Treat your home, car and personal cassette player to a Discwasher® Tape Deck CareSet.™ The Discwasher® C.P.R.™ Capstan-Pinch Roller Cleaner clears away contamination that can devour cassettes. And the Discwasher® Perfect Path™ Cassette Head Cleaner cleans up the sound of any cassette deck. Buy both together in our CareSet, wherever you buy tapes or stereo systems.



Discwasher Tape Deck CareSet

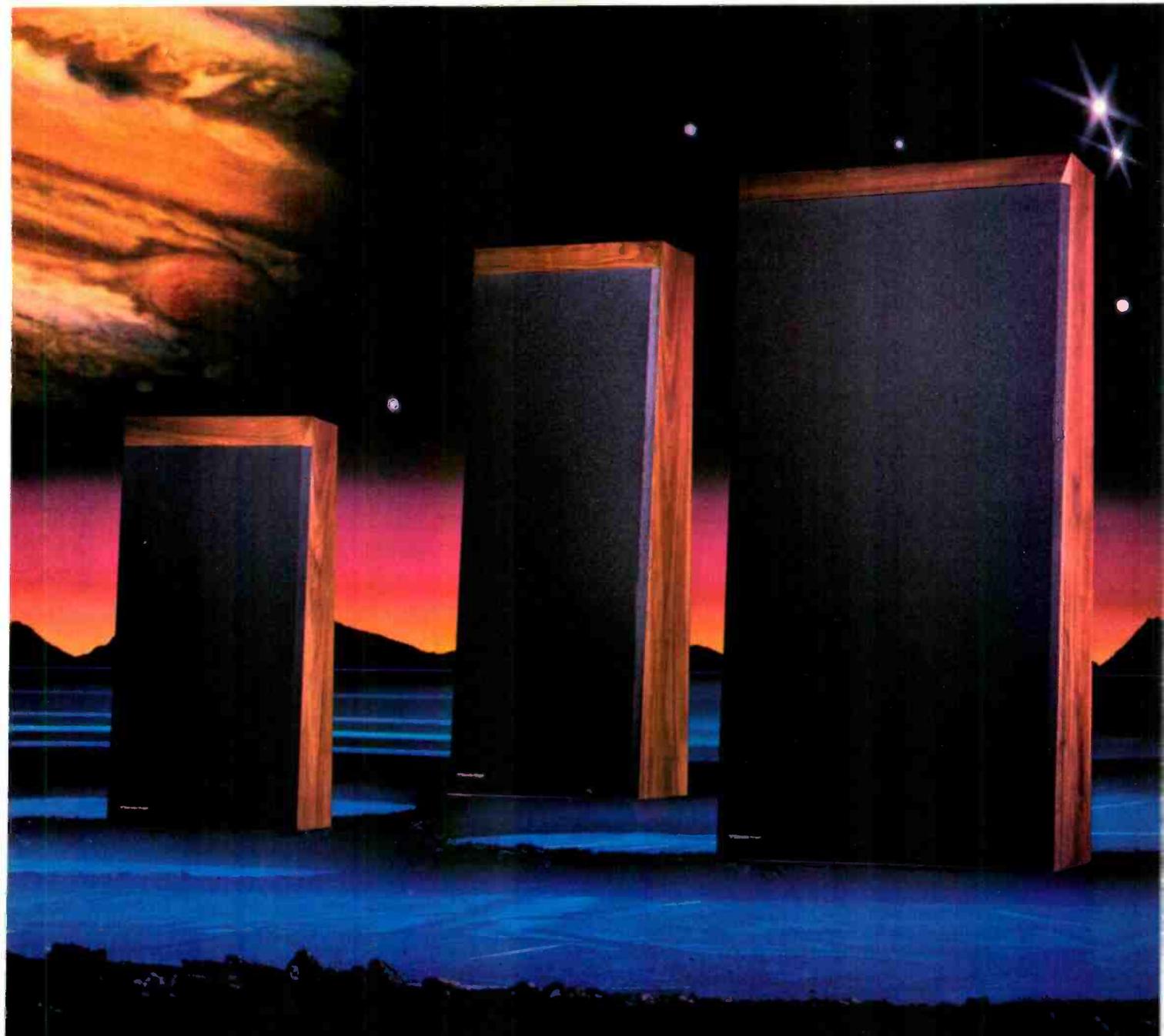


discwasher

a division of International Jensen Inc.

1407 North Providence Road, P.O. Box 6021, Columbia, Missouri 65205 USA

Enter No. 19 on Reader Service Card



THE STATE OF THE FUTURE.

FACT 1. Digital recordings allow previously compressed material to be reproduced with stunning realism and extended dynamic range.

FACT 2. The weakest link in the digital chain has been the loudspeakers—until now.

Announcing a true breakthrough in digital-ready loudspeakers from Cerwin-Vega. We call it the 2000 Series.

The Series is based on a new acoustic concept nurtured in our lab. We call it the vertical line array. This array places up to six* midrange drivers in a vertical line, with a high performance horn tweeter located in the precise "acoustic" center of the array. This results in symmetrically radiating sound waves which assure accurate stereo imaging and extremely wide dispersion.

Simply stated, everyone in the room can hear music at relatively equal sound levels—regardless of their distance from the speaker. Volume can be increased substantially without adding distortion or harsh acoustic glare. Each of our 2000 Series models utilize one of our legendary 10," 12" or 15" heavy-duty woofers in a genuine walnut monolithic styled enclosure, graceful enough to enhance the finest living space.

We feel that with our 2000 Series loudspeakers we have created a product that is so state-of-the-art that we prefer to call it state-of-the-future. So come hear the future today and take a part of the 21st century home with you.

* Model 2000-15

 **Cerwin-Vega!**

12250 Montague Street, Arleta, CA 91331
(818) 896-0777 Telex: 662250

Enter No. 15 on Reader Service Card

EDWARD TATNALL CANBY

OUT OF THE BACHS

Peter Schickele: Bestiary, performed by Calliope; Quartet for clarinet, violin, cello and piano, performed by the Chamber Music NorthWest. Vanguard VSD 71278, \$8.98.

I've been saying for years that Peter Schickele, under his loudly comic exterior, was a composer as pure as the driven snow. But the man has stayed in hiding behind the last of the Bachs (?), that preposterous creature who was dead long before he was born, a notable enough distinction to keep him alive through dozens of yearly Vanguard records. What P.D.Q. Bach has always needed was the music video-cassette for the visual horseplay which always goes with his music. Unfortunately, that new medium hasn't yet graduated from the high-money pop groups.

So, at last, P. Schickele, he of the roly-poly shape and large beard, is on his own! 'Bout time. The nicest thing about these two genuinely Schickelian works is that, minus P.D.Q., we find a new dignity and worth to the music, even though in one of them there is still the usual stage show. But you may easily ignore it (as described in the jacket notes) in favor of just listening, with the narrator's help in introducing various animals à la Ogden Nash and Camille Saint-Saëns in "Carnival of the Animals." Here, the words are less archly poetic, more casual, the music is, well, nicely modal and pseudo-medieval to suit the old instruments, superbly played and sung by the group called Calliope. The narrator, I can assure you, is the very ghost of P.D.Q. Bach himself, returned safely to his Maker. Perhaps at this point it should stay there.

The "Quartet" on side two is pure Schickele sound, no stage show, no story line. Set for a comfortably varied group of instruments (modern), it is gracefully written and again beautifully played, to complement Calliope on the first side. No great profundities here—only a series of episodes elaborated from a batch of loose ideas that had been hanging around for a good while looking for the right instruments. We move from a gentle neo-Brahms, minus weight, through lots and lots of casual counterpoint into a (gently) hysterical neoclassic jag, and end with a

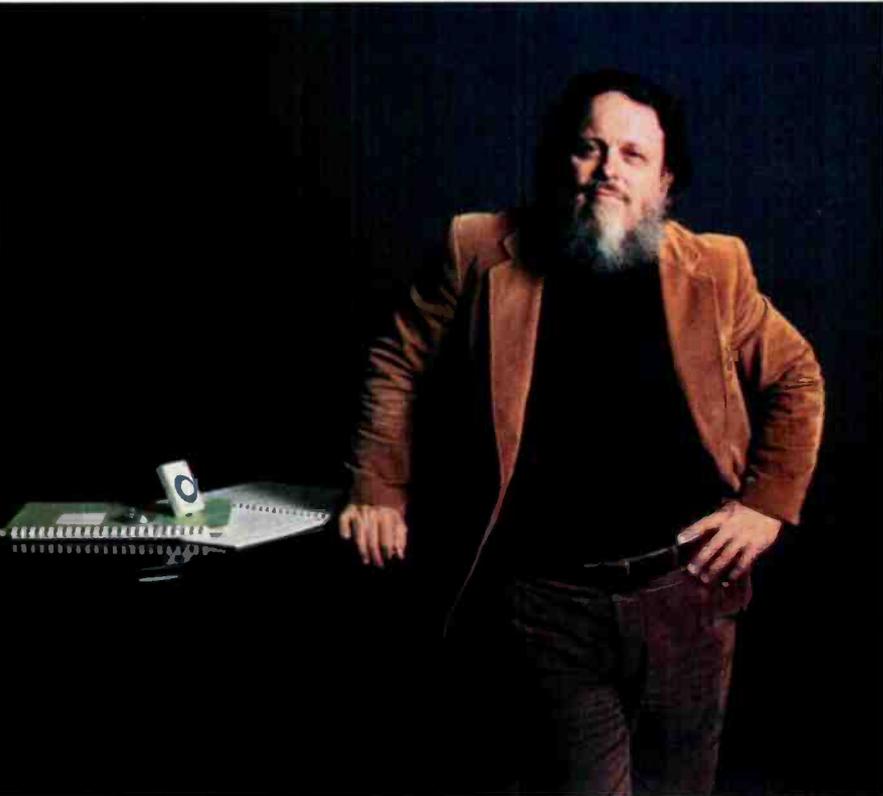


Photo: © 1984 Peter Schaaf, Courtesy of Vanguard Records

wild (but gentle) neo-Near Eastern peasant dance à la Bela Bartók. But Schickele is no Bartók. So this music will fill your living room gracefully and easily. Or even your car. All hail P.D.Q. Non-Bach.

Beethoven: Eroica Symphony, No. 3 in E Flat. The Cleveland Orchestra, Christoph von Dohnányi. **Telarc DG 10090**, digital, \$12.98.

The telltale yellow and the code letters DG around the label denotes Telarc's now-international stance, though the recording remains the familiar Soundstream digital out of Cleveland's Severance Hall. (The jacket is from Canada.) The LP price is, of course, way down but remains a dollar higher than Deutsche Grammophon's digital LPs in the U.S.A.—i.e., Telarc is still Telarc. I would not argue with all this; the sound on LP remains excellent, and there is, indeed, a new gentleness, says my ear, that could have to do with direct metal LP cutting. It's cleaner, loud or soft.

This, like other releases, is also available on CD. Perhaps significantly, a

young friend of mine bought the CD, then went out and got the LP for comparison. I will say no more! There are times, still, when the LP shines, which is merely a reflection of the still-new CD technology compared to almost 40 years of LP development.

Music also still counts! Again, I had heard disparagements of this first batch of Dohnányi recordings with the Cleveland Orchestra. Terrible, did I hear one person say?

Okay—I've tried it and have my ideas. I can easily disagree with a lot that this conductor does, recording at a time when he was about to become the orchestra's new permanent director. But the performance is a very long way towards the good from "terrible." I found it stimulating and exciting, if only because it flies in the face of a thousand earlier versions which have formed the "Eroica" in my own mind over a half-century span. I had to "teach" this work as Music Appreciation in my early 20s—from recordings, of course. I know all the dogma that was passed onward by the Professors in charge of things, well before WW II, not to mention the older school of

BRACE YOURSELF

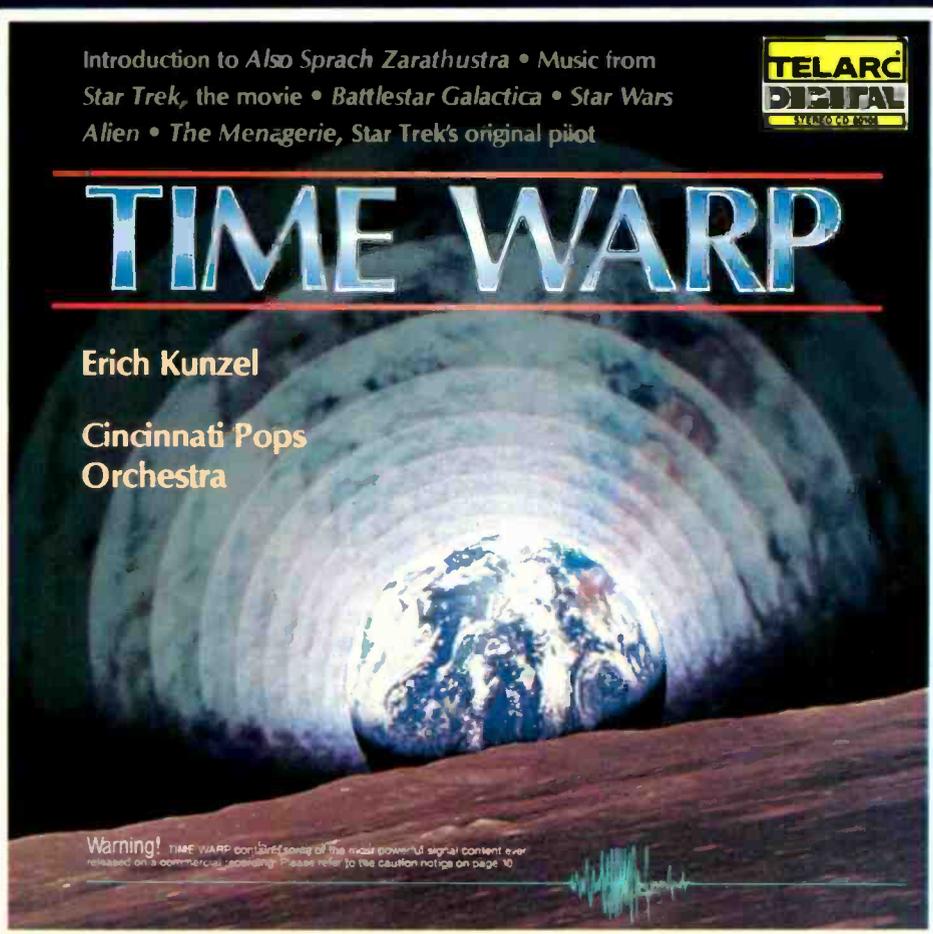
Introduction to *Also Sprach Zarathustra* • Music from
Star Trek, the movie • *Battlestar Galactica* • *Star Wars*
Alien • *The Menagerie*, *Star Trek's* original pilot



TIME WARP

Erich Kunzel

Cincinnati Pops
Orchestra



Warning! TIME WARP contains some of the most powerful signal content ever
released on a commercial recording. Please refer to the caution notice on page 10.

DG-10106

COMPACT
disc
DIGITAL AUDIO

CD-80106

For every missing traditional effect in this "Eroica," there are new ones that would make even Beethoven jump with surprise, deaf as he was.



Christoph von Dohnányi

heavyweight conductors, mostly with Russian, Dutch or German names. I remember the tempi—translate into record timing, 78 rpm and LP—which were *de rigueur*, that is, fashionable in those comparatively recent moments in this famous symphony's 180+ years of existence. Even the good program notes, jacket annotations for Telarc by Steven Ledbetter, reflect familiar thoughts on the "Eroica."

But not the performance! Where the old versions went massively slow, full of Significance, enlarging and emphasizing every musical effect in the undoubtedly revolutionary score of 1803, this one goes lightning fast, a disciplined, chrome-plated Viennese waltz of a sort never imagined in Vienna itself. The musically famous turning points of the work, that (we were always told, and believed) shook the very foundations of musical logic in Beethoven's Imperial Vienna of the classics, are here blithely traversed as though taken for granted and scarcely worth mentioning any more. I almost gasped at a number of these places—could it really have come to this?

But wait! Was the older and heavy-weight tradition, sealed on records straight out of the end of the 19th century, any closer to the "original" than Christoph von Dohnányi's reading? Not necessarily. There is no such thing

as a totally "authentic" rendition, not even of brand-new music today. The most persuasive versions of Stravinsky's music, for example, are largely not those conducted by Stravinsky himself (and preserved ceremoniously on records, largely by CBS); the best of Rachmaninoff is not necessarily in the Rachmaninoff recordings (equally zealous in the RCA preservation).

What I mean is that this "Eroica" is no ignorant, pedantic, coarsely conducted or coarsely played version. It is very full of life—you can hear that in the sparkling, impeccably accurate playing of this American orchestra, already famed for its precision under earlier conductors. It must have been a challenging occasion for most of the players, all but the incurably stodgy, if any. And, I have to add, for every missing traditional effect, there are a couple of new ones which might even make Beethoven jump with surprise, deaf as he already was in 1803. This is surely an updated "Eroica," speaking in 1985 terms, and I see nothing wrong with that. Therefore, I recommend the recording, whether LP, CD or cassette, if you will keep a more "traditional" version nearby, perhaps such as Bruno Walter's, still available on CBS's Odyssey label. Time does march on, if you can remember that famed Time/Life phrase.

New Danish Orchestral Music. Aaquist Johansen: Sinfonia; M. Winkel Holm: Eurydice Hesitates, Cumulus; Nørholm: Fluctuations.

Paula 16, \$7.98. (Available from Editions Orphée, P.O. Box 364, Prudential Center, Boston, Mass. 02199.)

Is this "new Danish orchestral music" for you? It could be. After all, a composer's aim is to produce interesting sounds out of whatever medium he may use, and the full-scale modern orchestra can do extraordinary things, once it is given the right instructions. Sounds that are unlike any orchestra's before our time, though the instruments are the same.

Thus, the opening "Sinfonia" by Aaquist Johansen, dating from 1976, begins with a blast of sonic dissonance that made my hair stand on end—nothing like it since Edgard Varèse. And so gorgeously recorded, a superbly produced LP, clean and clear, surprisingly wide in the dynamic range and with veritable A+ surfaces, so that every ping, boom and scratch is vibrantly real—the sheer dissonance of these sounds is what makes them sonically so interesting. Characteristically, it is not the big boom of the tympani that counts but the sharp edge to the drum sound, beautifully reproduced.

There is one potent influence in three of the four works here—electronic music. You will recognize it instantly—and yet there is no sound here that is not from a live instrument! Somehow, I think this accounts for the unusual appeal of the works as heard in our own recorded medium. I rather suspect I would like them less in a "live" performance; there is a certain inevitability as reproduced through a hi-fi system, and this is good. The old idea of "concert music reproduced in the living room" is indeed weakening; the new sounds we create today are midway between, often sonically more effective at home than in concert. Could we ask for more?

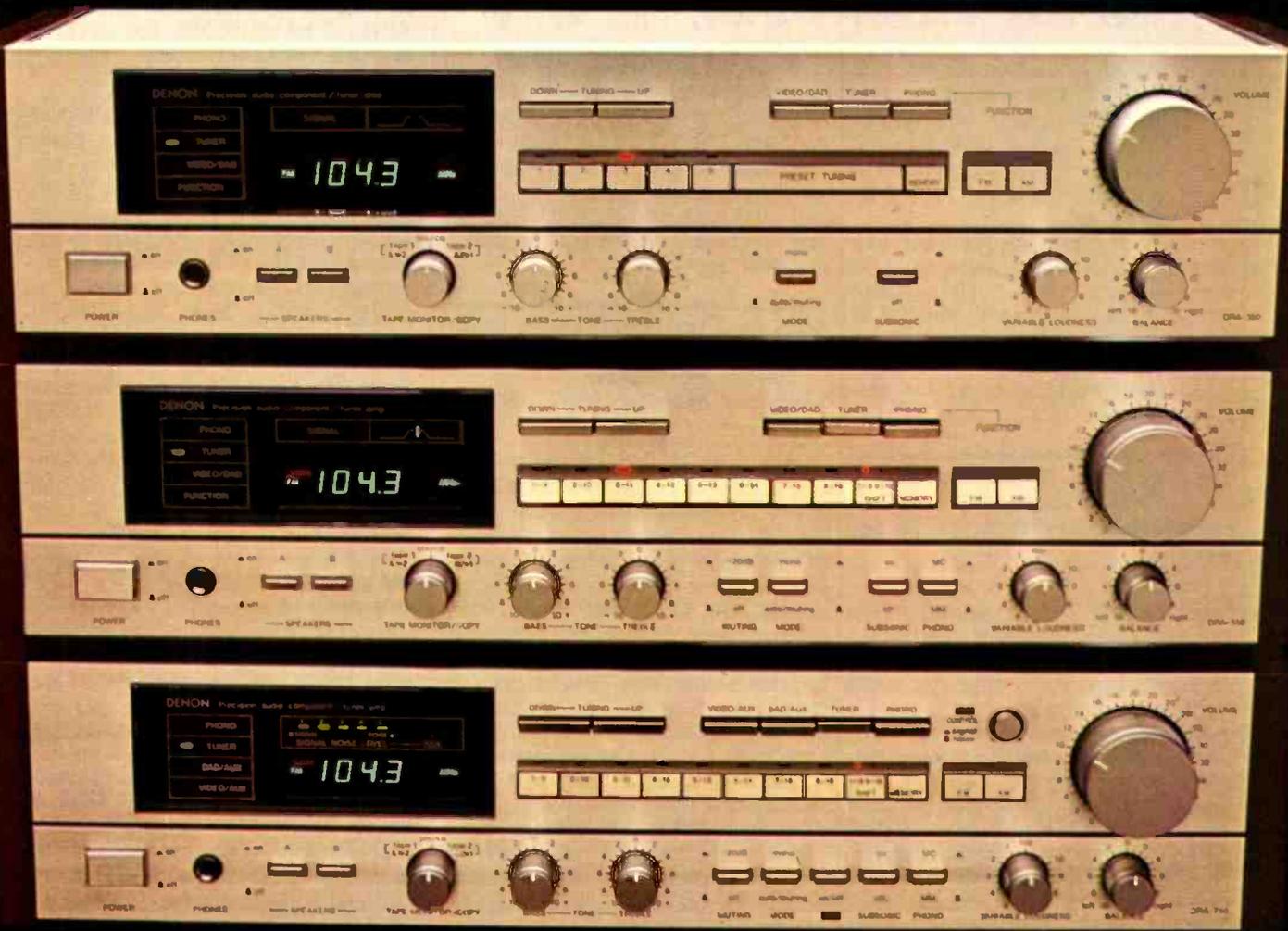
The one less dissonant work, "Eurydice Hesitates" by Mogens Winkel Holm, is also the most recent, 1977. It is actually the music for a ballet, performed by the Royal Danish, with choreography by the composer himself, a multimedia man, decidedly. These sounds, beginning somewhat harshly,

DENON RECEIVERS DO NOT COMPROMISE FIDELITY FOR CONVENIENCE.

Most receivers are designed as if the person desiring a compact, convenient component obviously cares less about sound quality. The DRA-Series Receivers, like all Denon products, place sonic quality above all. Their power sections incorporate Non-Switching Class-A circuitry (with no negative feedback on the DRA-750) and heavy duty power supplies, temperature-controlled by liquid-cooled heat sinks. Infinitely variable loudness control now ensures full listening pleasure at all volume levels.

The tuner section stores up to 16 AM or FM stations or any combination thereof (DRA-350; 5 AM/FM preset memory tuning). The DRA-750 incorporates Denon's exclusive Super Searcher tuning circuitry which eliminates the principle causes of distortion without sacrificing stereo separation.

Whether you choose a 70W/CH DRA-750, a 50W/CH DRA-550 or a 36W/CH DRA-350, its uncompromised performance will convince you that Denon products share more than name alone.



DENON

D E S I G N I N T E G R I T Y

Side panels included on DRA-750 only.

Denon America, Inc., 27 Law Drive, Fairfield, N.J. 07006 (201) 575-7810

Enter No. 18 on Reader Service Card

Some traditions, musical or otherwise, manage to stay alive beyond almost any reasonable hope. And so it is with the Viennese waltz, thank you.

soon resolve into an increasingly gentle kind of neoclassic dialog, between a solo English horn, Eurydice, and a harpsichord, representing Orpheus, reminding strongly of the well-known "Goldberg Variations" theme of Bach and in a manner that recalls Stravinsky at his most gentle (he also did a ballet on Orpheus). I found this music lovely and very moving, a splendid contrast to the noisier sounds of the other works.

The final piece by Nørholm is for 39 stringed instruments (including mandolin, two harps, guitar and harpsichord), no one of which plays together with any other. An interesting texture of sound and, again, superbly suited for hi-fi reproduction.

I find to my surprise that these four recordings, all analog, were made at different places from 1969 to 1980. Therefore, the uniformity of sound is all the more remarkable. Since the liner notes are in Danish, you will understand why I have not given the performing details.

The Real Thing. Original cast recording with Jeremy Irons and Glenn Close. **Nonesuch 78027-1-P**, two-record set, \$17.98.

If you are a playgoer, if you have seen *The Real Thing* in person on the stage and want a detailed "memento," then this album is for you. Provided you don't mind some atrocious audio mayhem along the way.

Judge your own reaction by mine, which is probably different. I found two things very wrong here and, in fact, turned the thing off in disgust after around 10 minutes, as a result. No reflection at all on the original play by Tom Stoppard *in the theater!* Just the manner in which it has been transferred to the recorded medium, which seems to me to ignore a good half-century of useful experience in our ever-growing world of audio expertise.

First, these actors with the British accents do not act *for records*. As Jeremy Irons says, "We knew how to do it, we'd done it for the past 200 nights." Exactly. So they "played across the microphones to each other, swooping and swirling through the scenes." Precisely. But did they *play to you*, listening via those same mikes? Not that I

can see. Like all too many actors, they blithely ignored the little matter of mike technique and reproduction from records, which is *not* the theater. Frankly, I found this a bit insulting. A knowledgeable actor, one should think, would re-study the entire play for this radically different and close-up medium. Snappy repartee on a live stage becomes exaggerated pretension when it is only inches away in your loudspeaker.

Second, the production uses antediluvian musical "bridges," right out of the 1930s, which are made from bits of recorded classical music, reproduced anemically as through a 1930s radio. The music—good music, as important in its area as this play is in the theater—is simply sliced off crudely, not even mercifully faded out, as action resumes. Enough?

Solid Gold Strauss: Greatest Waltzes and Polkas. Vienna State Opera Orchestra, Anton Paulik. **Vanguard Everyman SRV 394 SD**, \$3.98.

Here is the nearest we can come to an "authentic" Strauss waltz (and polka) in recent times—including, of course, the authentic verve and dash of the original music in the 19th century. Where else does it exist but where it always has, in Vienna? Some traditions, you see, musical and otherwise, manage to stay alive beyond almost any reasonable hope. How can they do it—we say. They do. And so it is with the Viennese waltz. It lives in Vienna and, thank you, is very well indeed.

It is ever so clear, then, that these musicians not only know every nuance of the tradition but, also, that they have not tired of it. No—it's not electrifying playing, as perhaps it was on the first occasions, just about a century ago for the later waltzes. But there is no flagging, none of that "Do we have to play *this* old stuff again?" We hear it, alas, in almost every non-Viennese orchestra that gets a waltz assignment. Or else—worse—somebody thinks the stuff ought to be pepped up, modernized, rearranged maybe, say, with a bit of symphonic rock sound.

I don't know how recently this was recorded; Vanguard has been into this sort of thing for a long time. But I can say that the sound is plenty clean

enough, the ambience is big and suited to the enormous dance halls, palaces, where the music was first heard. And the pressing has no rumble, no pulsing, no obtrusive hiss. Ah, there goes the inimitable Hungarian cimbalom in "Tales of the Vienna Woods"—such gracious music it plays!

Mozart: Wind Serenades in E Flat, K.375; C Minor, K.388. Los Angeles Chamber Orchestra Winds. **Nonesuch 79073**, digital, \$11.98.

As recording "fi" has improved over the years, the sound of winds, especially close-up solo winds, has become more and more attractive for the home listener. Strings too, but there the situation is different. String tone is not radically different from one type of instrument to the next, but all have a strong pattern of highs that is highly sensitive to distortion. In the old 78-rpm reproduction, the strings were mercifully smooth simply because those highs were entirely missing. But clarinet, flute, and oboe sounded much alike. Their upper colorations are more radically different—and now can be beautifully reproduced, to give each its own musical personality.

All that as an introduction to these two wind works, featuring pairs of the above plus bassoons (very low oboes) and horns. The playing is the acme of technical perfection, though there are some overly mechanical rhythms here and there, accurate but not very expressive. The sound, for my ear, is just about perfection—not so much the "fi" as simply in the rightness and presence of each instrument, perfectly miked for musical communication. That would be again the team of Aubort and Nickrenz, who are doing splendid work these days. The sound I am speaking of comes through in any of the current media, LP, Compact Disc or cassette.

This job actually goes back to April of 1982, via a Sony PCM-1610 digital processor and mastering, for LP, by JVC. The progress from recording session to store shelves is often deliberate, as well as careful. Only the biggest would-be hits are rushed along, and these, often enough, show the signs of too much haste. Not this record. It was worth waiting for.

T A N D B E R G



... is the choice of those who consider music to be an important part of their life. From digital-ready amplifiers and world's finest FM tuner, to the most sophisticated cassette & reel recorders, only Tandberg offers a complete family of the most respected music reproduction equipment. European-made... acclaimed world-wide. For a color poster (without advertising copy) and the name of your nearest dealer, send \$2 for postage & handling to: Tandberg of America, 1 Labriola Ct., Armonk, NY 10504. Enter No. 46 on Reader Service Card.

ROLLING STONES GATHERED

The Rolling Stones Collection
Mobile Fidelity MFSL 1-161 to 2-170,
 11-record set, \$250.

This lavishly packaged Mobile Fidelity Sound Lab Original Master Recording collection of 11 early Rolling Stones albums, cleaned up and remastered at half-speed, is obviously somebody's labor of love. At the suggested list price, it's also somebody's idea of how to make some bucks.

Almost all of the material was recorded between 1963 and 1969, although the original release dates for these LPs actually stretched from 1964 (*The Rolling Stones*) to 1971 (*Hot Rocks*). The 1969 cutoff date was chosen because of its significance and convenience; that year marked the departure and death of original Stone, Brian Jones, and it was the last year The Stones recorded for Decca/London before forming their own label under the aegis of Atlantic Records.

Physically, this package is simply gorgeous. Each disc is in a bright red jacket with the simple logo, The Rolling Stones, written across the front in jet-black script. Each disc is further protected by a cardboard insert and a rice-paper sleeve, and each fits into its individual slot in a sturdy, black presentation case bearing the same logo in bright red. Also included is a colorful booklet containing the original album, graphics and interviews with the engineers and producers involved with these recordings, plus Mobile Fidelity's Geo-Disc (which lists for approximately \$25) to assist in proper cartridge alignment.

So much for physical beauty. After first gazing upon this vision of vinyl loveliness, the audiophile and Stones fanatic alike soon will be asking if the contents of this attractive package justifies its hefty price. The Stones fan with a few coins to spare would do well to grab this beauty. Although not a complete set of early Rolling Stones LPs (missing are *Now!*, *December's Children [and Everybody's]*, *Got LIVE*, *If You Want It*, and *Flowers*, plus the five-song EP *Five By Five* and a couple of compilations), this is the most extensive collection from that period currently available.

It covers The Stones from the rough, raw, early blues-based rock days of



their first mono LP, *The Rolling Stones*, up to the more sophisticated, wider-ranging rock styles found on that glorious two-disc "greatest hits" compilation, *Hot Rocks*. The titles included in between are: *12 x 5*, *Out of Our Heads*, *Aftermath*, *Between the Buttons*, *Their Satanic Majesties Request*, *Beggars Banquet*, *Let It Bleed*, and *Get Yer Ya Ya's Out*. Listening to these albums in sequence is much like watching one of those speeded-up Walt Disney film sequences of a flower blooming. You can hear the growth before your ears as the boys go from bashing about ignorantly in the studio under the less-than-competent direction of producer/manager Andrew Loog Oldham, to working in conjunction with fine producers like Glyn Johns and Jimmy Miller, to producing their own complex, multi-layered cuts of the late '60s, culminating in the eclectic *Beggars Banquet*.

There is no shortage of great tunes here, from classics like "(I Can't Get No) Satisfaction," "Sympathy for the Devil," "Street Fighting Man" and "Jumping Jack Flash," to a slew of

lesser-known but potent Stones screamers and ballads alike. Further, these discs are clean and flawless, nicely pressed on Supervinyl, which makes their surfaces as quiet as a feather falling in a cotton factory. A true Rolling Stones addict tends to have copies that time and styli have treated mercilessly, leaving a legacy of scratches and worn groove walls. So for the sheer Stones fan, this one's a winner.

Some interesting questions arise for the true audiophile consumer, however. The half-speed mastering process certainly offers noticeable sound improvement. There is a new clarity to muddy passages, an audible extension of dynamic range resulting in sharper highs and fuller lows. Unfortunately, the original production on the earliest of these Stones discs was—dare I say it—lousy. I'm not talking merely poor, I'm talking terrible, the kind of stuff that will have an audiophile gritting his teeth in pain. The worst offender is the first album, *The Rolling Stones*. The distortion is appalling: Apparently the studios then used by The

A clear challenge from PDMagnetics to the readers of Audio.

Introducing the 500 CROLYN® HG Audio Cassette. Clear sound, clear shell...clearly superior.

The new 500 CROLYN® High Grade cassette will exceed even *your* high standards. We engineered it for you, the audiophile. We want to hear from you. We challenge you to compare it with the likes of XL-IIS and SA-X. Hear the difference genuine chromium dioxide tape makes versus cobalt-iron oxide imitations or other "chrome equivalent" tapes. Also, ask about 1100 Metal HG and Tri-Oxide Ferro HG.

Buy a 500 CROLYN® HG cassette. Use it—test it—under *your* standards. Send us your comments (plus outer wrapper and sales receipt). We'll send you a 500 CROLYN® HG Cassette FREE! We're betting you will agree with our results.*

Only the people who invented the compact cassette (Philips, the "P" in our name), and chromium dioxide (Du Pont, the "D" in our name), could bring you a tape this great.

Rating vs. Leading Premium Cassettes

	500 CROLYN® HG
Tape Background Noise	SUPERIOR
S/N, Low Frequency	SUPERIOR
S/N High Frequency	EQUAL
Dynamic Range	SUPERIOR
Frequency Response	EQUAL
Shell Quality	EQUAL
Overall Listening Quality	SUPERIOR

Specific test results available on request. For free cassette offer, technical information or the PDMagnetics dealer serving your area, write us at address below.

PDMagnetics

A legacy of quality from Philips and Du Pont.



*Offer expires March 31, 1985

©1984 PDMagnetics 600 Heron Drive, Pureland Industrial Complex, Bridgeport, NJ 08014

Enter No. 33 on Reader Service Card

CAMEL LIGHTS

It's a whole new world.



Today's
Camel Lights,
unexpectedly mild.

Warning: The Surgeon General Has Determined
That Cigarette Smoking Is Dangerous to Your Health.

9 mg. "tar", 0.8 mg. nicotine av. per cigarette by FTC method.

The selections in *Kiss the Sky* have been digitally remastered from the original tapes, with real gains in clarity and power.

Stones could not handle the raucous band's rip-roaring volume levels. And it seems as though their producer, Andrew Loog Oldham, couldn't handle the studio. In the booklet accompanying the set, Oldham confessed his ignorance of the recording process at the time, pointing instead to his and the band's youthful enthusiasm and willingness to learn on the job. Well, despite the poor recording, it is delightful to hear that wham-bam enthusiasm and fascinating to have this aural document of the early Stones.

The question remains, does the half-speed process serve the audiophile when it clarifies the flaws in a bad recording? Make no mistake, this technique cannot clean up this kind of distortion nor can it eliminate all of the hiss from the original tapes. And don't believe that hogwash about this kind of distorted sound being "authentic." If authentic sound is what you want, you'd be better off playing these distorted discs on a dinosaur '60s hi-fi set or, better yet, hearing them on a single-speaker radio of the same era.

None of the other discs are as badly recorded as *The Rolling Stones*, as The Stones improved rapidly in the studio. Besides some problems with spatial presencing and balances in *12 x 5* and *Out of Our Heads*, and an occasional spate of tape hiss here and there, the rest of the discs in this collection are much improved by the half-speed mastering process.

This is a guaranteed collector's item, printed in a limited edition of 25,000 numbered copies. Despite its flaws, it is a very special recording package. On a scale, weigh your love of The Stones against the shekels you can comfortably spare, and may the heavier pan win.

Paulette Weiss

Knud Jörgensen Jazz Trio

Opus 3 #8401, \$18. (Available from Scandinavian Sounds, P.O. Box 3656, San Clemente, Cal. 92672.)

Sound: A- Performance: A-

Opus 3, as the liner notes state, is a small, independent Swedish record company dedicated to recording timeless acoustical music such as classical, jazz and folk. The notes further state their intent to reproduce the

sounds of the instruments as naturally as possible, and, on this LP, they have done just that.

This is an excellent, well-recorded, and well-balanced program of standards played in a timeless, forward-looking style by Knud Jörgensen, a fine Danish pianist who has chosen to live in Sweden to pursue his love of jazz.

Mr. Jörgensen has a fine touch and clarity of expression with a direct way of stating what he intends to do, which is to make good, straight-ahead jazz. While I suppose one would call it modern, it is really very melodic and swinging and never far from the melody. Mr. Jörgensen and his sensitive accompanists, Johan Dielemans on drums and Sture Åkerberg on bass (both of whom make a solid contribution on their own) sound to me as if they had been working together, feeling one another, and reacting to each other's playing for a while. We, the listeners, are the beneficiaries.

This is an impressive debut record, and I very much like that Mr. Jörgensen keeps everything so well in balance. He likes the late Erroll Garner very much and there's nothing wrong with that, because he doesn't lean on that giant's style any more than absolutely necessary.

Frank Driggs

Kiss the Sky: Jimi Hendrix Reprise 25119, \$8.98.

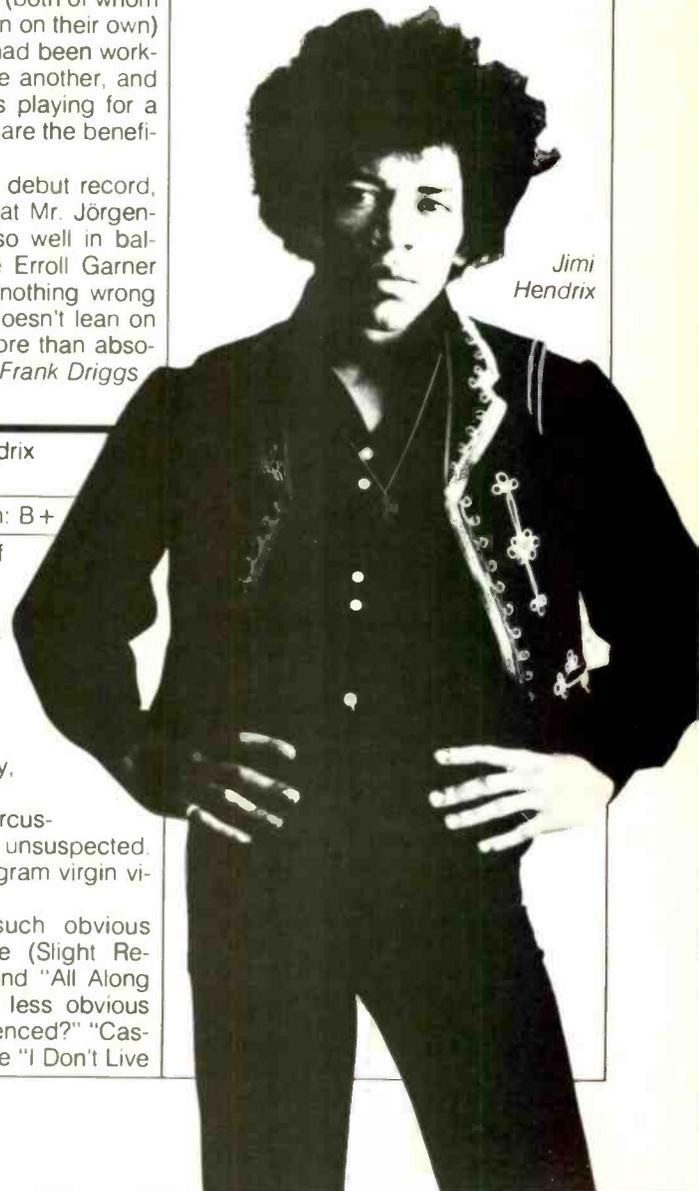
Sound: A- Presentation: B+

This newest reissue of Jimi Hendrix material is noteworthy in several respects. The selections have been digitally remastered from the original tapes, allowing real gains in clarity and power. Not unexpectedly, you can very clearly hear some incidental percussion previously nearly unsuspected. The pressing is on 150-gram virgin vinyl, and it is excellent.

Selections include such obvious ones as "Voodoo Chile (Slight Return)," "Purple Haze," and "All Along the Watchtower"; some less obvious cuts as "Are You Experienced?" "Castles Made of Sand," a live "I Don't Live

Today," and "Third Stone from the Sun," plus some that are at least partially new. These last include "Killing Floor," which opened Jimi's performance at the Monterey Pop Festival and has not been released before; "Stepping Stone" in its original mix, which also has not been on an album, and "Red House," listed as unedited for the inclusion of some studio patter. Data as to the when and where of recording has been included for each track, including educated guesses when exact information was not available.

All told, this new release serves best as an introduction to the genius of Jimi Hendrix for the previously uninitiated. The choice of material allows the re-



Jimi Hendrix

Placing Sinatra's voice so far front emphasizes his charisma, his command of phrasing and, alas, time's ravages to his voice.

mastering to be a factor while giving a feel for the full range of power and diversity in his work, from the rave-ups and psychedelia to the lyrical, mystical moments. Hendrix completists will want this anyway, but they will be very pleased when they do get it.

Michael Tearson

L.A. Is My Lady: Frank Sinatra with Quincy Jones and Orchestra
Qwest 25145, digital, \$9.98.

Sound: B Performance: C

Frank Sinatra has achieved such standing as an institution that any new release of his is a major event. Here he has teamed with that consummate pro, Quincy Jones, for a swinging soiree of tunes recorded on both coasts. The all-star orchestras feature players and soloists with top pedigrees, people like George Benson, Lionel Hampton, Bob James, Ray Brown, Joe Newman and

Randy and Michael Brecker, among many others.

Still, it is Sinatra's album. For better or worse, Quincy has placed the man's voice all the way out in front of the orchestra. "For better" means the man's charisma, which is inescapable, and his phrasing, which is commanding. "For worse" means the raggedy quality of his instrument itself, which simply cannot escape time's ravages.

As for performance, the orchestras used here play splendidly throughout, behind splendid arrangements. They are recorded beautifully with digital technology.

Sinatra is Sinatra, and his self-conscious swagger is at the fore most of the time. This is the saving grace of the title song which, otherwise, is pretty repulsive. He is most at ease on songs like "It's All Right with Me," "Stormy Weather" and "After You've Gone," all songs he has lived with for many years, ones he doesn't have to push so

hard on. Other times he can sound downright pugnacious and arrogant, as when he is taking great liberties with "Mack the Knife" and "Until the Real Thing Comes Along." On "The Best of Everything," a new 1984 number, Sinatra sounds like he hasn't really come to grips with the song, as if he should have done a few more takes or just left it and come back to it later.

By anyone's standards, Frank Sinatra is one of the all-time greats, but *L.A. Is My Lady* just isn't anywhere near his best work. Time's toll being too great could be one big reason. His own cockiness is another problem, as it repeatedly threatens to overwhelm the songs. Could be he feels the need to constantly remind people just how unbelievably hip it is to be Frank Sinatra.

This is one that will get played a couple of times before it finds its home on the shelf, nestled between other earlier and better Sinatra albums.

Michael Tearson

Hot tip.

Rave reviews for the Micro-Ridge Stylus.

"This time Shure has really come through... What you get is... detail, especially at high frequencies. There's a wonderful bloom around the music, and it's natural, not hyped!"

Stereophile Magazine

"The MR Stylus... should silence the nitpickers. Highs are slightly more extended; bass is tighter, better defined; distortion is lower; clarity is further increased..."

Sensible Sound Magazine

The world's toughest audio critics agree. Our Shure Micro-Ridge Stylus Tip sets the standard for distortion-free sound reproduction. The MR Tip's revolutionary design gives it uncanny tracing ability in your record groove.

The MR Tip is now available as an upgrade replacement stylus for the Shure V15 Type III, IV, and V cartridges. Dollar for dollar, there is no more effective way to improve the performance of your stereo system.

SHURE

You'll hear more from us.

Enter No. 50 on Reader Service Card

"Spectacular" "Astounding"

Stereo Review Magazine

High Fidelity Magazine

The Nation's Top Audio Experts Agree:
Polk's Revolutionary True Stereo SDAs
A ways Sound Better Than Conventional Speakers



SDA-CRS
\$395.

SDA-2
\$600.

SDA-1A
\$850.

In Baltimore or near by, call
436 West Baltimore Ave.

"The result is always better than would be achieved by conventional speakers."

Stereo Review Magazine

"They truly represent a breakthrough."

Rolling Stone Magazine

Polk's AudioVideo® Grand Prix Award winning SDA technology has been called the most important fundamental advance in loudspeaker design in the last 25 years. In fact, Polk's remarkable SDAs are the world's first and only True Stereo loudspeakers.

Hear the Remarkable Sonic Benefits Now!

Polk's exclusive True Stereo SDA technology results in spectacular, lifelike, three-dimensional sound. *Stereo Review* said, "Literally a new dimension in sound." *High Fidelity* said, "Astounding . . . Mind-boggling . . . Rabbergasting . . . An amazing experience . . . You owe it to yourself to audition them."

Polk Audio, Inc., 1915 Annapolis Rd. Baltimore, MD 21230. For nearest dealer call 1-800-843-3800.

Digital Disc Ready

polk audio
The Speaker Specialists®

Enter No. 35 on Reader Service Card

OUT OF THE MOUTHS OF BABES

Illustration: Rick Tulka



Children's Songs: Chick Corea
ECM 25005-2.

The first gentle but firm piano notes of Chick Corea's *Children's Songs* emerge crisp and clear against the clean silence of this sweet ECM Compact Disc. With the clarity of the bold, oversized letters on the white pages of a child's first reader, note after note possesses a vivid presence, whether standing alone or bouncing along in a tumble of headlong melody.

I cannot praise the sound quality of this original digital recording too highly; Corea's acoustic piano is so *alive* on this CD. Firmly situated in the phantom center channel, the piano is a palpable aural presence which seems to radiate music in all directions. There is a slight echo on extended notes which I find appealing; it heightens the sense of a rooted location for the instrument. I suspect this echo is a product of the West German studio—Tonstudio Bauer in Ludwigsburg—where *Children's Songs* was recorded, and also a production choice of Manfred Eicher, who, ably assisted here by engineer Martin Wieland, is responsible for some of the

most exquisite recorded sound of the past decade.

The intriguing music so lovingly preserved is certainly not kid stuff, despite the misleading title. Here are 19 deceptively simple bits of mood and melody, with the longest running just over 2½ minutes, and the shortest a mere 38 seconds. Except for an extended "Addendum" incorporating violin and cello, these are all solo acoustic piano pieces. There are actually 20 solo pieces if you go by Corea's original notation, although ECM has put two solos together and notes the CD as having 19 solo pieces. Corea maintains the illusion of simplicity with repetitive, rhythmic, left-hand figures, but what he does with his dexterous right hand—that's another story. Some pieces meander through snatches of lovely melody like a butterfly lightly exploring a meadow. Others scurry intensely in all directions like an ant on an undefined mission. Floating or scurrying, thoughtful, querulous, ominous, prancing—so many moods are created expertly in swift mini-chapters. The 5-minute-plus "Addendum" adds violin and cello to Corea's piano in an excit-

ing interplay which shows off this CD's marvelous dynamic range and further enhances its wonderful sense of aural space.

Children's Songs is one CD in an 11-title 1984 release from ECM. The whole package is splendid, and this lovely volume will delight the child in you and leave your adult sensibility satisfied, to boot.

Paulette Weiss

You and Me Both: Yazoo
Mute Records VG 651.

Yazoo's second album, *You and Me Both*, is soulful, doleful, bright and bouncy. It's a bittersweet universe painted by the sparkling synthesizers of Vince Clark, which conjure up pinpoints of light and vast surfaces of lifeless planets, and by the equally evocative vocals of Alison (Alf) Moyet, which ground the songs in an earthy blues style. Like the real universe, there's lots of empty space between these twinkling stars and solid planets. The velvety silence of the Compact Disc defines the music and lyrics without the lunar dust that clouds the surface of most standard analog LPs.

The imaging on this disc is divine, creating the illusion that each musical texture comes from a different source instead of being cooked up in the same oscillating circuit. Besides being well placed, each synthetic voice is different, ranging from fragile chimes to powerful aural explosions, yet they never devolve into cheap sound effects created for their own sake. The all-too-humanly flexible voice of Moyet adds depth and poignancy to the mellifluous melodies and sad lyrics of lost love.

Yazoo (known as Yaz here in the U.S.), creates moods ranging from the outer-space solitude of "Mr. Blue" to the delightfully imbecilic "Happy People," who "believe in having fun and smiling all the time" (Vince sings on this one). Recurring undercurrents tell of valiant struggles against death, war, and depersonalization. In "Softly Over," the spasmodic percussion echoes lyrics about a collapsing relationship. And still, a cheerful playfulness in the music and an assertive strength in the singing challenge the sorrowful mood.

It's compelling stuff that works on

THIS MONTH'S BIG EVENTS ON CBS COMPACT DISCS.

FEBRUARY

5

WHAM! MAKE IT BIG



RAMPAL
VIVALDI
6 CONCERTI, OP. 10
I SOLISTI VENETI
SCIMONE, cond.



8

JOHN CAFFERTY AND
THE BEAVER BROWN BAND



MUSIC FROM THE ORIGINAL MOTION
PICTURE SOUNDTRACK
EDDIE AND THE CRUISERS

TOTO



ISOLATION

14

15

CHOPIN: Piano Conc. No. 2
SAINT-SAENS:
Piano Conc. No. 2

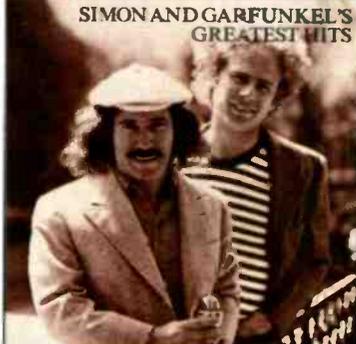


CECILE LICAD
London Phil. Orch.
ANDRE PREVIN

20 JUST RELEASED!

BRUCE SPRINGSTEEN "The River" (2 Discs)
DAN FOGELBERG/TIM WEISBERG:
"Twin Sons of Different Mothers"
PAUL McCARTNEY/WINGS
"Wings Over America" (2 Discs)
SURVIVOR "Vital Signs"
SCHUBERT: Quintet in C Major
Yo-Yo Ma, cello; Cleveland Quartet
MAHLER: Symphony No. 4
K. Battle; Vienna Phil./Maazel
MENDELSSOHN: Sonata, Op. 6;
Variations Serieuses, Op. 54; more.
Murray Perahia, piano

SIMON AND GARFUNKEL'S
GREATEST HITS



22

Enjoy today's revolution in sound with CBS Compact Discs. Our rapidly-growing catalog features hundreds of titles by superstar artists in all categories of music. Ask for a free copy wherever Compact Discs are sold.

COMPACT
disc
DIGITAL AUDIO

"CBS" is a trademark of CBS Inc. © 1984 CBS Inc.

Enter No. 14 on Reader Service Card

McINTOSH... POWERFUL PERFECTION

The magnificent music of the mighty organ commands *POWERFUL PERFECTION* from any power amplifier. The 500 watt per channel perfect voice of the McIntosh MC 2500 is *POWERFUL PERFECTION*. Prcud crafts-people, here in the United States, assemble carefully selected technolcically superior high quality components into a powerfully perfect power ampl fier. In the MC 2500 you get performance . . . you get a l the power necessary for perfect musical reproduction . . . you get complete response unaf-fected by distortion . . . and you get the pleasure of owning the best . . . you get *POWERFUL PERFECTION*.

Send for our 76 page catalog for more information.



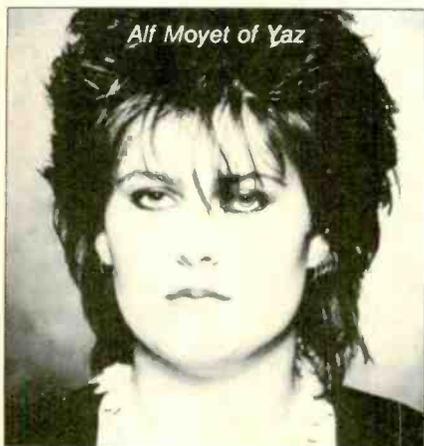
For Detailed Information on McIntosh Products Write:
McINTOSH LABORATORY, INC.
P.O. BOX 96, EAST SIDE STATION, #54
BINGHAMTON, NY 13904-0096

Organ pipes photographed at Casadesus Recital Hall
State University of New York at Binghamton, N.Y.

Enter No. 27 on Reader Service Card

The imaging on Yazoo's CD is divine, creating the illusion that each musical texture comes from a different source.

many levels, rewarding close and repeated listenings with discoveries of low-level comments from the keyboards behind the primary riff or the rough-edged, seductive intonation in Moyet's voice. It's an album of many moods, irresistibly danceable when played loud and comfortably soothing when played softly. And it isn't marred by the same pointless noodling and pretentious gibberish that infested two tracks on Yazoo's first album, *Upstairs at Eric's*.



Alf Moyet of Yaz

This album, which, sadly, is the final collaboration of Clark and Moyet, has a consistency that gives the repeat button on your CD player a reason for existence: You can nod off to the pretty songs or keep the neighbors awake all night with your nonstop aerobic dancing. A few of the riffs get caught in a rut, but what the heck. The 11-song disc lasts for only 40 minutes and 28 seconds, but you can set it to repeat for as long as you like. And I like.

Paulette Weiss

The Many Moods of Christmas: Atlanta Symphony Orchestra and Chorus, Robert Shaw.
Telarc CD-80087.

Over the years, countless Christmas programs have been recorded. They have ranged from fairly straightforward presentations to the employment of all sorts of musical gimmicks in an attempt to create a big seller. Most of these albums are ephemeral, though a rare few have become Christmas standards. Telarc's CD contribution is *The Many Moods of Christmas*, and it cer-

BLESSED



CARVER M-1.5t
Magnetic Field Power
Amplifier

"...the equal of any power amplifier in transparency, focus and smoothness and, of course, far ahead of any other we tested in sheer gut-shaking power and dynamic range. We especially enjoy hearing spatial detail, instrumental definition and completely natural dynamics on familiar records to a degree we did not know was extractable from the grooves when we listened through lesser amplifiers. At this level of sonic performance, the astoundingly small size and cool operation of the M-1.5t become the icing on the cake, rather than the main attraction."

Peter Aczel *The Audio Critic* Winter 1982-83

Recent advances in analog and digital disc recording technology have made source material with full, real-life dynamic range a reality.

But, if you want to hear this improvement in sound quality, your high fidelity system must include an amplifier *fully* capable of reproducing *all* of the music... the CARVER M-1.5t Magnetic Field Power Amplifier.

350 watts rms/chan. into 8 ohms, 20-20 kHz with less than 0.5% THD. And most importantly, the rating that is musically significant: 600 watts/chan. Long-Time-Period Reserve Power with 750 watts/chan. Dynamic Headroom. Weight: 16 lbs.

The CARVER M-1.5t...carefully and specifically designed for those who seek highest fidelity and musical purity.

For more information please write to:

CARVER
Powerful · Musical · Accurate

P.O. Box 1237 19210 33rd Avenue West Lynnwood, WA 98036

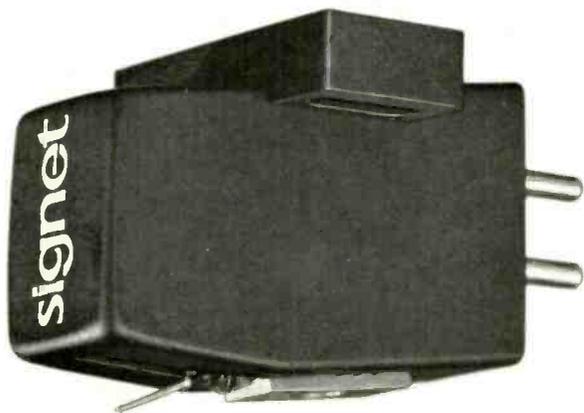
Robert Shaw re-creates a program he recorded back in 1965. Telarc once again gives us a CD with good sound and very clean definition.

tainly must be regarded as a true audiophile-quality Christmas album.

The Many Moods . . . title rang a bell for me, and, sure enough, this is a remake of the same program Robert Shaw recorded for RCA Victor about 1965. (I was Music Director for RCA Victor classical records at that time.)

The CD uses the same wonderful Robert Russell Bennett arrangements as on the original RCA recording. He has taken a group of traditional Christmas carols and scored them for large chorus and orchestra. Mr. Bennett has embellished the lovely old melodies with brilliant orchestrations, combining

Better sound from every record you own, with the new Signet TK10ML!

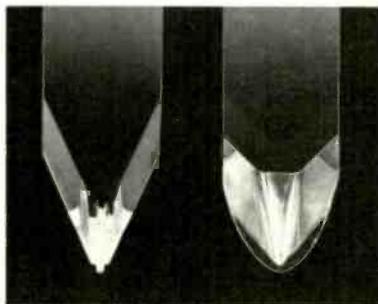


It's something you can't get with any other technology.

Until you hear the Signet TK10ML, you may not fully appreciate how superb today's analog recordings can be. And how much may be lost by going all-digital.

The single most significant advance in the Signet TK10ML is its unique new *MicroLine*™ stylus . . . with the longest, narrowest "footprint" ever achieved! Its scanning radius is a mere 2.5 microns, half that of the best ellipticals, while its vertical contact footprint is three times longer than the elliptical. The Signet *MicroLine* stylus tracks very high frequencies better—at lower groove pressure—than any other design.

Even with repeated playings, the *MicroLine* stylus maintains its shape, without "spreading" like all other tips.



So grooves sound new, long after other styli are threatening irreparable damage to your record collection.

Each Signet TK10ML *MicroLine* stylus is created from a whole, natural octahedral diamond, oriented for longest life, and with a square shank to precisely fit the laser-cut hole in our unique, ultra-rigid low-mass boron cantilever. You get perfect alignment. Period.

But the proof of quality is in the playing. With the new Signet TK10ML, older records literally come back to life. New records transcend the limits of ordinary technology. Your entire system gets a new lease on life.

Visit your Signet dealer. Peek into his microscope to see this fantastic stylus. Then get the real proof. Listen.

signet

SIGNET, 4701 HUDSON DRIVE, STOW, OHIO 44224

Enter No. 5 on Reader Service Card

Robert Shaw



tender lyricism with great, brazen fanfares and the exultant outpourings of a full chorus and an orchestra, each of tremendous sonority.

All the familiar carols are here—"Silent Night," "O Come, All Ye Faithful," "Joy to the World," etc. In "What Child Is This?" a lute is softly played against a background of lovely hushed strings, all to the old tune of "Greensleeves."

Dynamic range on this CD is awesome. On "Bring a Torch, Jeanette, Isabella" (I sang the solo refrain of this work when I was a 12-year-old choir-boy), the piece begins at a fairly low level, and by the time the finale is reached, the sonic output is very loud indeed! The general level of orchestral performance is very high, and, as usual, Robert Shaw's handling of choral balances is impeccable.

This is typical Jack Renner sound—very clean, good definition in the large acoustic perspective of Atlanta Symphony Hall, and with fine choral/orchestral balance. *The Many Moods* . . . is an outstanding recording and a joyous assemblage of Christmas music.

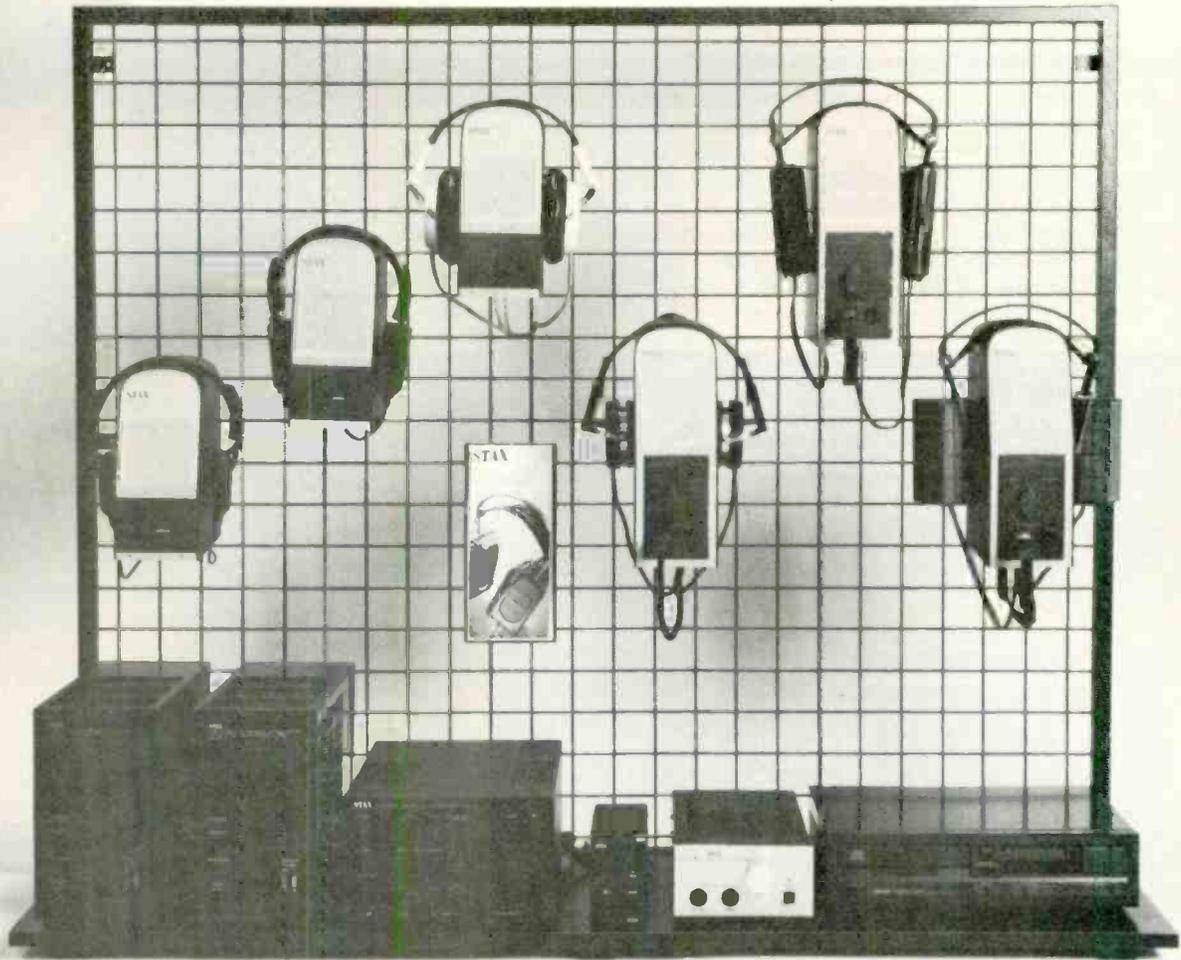
Bert Whyte

Shostakovich: Cello Concerto No. 1;
Kabalevsky: Cello Concerto No. 1.
The Philadelphia Orchestra, Eugene Ormandy; Yo-Yo Ma, cello.
CBS Masterworks MK37840.

For lovers of cello concertos, this CD is a must. The Shostakovich "Cello Concerto No. 1" is a difficult work, combining march-like rhythmic elements with angular dissonances and dance-like motifs from Russian folk music in the first movement, an expressive and lyrical second movement, an intricate cadenza that Yo-Yo Ma tosses

Which To Enjoy?

STAX electrostatic audio products



Experience the difference that STAX electrostatic earspeakers make. Internationally acclaimed, they surpass any other acoustical transducer available today.

Audition the full line of STAX electrostatic earspeakers at these dealers:

Alabama

Campbells Audio / Huntsville
Lawrence Stereo / Birmingham

California

Absolute Audio / Orange, Woodland Hills
Audible Difference / Palo Alto
Beverly Stereo / Los Angeles
Century Stereo / San Jose
Christopher Hansen, LTD / Los Angeles
DB Audio / Berkeley
Dimensions in Stereo / Torrance
Gene Rubin Audio / Monterey Park
House of Music / San Francisco
Music by the Sea / Leucadia
Paris Audio / Los Angeles
Sounding Board / Berkeley
Stereo Plus / San Francisco
Stereo Unlimited / San Diego
Western Audio / Palo Alto

Florida

Audio by Caruso / Miami
Audio Etc. / Jacksonville
Audio Insight / Ft. Lauderdale
Sound Components / Coral Gables, Ft. Lauderdale

Georgia

Hi Fi Buys / Atlanta

Hawaii

Sam Sung Enterprises / Honolulu

Illinois

Gill Custom House / Palos Hills
Paul Heath Audio / Chicago
Victor's Stereo / Chicago, Morton Grove

Maryland

The Gramophone / Lutherville

Michigan

The Court Street Listening Room / Saginaw

Minnesota

Audio Perfection / Minneapolis

New Jersey

Atlantic Stereo / East Brunswick
CSA Audio / Upper Montclair
Franklin Lakes Stereo / Franklin Lakes
Woodbridge Stereo / Woodbridge, West Long Branch

New York

Audio Breakthroughs / Manhasset, New York City
Audio Den / Lake Grove
Ear Drum / Manuet

Ears Nova / Great Neck
Gala Sound / Rochester
Grand Central Radio / New York City
Harveys Sound / New York City, White Plains
Innovative Audio / Brooklyn
Leonard Radio / New York City
Park Avenue Audio / New York City
Sound by Singer / New York City
Sound Stage Audio / Fresh Meadows, New York City
Stereo Exchange / New York City

Ohio

Custom Stereo / Columbus
Hoffman's House of Stereo / Brookpark, Wickliffe

Pennsylvania

Sassafras Audio / Montgomeryville, Jenkin Town,
Whitehall, Feasterville, Bryn Mawr

Virginia

High C Stereo / Leesburg

Washington

Definitive Audio / Seattle

Wisconsin

Flanner & Hafsoos / Milwaukee
Hi Fi Heaven / Green Bay

For a full STAX brochure, send \$3.00 to: STAX Kogyo, Inc., 940 E. Dominguez St., Carson, CA 90746

Enter No. 44 on Reader Service Card

Yo-Yo Ma brilliantly displays his virtuosity throughout the cello pieces. The CD provides generally good balances and nice, clean sound.



off with great panache, and a finale of great intensity and excitement. The Kabalevsky "Cello Concerto No. 1" is a much more lyrical and expressive piece, with a lovely and ingratiating largo second movement.

Throughout both works, Yo-Yo Ma brilliantly displays his virtuosity and

ever more strongly reminds me of Pablo Casals. I had the pleasure of recording Casals doing the Dvořák "Cello Concerto" at the Casals Festival in Puerto Rico. I remember him at his master classes, exhorting his students to "play from the heart." "You must play cantabile, you must make your

"Quite possibly one of the most significant developments in CD technology ..."

Bert Whyte, **AUDIO**, September 1984



While it may look familiar on the outside, it is something else on the inside. A close look will reveal that Meridian has sought out the finest transport from the originator of CD technology, Philips in Holland. To this foundation they added analog electronics similar to a top quality preamplifier, with discrete components and a separate power supply. Further sonic benefits are attained by improving the servo control of the laser mechanism and reducing mechanical vibrations to lower the number of errors the digital system would otherwise have to correct.

You can hear the difference at your Meridian dealer.

BOOTHROYD STUART
MERIDIAN

Exclusive U.S. Distributor:

MADRIGAL
LTD.

P.O. Box 781, Middletown, CT 06457

instrument sing," he would say. Yo-Yo Ma has certainly adopted this philosophy, a great complement to his technical armamentarium.

Eugene Ormandy, conductor emeritus of the great Philadelphia Orchestra, is getting on in years, but his accomplishment here is splendid. Ormandy was a personal friend of Shostakovich and premiered several of his works in this country.

As for sound, this was recorded by CBS engineer Bud Graham and his cohorts on the Soundstream digital recorder. Harkening back to the old days of CBS recordings of the Philadelphia Orchestra, they used the Scottish Rite Cathedral. Bud provides a moderately close-up sound, affording good orchestral definition in the warm and spacious acoustics of the Cathedral. Yo-Yo Ma's cello is in the phantom center channel, just slightly forward of the orchestra, and never sounds too prominent. Generally good balances and nice, clean sound—except, alas, when massed high strings begin to play at higher amplitudes. Then, they get overbright and somewhat shrill. Nonetheless, this is a most worthwhile recording. Bert Whyte

Fresh Aire: Mannheim Steamroller
American Gramophone AGCD-355.
(Available from American Gramophone, 9130 Mormon Bridge Rd., Omaha, Nebr. 68152.)

For the last half-decade or so, the productions of American Gramophone have been audiophile favorites, renowned for their quality of production and technical excellence. This company's still-small catalog is finding its way onto CD, and how welcome it is. This album is the first of the "Fresh Aire" set, which presently numbers five, and over the coming months we expect to see them all on CD.

CAN YOU SEE THE MUSIC?

B&W's newest star is in the spotlight.

To celebrate the marriage of Audio and Video, B&W of England commissioned its world renowned research team to design a loudspeaker dedicated to the audio/video environment. A new star was born!

Until recently, TV was meant to capture the eye rather than the ear, a one-experience medium. But now, with the availability of Beta and VHS Hi-Fi and the advent of Stereo TV, it has become a two-experience medium. Yes, you can expect theatre quality sound in your own living room. B&W video acoustic monitors reproduce the whole eight octaves of sound, an astounding improvement over the four to five octaves reproduced by ordinary TV speakers.

The television picture tube and associated components are seriously affected by stray magnetic fields. The magnets employed in TV loudspeakers are shielded to prevent magnetic interference but if large magnets required to produce true high fidelity are used, then shielding is only partially effective.

B&W goes one step beyond. B&W has totally redesigned the magnet circuits and motor system by producing nickel-cobalt centre pole magnets. B&W has produced ZMF speakers, giving virtually a Zero Magnetic Field. This revolutionary new approach actually enhances the performance of the loudspeaker system beyond anything achievable with simple screening; B&W ZMF speakers can be placed immediately adjacent to the television monitor without creating any adverse effect.

Behind the successful development of these video acoustic monitors lies B&W's world leadership in loudspeaker technology and design. B&W's Model 801 has been selected by famous recording companies, orchestras and conductors worldwide as their classical music monitor. For both the professional recording artists and the critical music lover, B&W has dedicated itself to the pursuit of perfection in the recreation of live sound.

More than a contribution to viewing pleasure, B&W ZMF loudspeakers provide all that has been missing from the complete audio video experience. LISTEN AND YOU'LL SEE!



B&W

See dealer listing on page 114.

Enter No. 10 on Reader Service Card

VIDEO ACOUSTIC MONITORS

SUPERB SOUND WITHOUT PICTURE DISTORTION OR MOVEMENT

Anglo American Audio P.O. Box 653, Buffalo, NY 14240 (416) 297-0595

Joe Beck's music is interesting and well scored. It ranges from a sort of introspective collage of guitar to lusty romps with the sextet in full cry.



"Fresh Aire" is the brainchild of composer-arranger Chip Davis, whose ability to meld modern and baroque musical styles is unique. Old and new instruments blend beautifully in a tasteful classical/rock setting. Highly recommended. *John M. Eargle*

Friends: Joe Beck
DMP CD-446. (Available from Digital Music Products, Rockefeller Center Station, P.O. Box 2317, New York, N.Y. 10185.)

Tom Jung continues to expand his Digital Music Products catalog with mostly small-scale stuff—but, without question, some of the best-sounding CDs on the market.

On his latest, *Friends*, he has recorded the redoubtable Joe Beck with his electric guitar, along with some stellar sidemen making up a really free-swinging sextet. All but one number in this generous 58:55 program was composed by Joe Beck. It is interest-

ing, well-scored music and ranges from a sort of introspective collage of guitar, with bells and percussion exhibiting much energy in the upper harmonics, to lusty romps with the sextet in full cry. The group frequently sounds like Weather Report.

As usual, Tom Jung has provided superb sound, recorded close-up with moderate reverb. It is pristine clean, highly detailed, beautifully balanced. Another winning effort! *Bert Whyte*

Buxtehude Organ Works, Volumes 1 and 2. Wolfgang Rubsam, organ. **Bellaphon 690-01-007 and 690-01-017.**

Bellaphon is a small German label whose CDs are now being distributed here. Their classical catalog seems to be largely baroque offerings, but there is a significant jazz segment as well.

These CDs are the first of the complete set of Buxtehude's organ works,

Outstanding

Designed by Dieter Rams, award-winning ADS Atelier components are rational, uncluttered audio equipment that emphasize both excellent real-

world performance, and human factors. For more reasons why you can't live without them call 800-824-7888 (in CA 800-852-7777) operator 483. Or write to

Chris Browder (our sales manager), ADS, 552 Progress Way, Wilmington, MA 01887. He'll send literature and the name of your nearby dealer.

T2 Tuner

Digitally synthesized tuning includes unique fine-tuning capability. **1**

16 preset stations, AM or FM. **2**
 Plus two other tuning modes; scan and manual. **3**

Excellent selectivity for exceptionally interference-free reception.

"...The T2 (tuner) sounds as good as it looks..."
Computers & Electronics



A2 Amplifier

Separate inputs for moving magnet and moving coil cartridges.

Rail-switching power supply.

Separate listening and taping outputs. **4**

Audio inputs for VCR or VideoDisc player. **5**

"... (On the A2 amplifier) you find some options that many separates omit, including high-cut and infrasonic filters." *High Fidelity*

C2 Cassette deck

Cassette drawer illuminated from within. **6**

Drawer slides out under its own power when you push button. **7**

Dolby B & C noise reduction controls placed logically inside cassette drawer. **8**

A sonic knockout which makes full use of the CD medium, Jeffrey Osborne's *Don't Stop* delivers fine, fine music.

and the decision to issue them all on CD is a bold one. Rubsam has chosen different instruments for the two discs, and both are in quite reverberant environments, upwards of 5 seconds. A good bit of musical detail could be lost under such circumstances, but Rubsam has paced the music in such a way that the structure comes through clearly. His performances tend to be a little mannered, at least in my opinion, and some of the drive of the preludes and fugues is sacrificed to a too flexible and pliant rhythmic line. However, this approach is well suited to the choral preludes, which make up a large portion of both programs.

Acoustics aside, the recorded sound is clean and realistic, if a bit distant. *John M. Eargle*

Don't Stop: Jeffrey Osborne
A&M CD 5017 DIDX 85.

Don't Stop punches its way out of clean silence with a fistful of musical

muscle, and it's a CD knockout. True to its title, Jeffrey Osborne's high-energy 1984 recording never stops delivering fine, fine music. With the exception of a couple of sweet, soul-tinged ballads such as "Let Me Know," the rabbit-punch rhythms of these cuts sweep them along at a swift clip. There's a wonderful staccato quality to these arrangements; percussion, synthesizers, bass, drums, and guitars jab cleanly into aural space, held together by Osborne's rich, commanding vocals at center ring. This staccato quality really shows off the capabilities of A&M's CD. The sound is crisp and pristine, each note wonderfully defined, whether it's deep in the mix like the faintest of chimes in the far right channel of "The Power," or way up front, like the lovely ringing guitar work by Michael Sembello on the opening title cut.

Here I must make note of a major error in A&M's otherwise superior liner booklet, which is one of the rare CD inserts to contain complete lyrics and

credits for the folks involved in this hot project. The credits for the title cut and the one that follows it, "Let Me Know," apparently have been reversed. The giveaway lies in the string credits: Hard as I listened, I could discern no strings attached to "Don't Stop," contrary to the credit line. Producer George Duke's own acoustic piano solo is a no-show on "Don't Stop" as well. However, both strings and piano appear on "Let Me Know."

Although this album has an R&B sensibility and a slam-bang energy associated with heavyweight dance music, it offers much, much more, and it is patently unfair to categorize it so narrowly. Osborne takes a lightning stab at funk-rock in "Hot Coals," knocks the ladies off their feet with the sensual, string-sweetened balladry of "Let Me Know," and presents a cast of pop champs—Pat Benatar, James Ingram, and Kenny Loggins among them—in a rocking yet voluptuous "Live for Today." His lyrics are pop/literate, and



P2 Turntable

Suspension isolates platter and tone arm to eliminate feedback.

Controls located outside dust cover. **11**

Angled dust cover allows full opening under overhanging shelf. **12**

Geometry of ultra low-mass tone arm reduces tracking error to theoretical limit. **13**

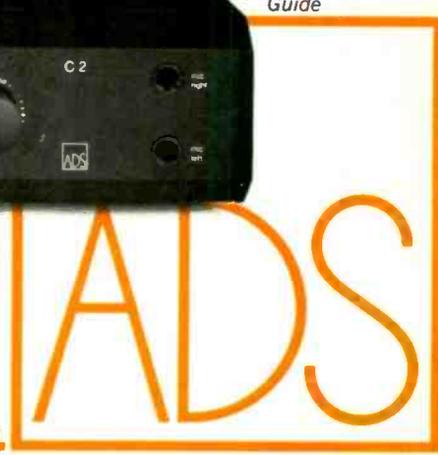
"... we believe that (the P2 turntable's) straightforward design contributes to extremely high performance..." *Audiophile Buyer's Guide*

© 1984 Analog & Digital Systems Inc.

Repeat button instructs deck to rewind and replay automatically. **10**

"The ADS C2 (cassette deck) provides excellent response, well-designed metering, low noise and distortion—all for a moderate price." *Audio*

Bias and Eq controls for all 4 tape types also placed in cassette drawer. **9**



Enter No. 1 on Reader Service Card

ADS Atelier.

SONEX looks as good as it sounds.

SONEX traps sound four times better than rich, thick carpeting, so just a few squares can tune your room like recording engineers tune their studios. It's easy to hang, and it looks good. Write for our color brochure, or try a box today. Four 24" squares per box.

Send \$39.95 plus \$3 shipping/handling to: 3800 Washington Ave. No., Minneapolis, MN 55412.

illbruck



Enter No. 22 on Reader Service Card

Try Audio's Classifieds

The marketplace for Hi-Fi gear!

Audio

BACK ISSUES/ BOUND EDITIONS/ BINDERS

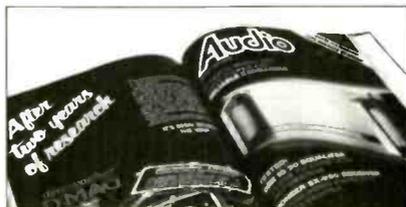


BACK ISSUES

Single-copy back issues of AUDIO from 1982 through 1984 are available. (Note: October 1983 is unavailable.) \$5.00 per issue postpaid.

BOUND ISSUES

A ready reference for audiophiles! A full year of AUDIO is carefully hard-bound for easy reference. Complete volumes for the years 1977 through 1983 are available.



BINDERS/ SLIPCASES

Maintain your AUDIO collection in these top quality binders or slipcases. Binders, \$9.00 each; 3/\$26.00; 6/\$50.00. Slipcases, \$7.65 each; 3/\$22.00; 6/\$40.00. Include \$2.50 per order for postage and handling.

TO ORDER indicate issue/book/binder/slipcase. Include proper amount for postage and handling. California residents must include 6% sales tax. Allow 4 weeks for delivery. Make check/money orders payable to: Old Del Mar Emporium (ODME), P.O. Box 1126, Redlands, CA 92373. DIRECT TOLL-FREE ORDER NUMBER: 1-800-833-6363. In California, call: 1-714-496-1842. Call Monday-Friday, 8:00 AM to 6:00 PM PST. Use your Visa, Mastercard, or American Express card. \$15.00 MINIMUM CREDIT CARD ORDER.

With an orchestra pared down to the size of those originally used, conductor Gerard Schwarz gives a fast-paced reading of Beethoven's "Pastorale."

his vocal and instrumental command are unquestionable.

Producer Duke deserves a trophy for his efforts, as does chief engineer Tommy Vicari and the large team of assistant engineers who turned out this championship recording. Spatial presentation is spectacular. Osborne's voice is center ring, where it belongs, surrounded by an instrumental arena of real aural depth and breadth. A high point is the ear-opening sense of movement created by a synthesizer in "The Power." The synth, sounding like a giant slowly inhaling, sweeps from right to phantom center to left channel as the cut ends. In fact, *all* the cut endings are impressive and a splendid showcase for the CD's extended dynamic range.

This CD is, both musically and technically, a real winner. *Paulette Weiss*

Beethoven: Symphony No. 6, "Pastorale." Y Chamber Symphony, Gerard Schwarz.
Delos D/CD 3017.

Here is an unusual Beethoven Sixth Symphony, "Pastorale," in that the performing orchestra is scaled down in size to the forces employed during Beethoven's time.

The Y Chamber Symphony of New York is conducted by its founder, Gerard Schwarz. Mr. Schwarz has turned his orchestra into a fine-sounding ensemble, much admired by the tough New York critics.

The Soundstream digital recording was engineered by my good friend Marc Aubort, which usually guarantees sound of exemplary quality. The work was recorded in Masonic Temple in New York, a spacious but not overly reverberant hall with a nice ambience and one where Marc has recorded many times. Using his basic tube-type omni Schoeps mikes, Marc achieves a very open and cohesive sound field, with good orchestral definition.

My only quibble is a bit of over-brightness in the high strings. Schwarz's performance is somewhat fast-paced, but his "Storm" is tumultuous and very exciting, with the Soundstream's unbridled dynamic range affording a most full and sonorous sound in spite of the reduced size of the orchestra.

Bert Whyte

CLASSIFIED ADVERTISING RATES

BUSINESS ADS—\$1.40 per word, MINIMUM charge PER AD, PER INSERTION \$33. All centered or spaced lines \$11.

NON BUSINESS ADS—95¢ per word, MINIMUM charge PER AD, PER INSERTION \$17. All centered or spaced lines at \$9.

ALL LINE ADS—First line set in bold face type at no extra charge. Additional words set in bold face at \$1.65 extra per word. One point ruled box is \$12.

CLASSIFIED LINE ADS ARE PAYABLE IN ADVANCE BY CHECK OR MONEY ORDER ONLY. (Sorry, we cannot accept credit cards or bill for line advertising.) **ALL LINE ORDERS** should be mailed to:

AUDIO/CBS Magazines
P.O. Box 9125
Dept. 346V
Stamford, CT 06925

ORDERS WILL NOT BE PROCESSED WITHOUT ACCOMPANYING CHECK OR MONEY ORDER FOR FULL AMOUNT.

CLOSING DATE—First of month two months preceding the cover date. If the first of the month falls on a weekend or holiday, the closing date is the last business day preceding the first. **ADS RECEIVED AFTER THE CLOSING DATE WILL BE HELD FOR THE NEXT ISSUE UNLESS OTHERWISE STATED.**

FREQUENCY DISCOUNTS—3 times less 5%, 6 times less 15%, 12 times less 20%. These discounts apply to line ads only. Ads submitted for a three-time frequency are unchangeable. Frequency discounts not fulfilled will be short-rated accordingly. Agency discounts do not apply to line advertising.

BLIND ADS—Audio box numbers may be used at \$6 extra for handling and postage.

GENERAL INFORMATION—Ad copy must be typewritten or printed legibly. The publisher in his sole discretion reserves the right to reject any ad copy he deems inappropriate. **ALL ADVERTISERS MUST SUPPLY:** Complete name, Company name, Full street address (P.O. Box numbers are insufficient) and telephone number. Classified LINE ADS are not acknowledged and do not carry Reader Service Card Numbers. **AGENCY DISCOUNTS** do not apply to line advertising. **FREQUENCY DISCOUNTS** not fulfilled will be short rated accordingly. Only those advertisers who have prepaid for their entire contract time will be **RATE PROTECTED** for the duration of that contract, in the event of a rate increase.

CLASSIFIED DISPLAY RATES

1 col x 1 inch	\$275
1 col x 2 inches	\$435
1 col x 3 inches	\$622
2 cols. x 1 inch	\$495
2 cols. x 2 inches	\$836

One column width is 2 1/8". Two columns wide is 4 1/4". For larger display ad rates and 6, 12, 18 and 24 times frequency rates call (212) 719-6338.

DISPLAY ADVERTISERS should make space reservation on or before the closing date. Ad material (film or velox) may follow by the tenth. **DISPLAY ADVERTISERS MUST SUPPLY COMPLETE FILM NEGATIVE READY FOR PRINTING OR VELOX. PRODUCTION CHARGES WILL BE ASSESSED ON ANY AD REQUIRING ADDITIONAL PREPARATION.**

ALL DISPLAY CORRESPONDENCE should be sent to:

Laura J. Lo Vecchio
AUDIO MAGAZINE
1515 Broadway
New York, NY 10036

FOR ANY ADDITIONAL INFORMATION, contact Laura directly at (212) 719-6338.

ASTOUNDING

loudspeakers from

EUPHONIC AUDIO

RR1 Box 266 New Egypt, N.J. 08533 201-989-2613

ATTENTION READERS:

Please note that only retailers who are authorized by manufacturers to sell their product lines are listed under the heading "AUTHORIZED DEALERS." This particular category is further subdivided into the geographic areas which these dealers serve.

Ads placed by private individuals, manufacturers and retailers can be found in specific categories, i.e., AMPS/PREAMPS. (The letters AD in bold face type at the end of an ad means **AUTHORIZED DEALER.**) We hope this will allow you to easily locate a specific product or service.

Audiophile's Corner

A Phono Cartridge is Like a Violin

No two sound exactly alike. We recommend the Alpha 1 moving coil cartridge by Monster Cable for its purity in sound and consistency in manufacturing. What it extracts from the record grooves is nothing short of phenomenal. Audition it at:

ELITE ELECTRONICS
20149-A Stevens Creek Blvd. Cupertino, CA 95060

AUTHORIZED DEALERS

NATIONAL

ABBIE'S AUDIO OFFERS CARVER, TANDBERG, David Berning, B&K, Nova, Lazarus, Robertson, Goetz Systems, Watkins, JSE, Spica, M&K, Celestion, VPI, AR Tables, Pink Triangle, Souther, Alphason, MMT Premier, Sumiko, Tailsman, Koetsu, Audioquest, Promethean Green, Monster Cable, Randall Research, Discrete Technology, Music Link, Heybrook, Zeta, Nitty Gritty, and others, free newsletter, 302 E. High St., Waynesburg, PA 15370, (412) 852-1134.

IF YOU ARE OBSESSIVE ABOUT DIGITAL AUDIO, WELCOME TO THE CLUB.

It's the Sony Digital Audio Club. The world's first club dedicated to creating awareness and understanding of the remarkable technology behind compact disc players—from the company that's most qualified to provide it.

This year, to welcome you to the club, you'll receive special promotions on compact discs; discounts on digital accessories; the club's quarterly newsletter, "The Sony Pulse"; The Sony Book of Digital Audio Technology (with over 300 pages of facts and details); a 30" x 40" digital audio poster; a digitally-recorded compact disc; and extensive information about the latest advances in digital prod-

ucts from Sony—the leader in digital audio.

To become a member, simply mail the coupon below, along with a check or money order for \$15* to Sony Digital Audio Club, Post Office Box 161, Lowell, Massachusetts 01852.**

And join the thousands of people who are already well on their way to satisfying their obsessions.

SONY

THE LEADER IN DIGITAL AUDIO.™

Name _____

Address _____

City _____

State _____ Zip _____

AM/2/85

*\$3.00 additional for postage and handling outside the U.S. ** Please allow 4-6 weeks for delivery.



Authorized Dealers

- ALABAMA**
Lies Audio Birmingham AL
- ALASKA**
Shimas Audio
405 E. Northern Lights Blvd
Anchorage AK
- ARIZONA**
Whison Audio Ltd. Tucson AZ
Sound Advice Phoenix AZ
- CALIFORNIA**
Chrysler Hansen Los Angeles CA
Henry Radio Los Angeles CA
Audio Command (Command West)
Los Angeles CA
Henry Radio Anaheim CA
Marcon Radio Inc. Glendale CA
Sound Company San Diego CA
Breen Sound Center San Diego CA
Dimensions In Stereo Torrance CA
Jonas Miller Sound Santa Monica CA
Audio Den Vign Nvus CA
Omega High Fidelity Claremont CA
Newport Audio Newport Beach CA
Carolina Sound San Rafael CA
Pro Audio Electronics Oakland CA
Golden Ear Chico CA
Stereo Horizons Lodi CA
Monterey Stereo Monterey CA
The Audio Difference Palo Alto CA
E. Dorado Audio South Lake Tahoe CA
Stereos Stereo San Francisco CA
The Sounding Board Berkeley CA
- COLORADO**
Boulder Sound Gallery Denver CO
Luten Lip Denver CO
Boulder Sound Gallery Boulder CO
Luten Lip Boulder CO
Audioelectronics Inc. Grand Junction CO
C.A.O.S. Audio, Colorado Springs CO
Mountain Music Val. CO
- CONNECTICUT**
Twister Etc. New Haven CT
Sound Advice Norwich CT
H. F. Stereo House Inc. Newington CT
Sounds Incredible Brookfield CT
Near Here Audio Ltd. Enfield CT
Audiovision Inc. Greenwich CT
- DISTRICT OF COLUMBIA**
Myer Emco Washington DC
- FLORIDA**
Market Place Electric Orlando FL
Audio Etc. Jacksonville FL
Las Fabrics Miami FL
Cartronics Miami FL
Audio Gallery Sarasota FL
Monte's Rolling Sound Tampa FL
Pyramic Audio Clearwater FL
Sound Gallery Ft. Lauderdale FL
Audio Group D/Fort Pierce
Fort Pierce FL
- GEORGIA**
Georgia Music Macon GA
- HAWAII**
Hilo Audio Inc. Hilo HI
Audio Design Honolulu HI
- ILLINOIS**
Audio Dimensions Moline IL
Glen Pogor & Audio Video Champaign IL
Audio Labs Springfield IL
Audio Consultants Evanston IL
Audio Enterprises Inc. Chicago Heights IL
Audio Music Believe It IL
Paul Health Audio Chicago IL
Stereo Systems Inc. Aurora IL
- INDIANA**
Aardvark Audio Mishawaka IN
- IOWA**
Audio Labs Des Moines IA
Audio Emporium Sioux City IA
The Audio Room Cedar Rapids IA
Audio Odyssey Davenport IA
- KANSAS**
Custom Sound Wichita KS
Kell's Hi-Fi Phonographs Lawrence KS
- LOUISIANA**
The Ragat Home & Commercial
Baton Rouge LA
Audio Systems Inc. Lafayette LA
Wilson Audio New Orleans LA
- MAINE**
New England Music Co. Portland ME
- MARYLAND**
Myer Emco Rockville MD
Wynne Automotive Rockville MD
- MASSACHUSETTS**
Sound & Music Northampton MA
Audio Concepts N. Attleboro MA
The Music Box Weymouth MA
Goodwin Music Systems Cambridge MA
Natural Sound Framingham MA
Cartridges Inc. Watertown MA
Nantucket Sound Hanover MA
- MICHIGAN**
Almas H.F. Stereo Dearborn MI
Classic Stereo Grand Rapids MI
Birmingham Auto Sound
Birmingham MI
Pome Electronics Grosse Pointe MI
- MINNESOTA**
Jensens Stereo Shop Burnsville MN
Stereo One Brainerd MN
Excelsa Music Inc. Edina MN
- MISSOURI**
Johnston's Audio Columbia MO
House Of Sound Springfield MO
Auto Etc. Inc. St. Louis MO
- MONTANA**
Rocky Mountain Hi-Fi Great Falls MT
Electric Paris Missoula MT
- NEBRASKA**
Sound Dimensions Lincoln NE
Customs Electronics Corp. Omaha NE
- NEVADA**
The Upper Ear Las Vegas NV
- NEW HAMPSHIRE**
Camera Shop Of Hanover Hanover NH
Campus H.F. Manchester NH
Auto Sounds Of NH Exeter NH
- NEW JERSEY**
Stuarts Audio Westfield NJ
Professional Audio Consultants
Mt. Burn NJ
The Audio Lab New Brunswick NJ
Audio Guard Inc. Englewood NJ
Jido's Automotive Corp. Englewood NJ
Sound Works Cherry Hill NJ
Sight & Sound Inc. Morristown NJ
Larkin Audio Wyckoff NJ
- NEW MEXICO**
Hudson's Audio Cir. Albuquerque NM
The Customman Santa Fe NM
Beason's Inc. Carlsbad NM
- NEW YORK**
Bobby O'S Audio World Huntington NY
Cine Music Syracuse NY
Gala Sound Rochester NY
The Happy Ear Walden NY
Transcendents Audio Ltd. Amherst NY
Unicom Audio Balaivis NY
Innovative Audio Brooklyn NY
American Audio Inc. New York NY
Park Ave Audio New York NY
Thru-A-F New York NY
Audio Saxon New York NY
Orpheus Audio Video Cons Ltd. NY NY
Ear Drum Norwalk NY
Pharos Custom Sound Southampton NY
The Audio Experts Inc. White Plains NY
Electronics Unlimited Roslyn Hts. NY
The Listening Room Scarsdale NY
Sound Concepts Mt. Kisco NY
Sounds Interesting Spring Valley NY
Stereo Stereo Freeport NY
Designations Stereo Store Setauket NY
- NORTH CAROLINA**
Audio Showcase Morganton NC
Mobile Sound Authority Durham NC
Audio Sound Inc. Raleigh NC
Acoustics Inc. Greensboro NC
- OHIO**
Larson Audio Dayton OH
On Sound Akron OH
P. J. Stereo Center Columbus OH
B&B Appance Co. Inc. Middleburg OH
Jameson's Toledo OH
- OKLAHOMA**
Audio Sonograph Ltd. Tulsa OK
Audio Dimensions Oklahoma City OK
- OREGON**
Oregon Audio Beaverton OR
Oregon Tapes Eugene OR
- PENNSYLVANIA**
House Of Records Erie PA
Video Sound Gallery Pittsburgh PA
Audio Stereo Centre Easton Hts. PA
The Stereo Store State College PA
Audio Etc. York PA
- SOUTH CAROLINA**
Music Padder Georgetown SC
- TENNESSEE**
Music By Audio Inc. Memphis TN
The Sound Room Johnson City TN
- TEXAS**
Audio & Morgan Music Co. Garland TX
Audio Works, Nacogdoches TX
Showers Stereo Midland TX
Electronic Service Center Dallas TX
B&M Electronics Inc. Houston TX
Sheffield Audio Inc. Houston TX
Audio Source San Antonio TX
- VERMONT**
Myer Emco Salton Burlington VT
- VIRGINIA**
Myer Emco Falls Church VA
- WASHINGTON**
Defensive Audio Seattle WA
Electronic Audio Bremerton WA
Stereo Shoppe Tacoma WA
- WISCONSIN**
Sound & Music Wisconsin Rapids WI
Sound Seller Marinette WI
Audio Emporium Milwaukee WI
Hi-Fi Heaven Green Bay WI
Stereo Sound Systems Corp.
Madison WI
- ALBERTA CANADA**
Audio Ark Edmonton AB
Sound Advice Calgary AB
- BRITISH COLUMBIA**
Stereo Sounds Brangora BC
The Sound Room Vancouver BC
The Sound Room Vancouver BC
Electronic Shop Victoria BC
Vancouver BC
The Harmonic Audio Warehouse
Kamloops BC
- MANITOBA**
Sound Direct Audio Winnipeg Man
Excelsa Distributors Winnipeg Man
Pro Music Ltd. Winnipeg Man
- NEW BRUNSWICK**
Whiz Kids Moncton NB
- NOVA SCOTIA**
Music Shop Dartmouth NS
Electric Co. Distributors Truro NS
- ONTARIO**
Anderson Sound Hamilton Ont.
Anderson Sound Kitchener Ont.
The Audio Centre London Ont.
Bay Bloor Radio Toronto Ont.
Bay Bloor Radio Scarborough Ont.
Cape Audio Audio Ottawa Ont.
Charmy Browne Sudbury Ont.
Dix Audio Etc. Brampton Ont.
Martin TV & Sound Port Credit Ont.
Sunderlight Co. Rexdale Ont.
Dix Audio Etc. Brampton Ont.
Dimension Stereo Kingston Ont.
Music Starport Stratford Ont.
Stereo Factory Thornhill Ont.
Frank Thompson Audio Hamilton Ont.
Taborn Electronics Downsview Ont.
Stereo Respective Sarnia Ont.
- QUEBEC**
Pierogy Haute-Fidélité
Shawmignard Que.
Atriers Electrique Sagssue Que.
St. Hubert & Gruby Que.
Audio Club Montreal Que.
La Boutique Du Son Stee. Que.
Wim Layton Audio Montreal Que.
Ous Audio Montreal Que.
Dimension D'écoute Huntington Que.
Roiac Electronique Ste-Joye Que.
Sound Images Montreal Que.
Circuit Electrique Chicoutimi Que.
Beaudry Electronique Joliette Que.
Belle Audio & Video Ste. Jovite Que.
Do-d'ard-orenaque Que.
Audio Perfection Coaticouche Que.
Vidéo Inc. Montreuil-Moreau Que.
- SASKATCHEWAN**
Sales Electronics Ltd. Kerrobert Sask.
Custom Stereo Saskatoon Sask.
Harris & J. Ltd. Regina Sask.

Visit a Showcase of AudioVideo Values in N.Y.C.-L.I.-Metro Area

ADS-BE-5-DOH STAR-GRAND-ALPINE GRACE AMBER-ADCOM-SIGNET FOSTER-DECHON-UDMAN-ALUSON-PYRAMID
PROAC-TALISMAN-PROTON-AUDIO-PRO-ACOUSTICS-AUDIOQUEST-UNICO BOY-BANG-I-DULFINER-BOSTON-ACOUSTICS

Call for hours: 212 961-9888. No mail orders.

173 Broadway, New York City, NY 10007
135 W. corner of B'way & 42nd St. One flight up, entrance on 42nd St.
184-10 Horner Harding Expm. Fresh Meadows, NY 11365
East 25 L.I.E., Utopia Plazn (Three blocks from Times Square)

AUTHORIZED DEALERS NATIONAL

ACOUSTAT AND PS AUDIO—SUPERB!
Free shipping! Fast service! Also Nakamichi, Thorens, Talisman, Audire, Hafler, Klipsch, Adcom, Mitsubishi, SAE, compact digital players. READ BROTHERS STEREO, 593 King Street, Charleston, South Carolina 29403. (803) 723-7276.

APPALLING? ISN'T IT?
How many esoteric audio products look and feel as if they were made by orangutans with screwdrivers. If you are fed up with sacrificing reliability, aesthetics and quality of construction to obtain purer sound, don't despair!
There are many high end audio components built by small yet solid professional companies which not only express the utmost in musicality but also reflect the high level of design integrity, craftsmanship and quality control. At Sound By Singer we select and blend only such components into systems designed to extract the most music from your audio dollars.

ACOUSTAT • ADCOM • AKROYD • APOGEE • AUDIOQUEST • AUDIO NOTE • AUDIO INTERFACE • AUDIO VOIS • B&K • BERNING • BEVERIDGE • COUNTERPOINT • CWD • DYNAVECTOR • FUSELIER • GRACE • GRADO • KISEIKI • KLOSS • KOETSU • KRELL • LINN SONDEK • LIVEWIRE • MC LAREN • MONSTER CABLE • NAIM AUDIO • NITTY GRITTY • NOVAK • NYAL (MOSCODE) • PRECISION FIDELITY • PROAC • PROTON • RANDALL RESEARCH • RAUNA • REGA • ROBERTSON • SNELL ACOUSTICS • STAX • SYMDEX • SYRINX • TALISMAN

SOUND BY SINGER
165 E. 33RD STREET
New York, NY 10011
(212) 683-0925
WE SHIP ANYWHERE

ATTENTION: BERNING, ALPHA, SOTA, AR TURNTABLE, DYNAVECTOR, STAX, FULTON, KOETSU, PETERSON, AUDIBLE ILLUSIONS, WALKER, MUSIC & SOUND, ZETA, ALPHASON, DENON CARTRIDGES, ELECTRO KINETICS, SHINON, GOETZ, BRB, OTHERS. CODS MAURY CORB 713-7284343

ATTENTION DYNA, HAFLER, CROWN OWNERS
Frank Van Alstine and Associates engineer complete new transcendence power-mos-fet amplifier and precision fet preamp designs to interface with your existing chassis. Original circuits, and their problems, are discarded. Obtain superior performance without buying expensive new hardware. Learn why "underground" magazines claim our rebuilt Dyna 150 is a best buy, our MOS-FET 120B sounds like 150 watts, our FM-5 circuits sound best, and our preamps play music. Call or write for free catalogue and sample Audio Basics monthly newsletter. We ship worldwide. Jensens Stereo Shop, 2202 River Hills Drive, Burnsville, Minnesota 55337 (612) 890-3517.

REPRESENTING THE BEST: Maplenoll, ProAc, Berning, Spectrum, Audioquest, BP Audio, 538 N. 8th Street, Reading PA 19601. (215) 375-9874 evenings and weekends.

AUTHORIZED DEALERS NATIONAL

AUDIO CLASSICS INVITES YOU TO EXPERIENCE the musical difference. Dealer for: Merrill, Souther, Pink Triangle, Koetsu, Accuphase, Alphason, Precision Fidelity, Quicksilver, Tiptoes, Triplanar, Onyx head-amp, Vampire Wire, Audible Illusions, Elite Rock, Straight Wire, Spectrum, Tiffany connectors, Kindel Audio, Lead Balloon, Discrete Technology, Fidelity Research, Promethean Green, Lazarus, YSL records and more. Ask us for the complete literature package which also includes our list of used and demo equipment. AUDIO CLASSICS INC., Oklahoma City, Oklahoma, (405) 842-3033.

AUDIO CONCEPTS—HOUSTON

Linn Sondek	Naim Audio	Isobariks
Rega	Mark Levinson	Spectral
Magnepan	Nakamichi	NAD
Kinergetics	Thorens	Energy
Apt	Hafler	PS Audio

Shipped prepaid. Closed Mondays. (713) 527-0774.

BEST DARN TRADES OFFERED. Dealer for Accuphase, Acoustat, Alpha-1, Audioquest, Audio Research, AR turntables, Beard, Bedini, Belles, Berning, Classe, Counterpoint, Creek, Dual, Duntech, Dynavector, Electrocompaniet, Electro Research, ESB, Goetz, Goldbug, Grace, Grado, Gyro-dec, Hafler, Hellus, JSE, Koetsu, MAS, Monster Cable, Music-Link, Oracle, Perreaux, Pentagram, Pink Triangle, Premier, Precision Fidelity, PS AUDIO, Pyramid, Rauna, Robertson, Rogers, Snell, SOTA, Spendor, Spica, Souther, STAX, Sumiko, Symdex, Syrinx, VPI, Win-Labs, Nitty Gritty, and more. In the beautiful OZARKS, Audio Doctor, 1518 West Commercial, Box 390, Buffalo, Missouri, 65622. 417-345-7245 Newsletters.

BEST TRADES OFFERED—Acoustat, Audio Research, Beard, Berning, Belles, Classe, Counterpoint, Creek, Dual Electro Research, ESB, Goetz, Hafler, Hellus, KEF, Koetsu, Oracle, Perreaux, Pink Triangle, PS Audio, Pro-AC, Robertson, Rogers, Snell, SOTA, Spendor, Spica, Souther, STAX, Sumiko, Syrinx, VPI, Premier, AR turntables, and more. Audio Doctor, P.O. Box 390, Buffalo, Missouri 65622. (417) 345-7245. Free newsletters.

EXCEPTIONAL AUDIO REPRODUCTION SYSTEMS
REGA, HEYBROOK, LOGIC, THORENS, AR, DUAL turntables; ZETA, REGA, PREMIER, LOGIC, GRACE tone-arms; ADCOM, ARCAM, AUDIRE, CREEK, KENWOOD BASIC, KYOCERA, ROTEL, SHERWOOD, VSP LABS electronics; FRIED, HEYBROOK, MORDAUNT-SHORT, MAS, REGA, WATKINS loudspeakers; TALISMAN, SUPLEX, GRADO & SIGNATURE, PROMETHEAN, REGA, PREMIER, ARCAM cartridges; AUDIOQUEST, DECCA, NITTY GRITTY, THE PIG, LIVEWIRE and other accessories. EARS, P.O. BOX 658-U, W. COVINA, CA 91790. 818-961-6158 EVENINGS, WEEKENDS MC/VISA. ANY MONTHLY SPECIALS! (SEND STAMP)

HAFLER—NEW AMPLIFIER
We stock all of the following components: DH-100K \$175.00, DH-100A \$225.00, DH-110K \$360.00, DH-110A \$440.00, DH-112 \$75.00, NEW DH-120 AMPLIFIER: DH-120K \$260.00, DH-120A \$340.00, DH-160K \$275.00, DH-160A \$375.00, DH-220K \$400.00, DH-220KE \$410.00, DH-220A \$500.00, DH-220AE \$510.00, DH-330K \$385.00, DH-330A \$460.00, DH-500K \$675.00, DH-500KE \$695.00, DH-500A \$850.00, DH-500AE \$870.00. Accessories too! Three year warranty on assembled units. FREE SHIPPING to all fifty states, PR and APO/FPO. WORLDWIDE EXPORTING. Visa and Master-Card honored. OXFORD AUDIO CONSULTANTS, INC., Box 145, Oxford, OH 45056-0145, 513-523-3333, TLX427791.

HAL'S STEREO & VIDEO CENTER. Established 38 years. Conrad Johnson, Perreaux, Sota, Sumiko, Magnepan, Monster Cable, Morkoff, Denon, Nakamichi, Proton and Mitsubishi Video, McIntosh. U.S. Rt. 1 & Texas Ave., Trenton, N.J. 08648 (609) 883-6338

THE PEOPLE TO LISTEN TO: knowledge, individual attention plus the names you want most in audio/video.

CSA

AUDIO/VIDEO

201/744-0600
upper montclair, n.j.

AUTHORIZED DEALER

•ACOUSTAT•ACOUSTIC ELECTRONICS•AUDIO RESEARCH•B&O•DENON
•Boston Acoustics•ADS•COUNTERPOINT•CARVER•DUNTECH•HAFLER
•Discrete Technology•KYOCERA•JENSEN VIDEO•PS AUDIO•ALPHASON
•Koetsu•Dahlgust•GRADO•LINN SONDEK•PROAC•SONOGRAPHIE
•REGA•Signet•THIEL•Naim•Koetsu•Grace

AUTHORIZED DEALERS

NATIONAL

MUSIC LOVERS: Exciting new advances in system design. Goetz, MCM, Spica, Berning, Lazarus, Sumo, The Rock, AR, MAS Mark II/MAS 282, Audioquest Shadow and AQ 407, Alphason, Grado, Shinon, Alpha, Koetsu, Music Link, LiveWire, Monster, Mobile Fidelity, Opus and select used/demo equipment. Newsletter, Musical Images of Kentucky, 11027 Buckeye Trace, Goshen, KY 40026, (502) 228-3200

NOTICE TO REVOX BUYERS: Unauthorized dealers are selling Revox products not designated for sale in the USA. **STUDER REVOX AMERICA CANNOT BE RESPONSIBLE FOR ANY WARRANTY SERVICING OF PRODUCTS SOLD BY THESE DEALERS.** For the location of your nearest authorized Revox dealer, call or write: Studer Revox America, 1425 Elm Hill Pike, Nashville, TN 37210; (615) 254-5651.

OXFORD AUDIO CONSULTANTS, INC.

For nearly ten years, we have been serving the audio cognoscenti, from our pastoral setting here in Oxford, Ohio, with excellent services, superb products and succinct, expert advice. We reach customers not only in Ohio, Kentucky and Indiana but throughout the United States, Puerto Rico and in countries all over the world. OAC specializes in accurate high quality audio components. Our product lines include AKG, Audionics, Dennessen, Hafler, Janis, Linn, Naim, Spondor, Vandersteen and Walker. Demonstrations are given by appointment in our single speaker demonstration room. Most orders are shipped by the next business day. We pay for shipping and insurance on orders shipped to the fifty states, Puerto Rico and APO/FPO. Our extensive export facility ships worldwide. OXFORD AUDIO CONSULTANTS, INC., Box 145, Oxford, OH 45056-0145, 513-523-3333, TLX427791.

SPICA SPEAKERS & ARCICI STANDS—SIMPLY THE BEST. Authorized dealer, personalized service, free shipping. Call for audition/prices. Mobile Recording Company, Carmel, IN, (317)-846-5308, 5-10 PM.

MIDDLE ATLANTIC

EVER WONDER WHAT REALLY GOOD DEEP BASS SOUNDS LIKE? Head on over to Cosmophononic Sound and wonder no more. We'll show you the remarkable JBL subwoofer, a speaker that reproduces the lowest octave with clarity and accuracy. Today's best sound sources have plenty of good deep bass, and only a JBL subwoofer will let you hear it the way it's intended to be heard. Cosmophononic Sound, 1614 2nd Avenue, New York City, (212) 734-0459.

ORPHEUS AUDIO—LONG ISLAND, NY

Lowest Prices! AR (turntable), Grace, Hafler, Kyocera, Orpheus, Sumiko, Vandersteen. (516) 676-5082.

DALLAS

AR	Nitty Gritty
Acoustat	Onkyo
Audible Illusions	PS Audio
Audio Source	ProAc
Audioquest	Randall Research
Belles	Reference Recordings
CJ Walker	Roberson
Conrad-Johnson	Sheffield
Electrocompaniet	SOTA
Grace	Sonographie
Grado	Souther
Harman-Kardon	Spica
Kimber Kable	Sumiko Products
Live Wire	Talisman
Magnepan	Thiel
MAS	Threshold
Monster Cable	VPI

Omni Sound
4833 Keller Springs Rd.
Dallas, Texas 75248
(214) 931-6664

Home of High End Values
Interfacing the finest equipment to meet your needs and budget.
Save on Audiophile Accessories & Records
Expert Service • Trade ins • FREE Shipping • MC/VISA
Write for Newsletter
40 Mass. Ave., Lexington, MA 02173
(617) 863-5221



AUTHORIZED DEALERS

MIDDLE ATLANTIC

AUDIO CONNECTION

In Northern New Jersey

TURNTABLES: Goldmund—Merrill—Heybrook—VPI

Industries—Systemdek IIX

TONEARMS: Eminent Technology—Goldmund Lurné

Grado Signature LSTA—Souther

CARTRIDGES: Alpha—Audioquest—Decca vdHul—

Grado Signature—Promethean

ELECTRONICS: (tube) Audible Illusions—Berning—

Eidolon—Jadis (France)—Quicksilver

(solid state) Electrocompaniet—Leach LSR&D—

FM Acoustics—Magnum—PS Audio—Klyne

SPEAKERS: Fuselier—Heybrook—Klndel—Rauna—

Spondor—Spica—3D—Vandersteen

ACCESSORIES: Goldmund mat/clamp—LiveWire—

Last—Randall—Kinergetics—Kimber Kable—Sims

Vibration Eng.—Tiptoes—Tweek—VPI

1-201-239-1799

615 Bloomfield Ave, Verona NJ 07044

AUDIO CONNECTION also has for sale: occasional close-outs, used equipment and display pieces. Single speaker demonstration; record cleaning; audiophile discs. Hours: Mo, Tues, Fri 12-7, Thurs 12-9, Sat 11-6. Please, call for an appointment!

Quality Tapes

THIS MONTH'S SUPER SPECIALS

TDK		MAXELL			
SA 90	1.85	MA 90	4.19	UDXL II 90	1.95
SA 60	1.75	MA 60	3.89	UDXL II 60	1.85
SAX 90	2.69	MX-5 90 New	4.19	XL II 5 90	2.65
SAX 60	2.49	MX-5 60 New	3.89	MX 90	4.69
ADX 90	2.55	MAR 90	5.99	UD 90	1.85
AD 90	1.85	MAR 60	4.79	UD 60	1.65
AD 60	1.48	LK 35-90	4.79	LN 90	1.15
D 90	1.15	LK 35-90B	5.85	LN 60	1.05
D 60	1.05	T-120	5.49	UD 35-90	4.89
MD-01 D/mag	15.49	T-120 H S	6.49	XL I 35-90B	6.39
				T-120	5.49
				T-120 HGX	7.49
SONY		FUJI			
UCXS 90	2.25	FR METAL 90	3.49		
UCXS 60	1.95	FR II 90	1.99		
LNK 90	1.05				
LNK 60	.85				
L-750	5.49	TRAC		DISC WASHER	
L-750 HG	7.49	Reels in Casset.		DISCKIT	
T-120	5.49	CDC 90	2.89	SYSTEM	
		CRC 90	5.19	Tape Care Set	
				11.49	
				16 oz. Fluid	
				9.99	

CALL NOW 718-434-5817 or order by mail

In Continental USA add \$3.50 for shipping on orders up to \$70. Over \$70 add 5% of total order. Elsewhere in USA add \$7 on orders up to \$70. Over \$70 add 10%. Outside USA write. MC/VISA additional 3%.

QUALITY TAPES

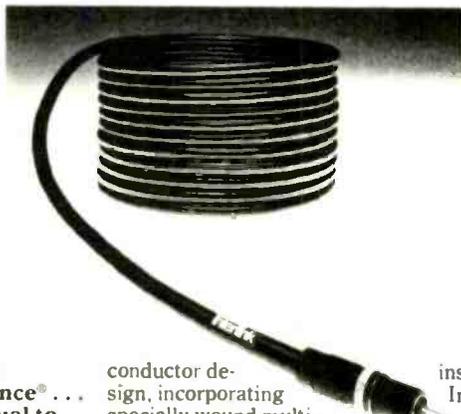
104 East 7th Street, Dept. A 2, Brooklyn, NY 11230

AUTHORIZED DEALERS

MIDDLE ATLANTIC

BRUCE AUDIO WANTS TO HELP your stereo system reach new lows—with a JBL subwoofer. Not only will the JBL B380 or B460 give you the bottom octave that's missing from most full-range systems, it will improve midrange reproduction by relieving the full-range woofers of responsibility for the lowest frequencies. Hear what a JBL subwoofer can do for your system at Bryce Audio, 115 West 40th St., New York City. (212) 575-8600.

Never Before has so Much Praise been Given to an Audio Cable



Monster Cable's Interlink Reference® . . . Performance equal to the world's finest audio components.

"Pure harmonic integrity"
Sound News Journal.
"Effortlessly revealing"
International Audio Review,
"Stunning clarity"
Stereophile.

It doesn't seem possible, but this is what you'll hear with Interlink Reference incorporating our new "Bandwidth Balanced™" cable technology. Interlink Reference utilizes a special dual

conductor design, incorporating specially wound multiple gauged "wire networks" to critically align the music signals in both amplitude and phase for the best possible sound with the least distortion.

The Result?

Music reproduction so real that the only thing better is a front row seat. Greater dynamic range, lower distortion, and the uncanny ability to precisely place and localize each

instrument . . . make Interlink Reference an indispensable part of your sound system. See your Monster Cable dealer for a demonstration, and see why the critics are raving. Then take some home . . . you'll rediscover how good your entire sound system can really be.



interlink® REFERENCE

Interlink 4 and Interlink Special are available at less cost and still use the same "bandwidth balanced" design.

Monster Cable® Products, Inc.
101 Townsend, San Francisco, CA 94107
415 777-1355 Telex: 470584 MCSYU1

Authorized Linn/Naim Dealers

Here is a list of a few good dealers that won't try to TALK you into believing that they are "experts". They can, and will, actually demonstrate the differences in components under conditions that will allow you to make a sensible decision.

ALABAMA

Audition, Homewood
Campbell Audio & Video, Huntsville

ARIZONA

Listening Post, Tempe

CALIFORNIA

Audio Basics, Claremont
Classic Audio, Encinitas
Musical Images, Fresno
Havens & Hardesty, Huntington Beach
Christopher Hansen, Los Angeles
Gene Rubin Audio, Monterey Park
Audible Difference, Palo Alto
Keith Yates Audio, Sacramento
Stereo Design, San Diego
House of Music, San Francisco

COLORADO

Audio Alternative, Fort Collins

FLORIDA

Sound Components, Coral Gables
Sound Components, Fort Lauderdale
Sound Source, Marathon
Audio Gallery, Miami
Audio Gallery, Sarasota
Audio Visions, Tampa

HAWAII

Audio Shoppe, Honolulu

ILLINOIS

Pro Musica, Chicago
Victor's Stereo, Chicago
Victor's Stereo, Morton Grove
Sound Choice, Lisle
Absolute Audio Systems, Rockford

INDIANA

Audiotrend, Evansville
Hi-Fi Gallery, Indianapolis

MASSACHUSETTS

Matrix Audio & Video, West Hatfield

MICHIGAN

Absolute Sound, Ann Arbor
Sound Room, Grand Rapids

MISSOURI

Audio Renaissance, Kansas City
Music Systems, St. Louis

NORTH CAROLINA

Audio Salon, Charlotte
Stereo Sound, Chapel Hill
Stereo Sound, Greensboro
Stereo Sound, Raleigh

NEBRASKA

Sound Environment, Lincoln
Sound Environment, Omaha

NEW JERSEY

CSA Audio Design, Upper Montclair

NEW YORK

Ears Nova, Great Neck
Innovative Audio, Brooklyn
Sound by Singer, New York
Stereo One, East Rochester

OHIO

Stereo Showcase, Dayton
Oxford Audio, Oxford

OKLAHOMA

Audio Dimensions, Oklahoma City

PUERTO RICO

Precision Audio, Rio Piedras

SOUTH CAROLINA

British American Sound, Charleston

TEXAS

High Bias, Austin
Audio Distinctions, Corpus Christi
Audio Concepts, Houston
Concert Sound, San Antonio

VIRGINIA

High-C Stereo, Leesburg
Listener's Shop, McLean

WASHINGTON

Definitive Audio, Seattle

audiophile systems LTD.

6842 Hawthorn Park Drive
Indianapolis, Indiana 46220

AUTHORIZED DEALERS

MIDWEST

ATTENTION DETROIT AND SURROUNDING AREA AUDIOPHILES!

Esoteric Audio of Farmington Hills is pleased to have Karen Sumner of Electrocompaniet as our guest for an evening of music, conversation, and enlightenment. There possibly may be the unveiling of exciting new products direct from Norway.

Join us! Due to space restriction, **RESERVATIONS MUST BE MADE.** Call (313) 553-8240 for time and date details and reservations.

COHERENCY & TRANSPARENCY: Delivered by Spica at Esoteric Audio of Farmington Hills.

CONRAD-JOHNSON PREMIER 3 & 4 AT Esoteric Audio of Farmington Hills.

HEAR THE ELECTROCOMPANIET

Preamp/wire I and II at Esoteric Audio of Farmington Hills.

IN BLOOMINGTON, THE PLACE TO GO to add new lows to your stereo system is American Audio-Video. We feature the best subwoofers you'll find—and they're from JBL! We think that only JBL can reproduce both the power and the subtlety of the low bass on today's best recordings. Come in and hear what we mean. American Audio-Video, Bloomington, IN. (812) 334-1905.

NEW ENGLAND

GOODWIN'S MUSIC SYSTEMS

In New England, Goodwin's is recognized as the leader in high performance audio. Along with the finest in components, we can provide the most sophisticated custom installation tailored to your individual needs. We offer:

Mark Levinson, Magneplanar, Apogee, Soundlab, Quad, Entec, Goldmund, Linn, Oracle, Tandberg, Nakamichi, Bryston, Hafler, Adcom, Celestion SL, Eminent Technology, Nitty Gritty, Walker, AR, Thorens, Infinity, H-K, NAD, Proton, B & W, Rega, Camber, Essence, Janis, Velodyne, Van den Hul, AudioQuest, Monster, Favorite, Kyocera, Stax, Astatic & Grace.

Goodwin's Music Systems, 16 Eliot St., Harvard Square, Cambridge, MA 02138 Tel. 617-492-1140

AUTHORIZED DEALERS

SOUTHWEST

CROSBY'S IN NEW MEXICO, Quicksilver, N.Y. Audio Labs (Futterman), Counterpoint, Audire, PS Audio, Classé, Spica, ProAc, Vandersteen, Sota, VPI, Sonographe, Randall, Eminent Tech, ECT, "Good trades" "Satisfaction Guaranteed" Hobbs, NM (505) 393-3992, 392-8448 (Eve).

GENE RUBIN AUDIO—LOS ANGELES

Linn Sondek	Naim Audio	Isobariks
Thorens	Conrad-Johnson	Acoustat
C.J. Walker	Creek	Spendor
Acoustic Research	NAD	Celestion
Dual	Precislon Fidelity	PS Audio
Pre-paid shipping, (818) 571-1299, (Pac. time)		

WEST

GOETZ SYSTEMS DENVER—For the love of music! Hear the Goetz Speakers and amplifier, now, in Denver. By appointment 303-422-1674.

KUSTOM HI-FI IN BURLINGAME wants to introduce you to the best in low frequency reproduction—a JBL subwoofer. From cannon to contrabassoon, a JBL subwoofer gives you all the power—and the detail—that's present in the lowest octaves. We wouldn't live without it. And we think you'll feel the same way. Kustom Hi-Fi, 220 California Drive in Burlingame, CA.

AMPS/PREAMPS

ATTENTION HAFLER OWNERS

The Musical Concepts M-110SN modification will elevate your Hafler DH-110 to reference quality. Yes, your M-110SN will compete with the best! Consider the cost! M-110SN kit \$155, installed \$230. Musical Concepts, 1060 Fifth Plaza, Florissant, MO 63031. 314-831-1822

BEL 2002 POWERAMP. Class A circuitry. Experience the "3-dimension" and awesome low frequency reproduction at PRESTO AUDIO, (408) 878-8283

BRYSTON 1B PREAMPLIFIER \$420. Electrocompaniet MC-2 class-A headamp \$80. Both like new. Free Sound Connections silver Interconnects. (713) 774-0736.

COUNTERPOINT—Tube & tube hybrid amps & preamps of the first order of magnitude. One of the first preamps to allow the listener to appreciate the nuances of multiple melodic lines. The SA-7—\$600. LANDES AUDIO, Rt. 24, Chester, N.J. 201-879-6889 **AD**

MUSIC TO YOUR EARS

PREAMP AMP	Audio Research • Sony Esprit • SAE-X
SPEAKERS	Infinity RS-1B • B&W 808
TURNTABLE	Oracle Adelphi • Micro-Seiki BL-111
CARTRIDGE	Black Koetsu • Accuphase AC-2 • Alpha 2
CASSETTE DECK	Tandberg TCD-3014 • Nakamichi Dragon
TUNER	Tandberg TPT-3001A
VIDEO	Mitsubishi Monitors • Kloss Novabeam

Avenue ParkAudio

425 Park Avenue South at 29th Street New York, N.Y. 10016 212 685-8101/3102

For accuracy, quality and reliability, we carry and demonstrate:
AUDIO RESEARCH • SONY ESPRIT • SONY ES SERIES • MCINTOSH • NAKAMICHI • SAE-X • BLACK KOETSU • ACCUPHASE AC-2 • ORACLE • B&W • QUAD • MERIDIAN • ESB • BANG & OLUFSEN • TANDBERG • KIRKSAETER • SHAHINIAN ACOUSTICS • PIONEER LASER • VISION • DENON • INFINITY • MITSUBISHI • LUXMAN • SIGNET • KLOSS NOVABEAM • ADS • PROTON • MONSTER CABLE

AMPS/PREAMPS

BIG TEN SYSTEM

(ABOUT \$10,000)

Turntable: Linn Sondek Lp-12
 Tonearm: Syrnix PU-3
 Cartridge: Kiseiki Blue
 Tuner: Adcom GFT-1A
 Preamp: Krell PAM 3
 Amp: Krell KSA-100
 Speakers: Apogee Scintilla's

SOUND BY SINGER

165 E. 33rd Street
 New York, NY 10016
 (212) 683-0925

E.A.R. 509 MONO TUBE AMPS. West Morris Audio, Land-
 ing, N.J. 201-398-0835.

EXCELLENT CONDITION. Power amp BGW system
 750B, \$750. Call William (718) 783-6080 or 4709.

HAFLER IN THE SOUTH!

In stock, the superb Hafler pre-amps, amplifiers, tuner and
 equalizer. Immediate FREE shipping. Also Acoustat, Ad-
 com, Audire, Conrad-Johnson, Dynavecator, Fried, Klipsch,
 Mrage, Nakamichi, PS, SAE, Talisman, Thorens, compact
 digital players. READ BROTHERS STEREO, 593 King
 Street, Charleston, South Carolina 29403. (803) 723-7276.
 AD

HARMAN KARDON, NAKAMICHI, TANDBERG, CROWN,
 REVOX, HAFLER, CARVER, NAD, DBX, ELECTRO-
 VOICE AND OTHER QUALITY COMPONENTS. BEST
 PRICES—PROFESSIONAL CONSULTATION. ALL
 PRODUCTS COVERED BY USA MANUFACTURER'S
 WARRANTY. AMERISOUND SALES, INC.; P.O. BOX
 24009, JACKSONVILLE, FL 32241. EAST: (904) 262-
 4000; WEST: (818) 840-0878.

MUSIC, NOT JUST SOUND.

Our equipment is designed to reveal the full range of music. Hear it all at Chestnut Hill Audio:
 Accuphase, Acoustic Electronics, Amber Apature, Apogee, Audio Pro, Audioquest,
 B&K Components, Berning, CWD, Counterpoint, DB, Denon, Duntech, Dynavecator, EMT, Entec,
 Euphonic, Fournier, Grace, Hafler, Janis, Koetsu, Kiseki, Krell, LAST, Linn Sondek, Live Wire,
 Mark Levinson, J. A. Michell, Monster Cable, Music Reference, NAD, Naim, Oracle, Origin,
 Pioneer Video, Proton, Pyramid, Quad, RGR, Rogers, Signet, Sony, Souther, Spectral, Spondor,
 Symdex, Syrnix, Talisman, Tandberg, Thorens, 3D Acoustics, VPI, VSP Labs, Vandersteen, Zeta.
 We are located at 311 Cherry Street, Philadelphia, Pa., 19106. (215) 923-3035.

CHESTNUT HILL AUDIO LTD.

AMPS/PREAMPS

MARK LEVINSON ML7 W/L3A CARDS, \$3300, ML9
 \$2200 perfect condition. Jim 601-289-1711 (day) 601-981-
 5288 (night).

MARK 9 POWER AMPLIFIERS, 250 watt amp using six
 6550A outputs tubes and a regulated power supply.
 \$795.00 kit - \$975.00 wired. Write for brochure. AUDIO
 CLASSICS/ATLANTA, PO BOX 690, ROSWELL GA
 30077.

MCINTOSH AUDIO EQUIPMENT—All types—tubes &
 transistor—electronics & speakers—bought—sold—trad-
 ed. S.D.R. P.O. Box 176, Walton, NY 13856, 607-865-
 7200.

MUSICAL CONCEPTS MODIFICATIONS are simply the
 most cost effective way to esoteric sound. Our modular kit
 concept allows you to upgrade in a logical sequence. Our
 Hafler modifications are satisfying the fusslest audiophiles!
 Send for full line brochure. Musical Concepts, 1060 Fifth
 Plaza, Florissant, MO 63031, 314-831-1822

PERHAPS THE EAST COAST'S LARGEST dealer in
 HIGH END used stereo. BOUGHT • SOLD • TRADED—
 STEREO EXCHANGE, 687 Broadway between 3rd & 4th
 Streets (opposite Tower Records) NYC 10012 (212) 505-
 1111.

AMPS/PREAMPS

MUSICAL CONCEPTS NEW PRODUCTS: LC-200, a pair
 of 26,000mfd/75V capacitors the same size as those in the
 Hafler DH-200/220 (also for Dynaco ST-150 and ST-400/
 410). LC-500, as above but 38,000mfd/100V (Hafler DH-
 500). A new technology makes these possible! TP-200 (2
 amp toroidal transformer), replaces 4 amp DH-200/220
 transformer. LIPS, outstanding low impedance regulation
 circuit board for Hafler preamps. DH-101, others. Write for
 our brochure and review packet. Musical Concepts, 1060
 Fifth Plaza, Florissant, MO 63031, 314-831-1822.

ROBERTSON'S RENOWNED 4010 AMPLIFIER IS
 AMAZING! Their incredible, new 6010 defies description.
 You must hear them! Audio Nexus, NJ (201) 464-8238,
 (201) 730-2409.

LOUDSPEAKERS

ADS-1290'S MATCHED PAIR, WALNUT. Brand New In
 boxes, \$1150.00. Call Doug at 716-532-2225 or 716-532-
 3181.

THE UNSPEAKER

- No artificial sweeteners, artificial flavors or colorants added.
- The First Minimum Periodicity Loudspeaker System.
- Minimum Periodicity is a new measurement and design technique from Dayton Wright Research.



LCM I

dw
 DAYTON
 WRIGHT

THE DAYTON WRIGHT GROUP LIMITED
 97 NewKirk Road North, Richmond Hill, Ont. M4C 3G4 (416) 884-8586



regal

REGA turntables reflect a splendidly simple British design philosophy: use only what is necessary & make it of the highest quality. The result is a handsome source of beautiful music, at a proper price.

You are invited to hear your favorite recordings on a REGA. Please address consumer & dealer inquiries to:

import audio

3149 shenandoah, st. louis,
 mo. 63104 • 314-773-1211

stereophile

SAVVY EQUIPMENT REPORTS AND SPIRITED EDITORIAL CONTENT

Send \$20 for 10 issues Stereophile 1107c Early Street Santa Fe NM 87501 or
 Call toll-free 800/821-3528

AudioVisions

Featuring State Of The Art Technology,
Combined With Truly Old-Fashioned Hospitality.

electronics

BELLES • BRYSTON • DENON • LUXMAN • S.A.E.

loudspeakers

ALLISON • DESIGN ACOUSTICS • DUNTECH
ENERGY • I.T.C. • MARIAH • M & K • SNELL • THIEL
turntables, cartridges, tape decks
ACCUPHASE • ADCOM • AUDIOQUEST • DENON
DYNAVECTOR • F.R. • GRACE • GRADO • KOETSU
ORACLE • SOTA • SUMIKO • SYSTEMDEK • THORENS

We Are Different!!!!

Customers travel to visit us from as far away as Boston, Philadelphia, Albany. Why do these people travel so far to purchase their stereo components from AudioVisions? Visit us soon (please make an APPOINTMENT in advance), and you, too, will decide that we are different.

SOTA: New Products Coming Soon

New Mats (including an ACRYLIC mat and an INTER-MAT), a reflex record clamp, and the "Electronic Fly-wheel" power supply conditioner.

BRYSTON: NEW OUTPUT DESIGN

Not content to rest on its earlier achievements, BRYSTON has just introduced a novel output design on the 3B and 4B amplifiers. The number of output transistors per channel remains the same (four on the 3B, eight on the 4B), but both polarities of transistor are now used on each half of the output waveform, with both polarities active at all times. Even the smallest asymmetry in the zero-crossing region is now virtually eliminated. Moreover, the distortion spectrum that remains favors lower order harmonics rather than the nastier upper harmonics. The distortion spectrum is thus similar to the best of the true Class "A" designs, but with much lower distortion percentages. A startling improvement is heard immediately. Listen... and enjoy. (Enjoy, too, the unique Bryston sense of commitment to you, the consumer: Bryston has not instituted any 3B or 4B price increases whatsoever.)

DISTECH SPEAKER CABLE

Almost two years ago, we became one of the first audio stores in the country to recommend DISCRETE TECHNOLOGY speaker cable. Now, this "Ultimate Cable" is being used by several prestigious amplifier and speaker manufacturers inside their components. At first, the relatively high price of this extraordinary cable made us feel somewhat uncomfortable. (Whenever possible, we have always preferred to see our customers spend less, not more.) Meanwhile, our customers have been telling us that the DISTECH cable they purchased from us is among the very best audio equipment investments they have ever made. In comparison with other cables that cost over twice as much, DISTECH cable is a genuine bargain!

THE "NITTY GRITTY" RECORD CLEANING MACHINE
SONEX TILES • AKG MIKES • SELECT AUDIO CABINETS

1067 MONTAUK HIGHWAY, WEST BABYLON
NEW YORK 11704 (516) 661-3355

LOUDSPEAKERS

ARE THE BEST LOUDSPEAKERS really available only by mail? Send one dollar for our 60 page color catalog. Acoustic Interface, POB 6632 Santa Barbara, CA. 93160.

AR 9LS LOUDSPEAKERS, mint condition used less than five hours. \$800 plus shipping. After 9:00 AM EST, (803) 248-4316, (803) 248-2672.

A&S OFFERS THE WIDEST SELECTION of European and American speaker kits and raw drivers including Dynaudio, Fried, Audax, Falcon-Acoustics, SEAS, Peerless, Morel, Dalesford/Cambridge, Jordan, Philips, Becker, Pyle, JVC. Featuring custom auto speaker systems, Morel Intergras and the "Avery Dark 10". Free catalog. A&S SPEAKERS, Box 7462A, Denver, CO 80207. (303) 399-8609.

ATTENTION AUDIOPHILES: JSE INFINITE SLOPE LOUDSPEAKERS Models 1 and 2 with a Lifetime Transferable Warranty are now available. Inquire about our 7 day auditioning program. Sound Unlimited, est 1959, 178 Main St., Bristol, Conn. 06010. (203) 584-0131.

BRITISH LOUDSPEAKERS—From Cambridge, England, a highly regarded small monitor speaker with an unusually boxless sound. A quality wood finish with fine English craftsmanship. \$250.00 a pair. Dealer inquiries welcomed. LANDES AUDIO, Rt. 24, Chester, N.J. 07930, 201-879-6889 AD

CELESTION SL-6 IN ROSEWOOD WITH SL-6 STANDS, full 5 year warranty, please ask for Frank Jr. (518) 563-8105

FRIED SPEAKERS & KITS

State-of-the-art sound. Try our prices! Free shipping. Also Nakamichi, Hafler, SAE, Audire, Mitsubishi, Adcom, Dynavector, compact digital players. READ BROTHERS STEREO, 593 King Street, Charleston, South Carolina 29403. (803) 723-7276. AD

LOUDSPEAKERS

CONSTRUCT STATE-OF-THE-ART LOUDSPEAKERS at far less cost than you've ever dreamed! Dynaudio, Strathairn, Seas, Peerless, Morel etc. Capacitors, coils including IAR/WCB Ultracaps™. Acoustic foam for cost-effective room treatment, cabinet dampening. Shadow Electronic crossovers. Full line definitive, esoteric speaker kits. Beautiful oak, walnut cabinetry. Thousands of satisfied customers because of our products, informed assistance, fast service, and guaranteed lowest prices. Catalog \$2.00 refundable (608) 781-2110 MC/Visa AUDIO CONCEPTS, 1631 Caledonia St., LaCrosse, WI 54603.

DAYTON WRIGHT'S LCM-1 LOUDSPEAKER: WORLD'S FINEST minimonitor. Audio Nexus, NJ, (201) 464-8238, (201) 730-2409.

DRAMATICALLY IMPROVE YOUR "NEW" AR TURNTABLE.

- 1) AudioQuest Sorbothane Mat \$35.00.
- 2) Drilled Aluminum Armboards
MMT or Linn Arms \$25.00.

All others (provide template) \$25.00.
We guarantee these products to improve the AR's transparency, detail and smoothness or we will refund purchase price. The Audio Advisor, Inc., Box 6202, Grand Rapids, MI 49506 (616) 451-3868. Shipping: \$3.00/item. AD

ELECTRO-VOICE AUTHORIZED DEALER—Components, interface, stage, studio and PA speakers. The 15" woofer system components with tweeter and midrange horns cost about \$800/pair at our low prices. Just plain impressive! Rick Marder (201) 561-8123. AD

E.M. LONG REFERENCE MONITORS. I have an extra pair of TIME ALIGN(R) Reference monitors to sell for \$4500. Please. Only serious inquiries. 415-531-8725

GOETZ SPEAKER SYSTEMS. (313) 478-5036 evenings. AD

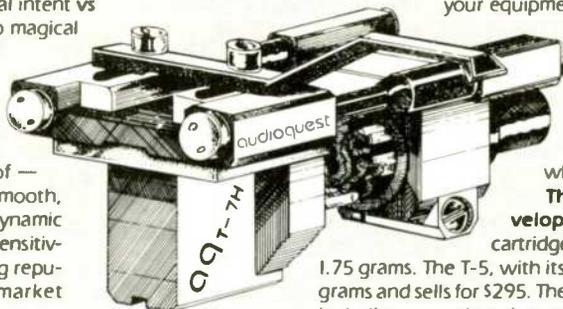
Randall Research Cable Systems ... the indispensable component

17925-A SKY PARK CIRCLE • IRVINE, CA 92714 • (714) 261-8141 • TELEX 382175

MUSIC OR MAGIC . . . ?

When developing a new product many decisions must be made and many different parameters must be balanced. The best audio equipment is the result of someone listening very carefully and being very sensitive to the notion of musical intent vs information processing. There are no magical solutions, alchemy isn't the answer. If we wanted to sound trendy we would call our approach "holistic".

The new AQ T-5 and AQ T-7 moving coil cartridges have a musical balance we are very proud of — a combination of superior tracking, smooth, clean, fast, neutral sound, high dynamic contrast and a minimum of tone arm sensitivity. AudioQuest has earned its strong reputation in the quality cartridge market



with its high output moving coils. Almost single-handedly, AQ has made most preamps and transformers obsolete. The AQ T-5 and T-7 are available in 3 output levels so you can choose the best one for your equipment. The T-5H and T-7H have an output

of 2.2mV for all normal phono inputs. The T-5M and T-7M are 1.1mV and are perfect for "high gain" preamps (which includes almost all current tube units). The T-5L and T-7L are .22mV and should be used when a top quality MC input is available.

The AQ T-5 and T-7 use a specially developed tapered titanium cantilever. Both cartridges have a compliance of 12 and track at 1.75 grams. The T-5, with its solid brass mounting plate, weighs 8.8 grams and sells for \$295. The T-7 has a solid sapphire support system including mounting plate, weighs 6.9 grams and sells for \$495. The AQ M-1 induced magnet cartridge at \$95 and the AQ MC-3 high output MC at \$145 also set value standards that can't be matched.

aq audioquest
AudioQuest brings your system to life!

412 N. Coast Highway, #B-360, Laguna Beach, California 92651 714/720-1995

LOUDSPEAKERS

GOETZ SPEAKERS

The new Grand Master Series. Precise image and focus, extremely dynamic 'big sound', tonally accurate and speakers that completely vanish! Closest to a live performance yet! Musical Images of Kentucky, (502) 228-3200 **AD**

HARMAN/KARDON, NAKAMICHI, TANDBERG, CROWN, REVOX, HAFLER, CARVER, NAD, DBX, ELECTRO-VOICE AND OTHER QUALITY COMPONENTS. BEST PRICES—PROFESSIONAL CONSULTATION. ALL PRODUCTS COVERED BY USA MANUFACTURER'S WARRANTY. AMERISOUND SALES, INC.; P.O. BOX 24009, JACKSONVILLE, FL 32241. EAST: (904) 262-4000; WEST: (818) 840-0878.

J.B.L. PARAGON FOR SALE \$2500. A classic stereo speaker in very good condition. Call 415-531-8725

LANDES AUDIO—Offering speaker modification, utilizing metallized polyprop capacitors, superior wire, and specialized cabinet modifications. Landes Audio, Rt 24, Chester, N.J. 201-879-6889 **AD**

LOUDSPEAKER COMPONENTS—KITS, Audax, Dynaudio, Eclipse, Focal, Foster, Peerless, Morel, Vifa, SIARE, and more! New catalog, 50¢. Meniscus Systems, 3275W Gladiola, Wyoming, Michigan 49509

ONE PAIR OHM LOUDSPEAKERS model "H". Very good condition. \$400.00. 404-321-4299 after 5 p.m. EST.

PERHAPS THE EAST COAST'S LARGEST dealer in HIGH END used stereo. **BOUGHT • SOLD • TRADED—STEREO EXCHANGE,** 687 Broadway between 3rd & 4th Streets (opposite Tower Records) NYC 10012 (212) 505-1111.

SL6 AND 600 MUSICALITY in a small box using lasers: Esoteric Audio of Farmington Hills.

LOUDSPEAKERS

PRESTO AUDIO has the finest small speaker in the world—ProAc "Tablette". We offer direct comparison with Rogers LS3/5A.

SPICA TC-50 SPEAKERS. West Morris Audio, Landing, N.J. 201-398-0835.

SPICA TC-50

These amazing speakers are available from:

OPUS ONE
400 smithfield street
pittsburgh, pa. 15222
or
357 north main street
butler, pa 16001

Telephone orders, please call toll free 800-441-2327.

FREE shipping on all pre-paid orders within the 48 states. Visa, Mastercharge and American Express accepted

TANGENT ACOUSTICS—The RS-4, long considered one of the finest full range British speakers, originally \$760.00 in 1976. Available in 1984 for \$795.00. One of the few true bargains. The PS range offers no holds barred performance in exquisite cabinetry. Current technology upgrades available on all Tangent models. LANDES AUDIO, Rt. 24, Chester, N.J. 07930. 201-879-6889 **AD**

THE PROJECTION SERIES OF LOUDSPEAKERS by Speaker Designs. Audition a system in your home. If you can find a better value within 15 days ship them back. Priced \$529 to \$750 (includes stands and equalizer). Speaker Designs, 528 Demmler Drive, Pittsburgh, PA 15237. (412) 367-1573 10 a.m. to 5:30 p.m. (412) 367-8066 after 5:30 p.m.

MOREL INTEGRA



MOREL'S "INTEGRA" AUTO FIDELITY loudspeakers provide the perfect solution to high-quality sound reproduction in the car. Morel's system differs from conventional coaxial systems which use two separate drivers that have to be mounted mechanically together. The "Integra" concept is based on a two-way coaxial system consisting of two magnets - one for the dome tweeter and one for the woofer - integrated on a single axis. Similar in their high power-handling and excellent sound to the Morel driver units for home loudspeakers, the Morel Integra auto fidelity loudspeakers are durable and rugged enough for use in any type of vehicle.

INTEGRA - 1 MkII

Integrated 2-way 6" / Dome Tweeter (Adapted for bi-amp)

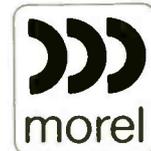
Power Handling Capacity	100 Watts RMS
Frequency Response	45-25000 Hz
Woofer Type	6" Dia. 3" Aluminum voice coil
Tweeter Type	Soft dome, Aluminum voice coil
Ferrofluid Cooling/Damping	Yes
Impedance	4 ohms
Sensitivity 1W/1M	91 db
Magnetic Structure Weight	2.3 lbs./1.05 Kgs
Dimensions	160mm/6 1/4" Dia. 67mm/2 1/4" Depth
Mounting Depth	53mm/2 1/8"
Net Weight	2.85 lbs./1.3 Kgs
Front Grill	Integral metal grill

INTEGRA - 2 MkII

Integrated 2-way 8" / Dome Tweeter (Adapted for bi-amp)

Power Handling Capacity	120 Watts RMS
Frequency Response	35-25000 Hz
Woofer Type	8" Dia. 3" Aluminum voice coil
Tweeter Type	Soft dome, Aluminum voice coil
Ferrofluid Cooling/Damping	Yes
Impedance	4 ohms
Sensitivity 1W/1M	92 db
Magnetic Structure Weight	2.3 lbs./1.05 Kgs
Dimensions	220mm/8 1/4" Dia. 75mm/3" Depth
Mounting Depth	57mm/2 1/4"
Net Weight	3.3 lbs./1.5 Kgs
Front Grill	Integral metal grill

Please write for details:



morel acoustic usa

414 harvard street, brookline, mass. 02146
u.s.a. tel. (617) 277-6663

morel acoustic ltd

industrial area b, p.o.b. 140, ness ziona
70 451 israel. tel. 054-70796, telex 361951



Versatile.

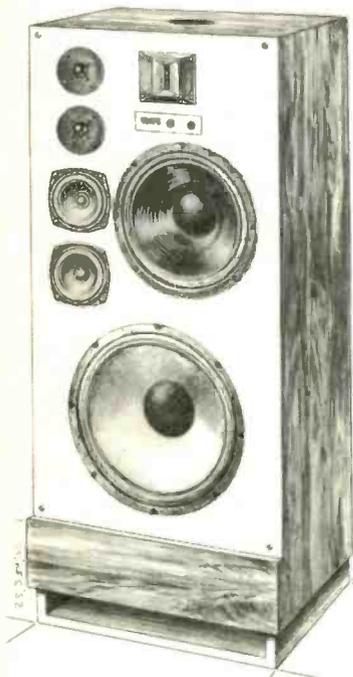
UHER 6000 REPORT UNIVERSAL: Uher's newest open-reel recorder is rugged, reliable and perfect for ultra-high quality recordings at home or in the field.

The Uher 6000 complements the famous Uher 4000 Series with its own spectrum of professional applications: ■ All functions are solenoid controlled, easily adaptable to remote control for playback of announcements, commentaries, etc. ■ Record up to 12 hours on triple play tape ■ Built-in, non-stop playback circuitry ■ Use the 6000 as a dictation machine with optional microphone and foot-operated remote control switch ■ "Vox on-off" acoustically starts record function through sound pulses, perfect for recording telephone conversations ■ "Dia-Pilot" automatically triggers slide projectors ■ Electronically controlled, 3-speed, tape drive system ■ Master fader and switchable ALC ■ Dynamic Noise Reduction (switchable) ■ Record level control and peak reading metering ■ Completely portable—powered by dry cells, nickel cadmium rechargeable batteries, 12 volt car battery and 110-240V, 50-60Hz current ■ Die-cast aluminum case for heavy-duty use ■ Built in West Germany by UHER Werke Munchen GmbH ■ See your UHER audio retailer or, for complete information, contact Uher of America, 7067 Vineland Ave., North Hollywood, CA 91605, (818) 764-1120.



Uher. The Best.

ANNOUNCING QSO HOLOSONICS FROM VMPS



The VMPS Super Tower/R QSO Series, 49"x21"x17"; 140 lbs. shown with grillframe removed.

VMPS introduces a new system of loudspeaker image enhancement (i.e. a three-dimensional soundstage from a single stereo pair) which matches the best of the recent phase-matrix and omnidirectional systems for boxlessness, spaciousness and depth, but without the artificial "everywhere and nowhere" image and poor instrument localization that plagues many of these speakers.

QSO Holosonics utilizes the inherently linear-phase Quasi-Second-Order filter network, plus driver level staggering and small amounts of linear time delay, to generate a breathtaking stereo image which is true to the phase and ambient information of the program source. Our new system is currently available in the VMPS **QSO Tower II** (\$419ea kit, \$599ea assem), **Super Tower/R** (\$679ea kit, \$969ea assem), **Super Tower IIa/R** (\$999-1199ea kit, \$1499-1699ea assem) and **Widerange Ribbon** (\$5995-7500).

Write us for brochures, test reports, and information on QSO Holosonics and hear these systems, our famous **Subwoofer** (\$250ea kit, \$375 assem), and John Curl-designed **Electronic Crossovers** (\$250 & \$449) at the dealers listed below. Kits supplied with fully assembled cabinets and all prices include **free shipping** in USA.

VMPS AUDIO PRODUCTS

div. Itone Audio

1016 Contra Costa Dr. El Cerrito CA 94530
415-526-7084

Hear VMPS at: The Listening Studio, Boston; Cuomo's, Salem NH; C&S Audio, Colorado Springs Co; Stereo Unlimited, San Diego Ca; Efficient Stereo, Torrance Ca; Sounds Unique, San Jose Ca; Itone Audio, El Cerrito Ca; Stereotown, Brookings SD; Missoula Trumpet Sales, Missoula Mt; North American Sound, San Angelo Tx; The Long Ear, Big Bear Lake Ca; Arthur Morgan (rep), Altamonte Springs, Fl; Eclectic Audio, Livermore Ca.

LOUDSPEAKERS

THIEL CS3 SPEAKERS AT Esoteric Audio of Farmington Hills.

VANDERSTEEN AUDIO IN NEW JERSEY exclusively at Audio Connection: models 1B, 2C and 4. Please call 201-239-1799 for appointment

RECEIVERS

HARMAN/KARDON, NAKAMICHI, TANDBERG, CROWN, REVOX, HAFLE, CARVER, NAD, DBX, ELECTRO-VOICE AND OTHER QUALITY COMPONENTS. BEST PRICES—PROFESSIONAL CONSULTATION. ALL PRODUCTS COVERED BY USA MANUFACTURER'S WARRANTY. AMERISOUND SALES, INC.; P.O. BOX 24009, JACKSONVILLE, FL 32241. EAST: (904) 262-4000; WEST: (818) 840-0878.

TURNTABLES

HARMAN/KARDON, NAKAMICHI, TANDBERG, CROWN, REVOX, HAFLE, CARVER, NAD, DBX, ELECTRO-VOICE AND OTHER QUALITY COMPONENTS. BEST PRICES—PROFESSIONAL CONSULTATION. ALL PRODUCTS COVERED BY USA MANUFACTURER'S WARRANTY. AMERISOUND SALES, INC.; P.O. BOX 24009, JACKSONVILLE, FL 32241. EAST: (904) 262-4000; WEST: (818) 840-0878.

MERRILL AR MODIFICATIONS

Tonearm Replacement Subchassis Kit for old AR \$85.00—Subchassis for sonic improvement of AR-XE with adjustable feet \$95. Following modifications are for all models: Platter Coating \$10. Replacement Spindle \$25. Spring Kit \$8. High Torque Motor \$45. Platter Balancing Service \$10. Replacement Inner and outer platters \$135 for all AR-XA, AR-XB, and AR-XE turntables. UNDERGROUND SOUND, 2125 Central Ave., Memphis, TN 38104 (901) 272-1275.

MERRILL TURNTABLE

Features: Beautiful solid oak base. A tunable, three-point Constant Resonance Suspension System. A subchassis designed to absorb tonearm release energy. Supplied with an Inner gravity clamp and outer periphery record clamp. Price: \$789. For more information contact UNDERGROUND SOUND, 2125 Central Ave., Memphis, TN 38104. (901) 272-1275.

VPI ACRYLIC TABLE—STATE OF THE ART of Farmington Hills. AD

TURNTABLES

MICRO SEIKI TURNTABLES ARE THE world's finest. Air-Bearing, completely outboard motor design, 20 lb bronze platter, non-resonant zinc alloy frame. For full information and dealer inquiries write: Analog Excellence, Box 69A97, Los Angeles, CA 90069.

PERHAPS THE EAST COAST'S LARGEST dealer in HIGH END used stereo. BOUGHT • SOLD • TRADED—STEREO EXCHANGE, 687 Broadway between 3rd & 4th Streets (opposite Tower Records) NYC 10012 (212) 505-1111.

SOTA SAPPHIRE: EXQUISITE SOUND FROM THE CROWN JEWEL of turntables. Audio Nexus, NJ, (201) 464-8238, (201) 730-2409.

TUNERS

HARMAN/KARDON, NAKAMICHI, TANDBERG, CROWN, REVOX, HAFLE, CARVER, NAD, DBX, ELECTRO-VOICE AND OTHER QUALITY COMPONENTS. BEST PRICES—PROFESSIONAL CONSULTATION. ALL PRODUCTS COVERED BY USA MANUFACTURER'S WARRANTY. AMERISOUND SALES, INC.; P.O. BOX 24009, JACKSONVILLE, FL 32241. EAST: (904) 262-4000; WEST: (818) 840-0878.

MULTI COMPONENTS

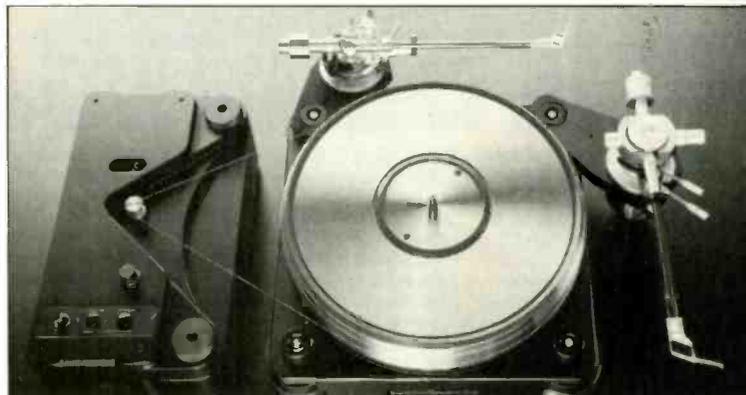
ACCURATE AFFORDABLE AUDIOPHILE EQUIPMENT AT GREAT PRICES! WE CONCENTRATE ON COST-EFFECTIVE AUDIOPHILE PRODUCTS AND HOW TO GET THE MOST OUT OF THEM. GREAT SELECTION INCLUDING ACCESSORIES, CABLES, AND RECORD CARE PRODUCTS. SPECIALISTS IN TURNTABLES, TONEARMS, CARTRIDGES. GOOD HONEST ADVICE AVAILABLE. CALL OR WRITE FOR OUR FREE NEWSLETTER. HCM AUDIO, 1600BB MANGROVE, CHICO, CA 95926, (916) 345-1341

ACCOSTAT TNT-200 AMP, \$650. Perreux 1150-B amp, \$690. Perreux SM-2 preamp, \$780. Goetz GMS-3 speakers \$1600. Sony TA-N86B 80 watt class-A amp, \$150. Audio by A. J. Conti, (603) 883-4504.

AUDIO RESEARCH SP-6B, D-120A; Tympani I-D; Thorens TD-126 w/Ruby; Marantz 110; B.O. 1100 Salisbury II, Lincoln, NE 68505.

MICRO SEIKI TURNTABLES

SIMPLY THE BEST BELT DRIVE TURNTABLE SYSTEMS AVAILABLE



AT LAST! MICRO SEIKI JAPAN INTRODUCES

ITS FULL LINE OF HIGH-END TURNTABLE SYSTEMS TO U.S. AUDIOPHILES.

Illustrated, the Micro Seiki RX-1500VG, shown here mounted with two tonearms (four are possible). Platter: 20 lb bronze platter. Record hold down: light force vacuum system. Frame: massive 36 lb non-resonant metal alloy. Motor: outboard belt-drive DC servo. Inertia moment: 3,000 lb/cm². Total system weight: 100 lb. U.S. list \$1,495 (w/out tonearm). Other versions also available: the 1500VGB, an air-bearing vacuum motor version; the bronze platter floats on a thin, 0.3mm layer of air—U.S. list \$1,995. The RX-1500 Basic, an aluminum platter version with no air-bearing or vacuum functions—U.S. list \$795.

And introducing The Ultimate Analog Turntable System, The SZ-1T/SZ-1M. Specifications: 132 lb non-resonant zinc alloy frame. Platter: 48 lb air-bearing, vacuum, bronze platter. Motor: outboard 44 lb hysteresis synchronous air-bearing phono-motor. Inertia moment: 26 tons/cm². Total system weight: 240 lb. U.S. list \$10,000.

FOR COLOR BROCHURE AND DEALERS INQUIRIES, WRITE:
MICRO SEIKI USA, P.O. BOX 69A97, LOS ANGELES, CA 90069

MULTI COMPONENTS

AUDIO EQUIPMENT NEW AND USED

ACCOUSTAT III: TNT200 amplifier; AUDIOVICS PZ3 poweramp; ET1 headamp; BEVERIDGE Tube preamp; BRYSTON 2B poweramp; CELESTION DT250—\$400/pr; GRACE 9E Ruby—\$200/new; LINN LP12 w/Itok/Asak; LUXMAN 110 FM tuner; MCINTOSH C28 preamp; C32 preamp; MR78 tuner; 2120—\$600; 2205 poweramp; ORACLE Alexandria w/arm; ORACLE/Magneplan/Dyna-vector Ruby; PERREAU SM2 preamp; REVOX B77 Reel-to-Reel; SONOGRAPH SG3 turntable without arm—\$295; TANDBERG TD20A; THIEL O31—\$880/pr; Call Terry #402-391-3842

AUDIO HOUSE—FLINT MICHIGAN: ROGERS, SOTA, CONRAD JOHNSON, ROBERTSON, NEC VIDEO, ON-KYO, REVOX, AUDIO PRO, SPECTRUM, SOUTHER, GRADO, BELLES, GONZA Speaker wire 12 gauge 100ft. \$49. 4304 Brayon, Swartz Creek, Michigan, 313-655-3639 by appointment.

DEEP SIX SYSTEM

(ABOUT \$6000)

Turntable: Linn Sondek LP-12
 Cartridge: Talisman S
 Tonearm: Linn Itok LV-II
 Tuner: Adcom GFT-1A
 Preamp: Counterpoint SA-3
 Amplifier: Precision Fidelity M-8
 Speakers: Acoustat II + II

SOUND BY SINGER

165 E. 33rd Street
 New York, NY 10016
 (212) 683-0925

AD

DENON DL-103C GOLD MC CARTRIDGE. \$85; Stanton LZ-9S cartridge, \$115; Technics EPC-P310MC2 P-Mount MC cartridge, \$95; Baby Advent loudspeakers, \$130; Technics SB-R100 flat loudspeakers, \$140. All new, unused. For IBM PC: Profit Systems Multigraph monochrome/color card (graphics in both modes), \$295; XCOM internal 300/1200 baud modem with CrossTalk (works in compatibles), \$335; IBM floppy controller, \$95. Call Michael, (212) 794-1430.

ELECTRONIC REPRESENTATIVES NEEDED!! UNLIMITED PROFIT POTENTIAL! LOWEST POSSIBLE PRICES!! OVER 100 BRANDS! AUDIO - VIDEO - CAR STEREO - COMPUTERS ELECTRONIC EXPERTS 1000 ORANGE AVE., WEST HAVEN, CT 06516

HIGH END AUDIO IN KANSAS CITY, Alphason, Acoustat, AR, Counterpoint, Creek, Futterman, Goetz, Grace, Heybrook, MAS, Moscode/NYAL, Robertson, Talisman, Walker, & More! The Music Room, 4806 Canterbury, Roeland Park, Kansas 66205. (913) 236-5907.

MULTI COMPONENTS

FINE PREVIOUSLY OWNED DEMO/USED EQUIPMENT!!

Stax ELS F81 used \$1695.00
 Marantz 10B 450.00
 Audio Research SP6E 1295.00
 Audio Research D90B 1295.00
 Audio Research SP3A-1 450.00
 Audio Research D76A 650.00
 Michell GyroDec 750.00
 Audio Research D60 795.00
 Magneplan Tympni 4's demo 2295.00
 Magneplan Tympni 4's used 1995.00

CUSTOM STEREO ELECTRONICS INC.

1391 S. Hamilton Road
 Columbus, OH 43227
 (614) 235-3531—(614) 235-7575

AD

HARMAN KARDON, NAKAMICHI, TANDBERG, CROWN, REVOX, HAFLER, CARVER, NAD, DBX ELECTRO-VOICE AND OTHER QUALITY COMPONENTS. BEST PRICES—PROFESSIONAL CONSULTATION. ALL PRODUCTS COVERED BY USA MANUFACTURER'S WARRANTY. AMERISOUND SALES, INC., P.O. BOX 24009, JACKSONVILLE, FL 32241. EAST: (904) 262-4000; WEST: (818) 840-0878.

HCM AUDIO 1-916-345-1341 "VALUE LIVES" AUDIO-QUEST ★ B & IV ★ GRACE ★ GRADO ★ HAFLEP ★ LIVEWIRE ★ MONSTER CABLE ★ NITTY GRITTY ★ PREMIER ★ PYRAMID ★ SOTA ★ STAX ★ TALISMAN ★ THORENS ★ SUMIKO ★ AND MUCH MORE ALL AT REASONABLE PRICES! FREE NEWSLETTER & EXPERT ADVICE. HCM AUDIO, 1600BB MANGROVE, CHICO, CA 95926

KRELL KSA-50 AMPLIFIER, \$1150. Krell PAM-1 preamp, \$1195. Snell Type C loudspeakers, \$1150. Souther SLA-3 tonearm, \$500. Maplekroll turntable and air-bearing arm, \$490. PS-4H preamp, \$450. Audio by A.J. Conti, (603) 883-4504.

MORE WITH FOUR SYSTEM

(UNDER \$4300)

Turntable: Linn Sondek Lp-12
 Tonearm: Linn Basik LV-X
 Cartridge: Talisman 1A
 Tuner: Adcom GFT1-A
 Preamp: Counterpoint SA-7
 Amplifier: Robertson 4010
 Speakers: Fuselier 3.3

SOUND BY SINGER

165 E. 33rd Street
 New York, NY 10016
 (212) 683-0925

AD

MAGNEPLANARS...

Because
 Music Doesn't
 Come In Boxes.



From the \$500 per pair SMGa to the \$2000 MG-III, Magneplanar® speaker technology eliminates the box for a more open, natural sound. And because Magneplanars are bipolar—radiating sonic energy to the rear as well as forward—the three-dimensional space the artists occupied while recording is recreated precisely in your home.

MAGNEPAN

1645 9th Street
 White Bear Lake MN 55110



TRANSISTOR SUPERIORITY

Quality and Value

Quality in Design

"...unique distortion cancelling circuitry..."

Quality in Construction

"...greater resistance to overload..."

Quality in Sound

"...compares to reference equipment..."

KBA-200

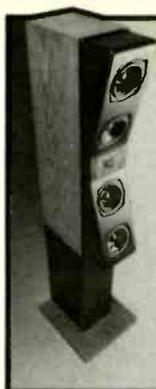
200 Watt High Power Amplifier \$1495.00

For Information —

UNDER LICENSE BY ASR

K KINERGETICS INCORPORATED

6029 Reseda Blvd. • Tarzana, CA 91356 • (818) 345-2851



BENNETT SOUND CORPORATION

The first wholly new
technology in
loudspeaker systems
in fifty years.

P.O. BOX 565
RESEDA, CA 91335
(818) 345-1608



Luxman
Harman/Kardon
Tandberg
Boston Acoustics
Audio Control
Sherwood
Hitachi
Denon
Revox
Onkyo
Ortofon
Hafner
Thorens

ADS
AIWA
Grace
M&K
B&O
SME
& Many More

Get It Free!

We Deliver FREE
Anywhere in the
Continental USA!

the SOUND Approach

6067 Jericho Tpke., Commack, NY 11725
Charge It...Call 516-499-7680

High Performance Review

Candid Listening Evaluations AND Leading-Edge Lab Tests. Like no other, we give you this balance. Reviews of the Conrad-Johnson Premiere 3, Mark Levinson ML-7A, Dynavector 17D2 MR, Krell KMA-100 and others from Quad, Nakamichi, etc. Each quarterly 170 page issue (no Ads) reviews 10-15 components and has 80+ recording reviews written by musicians. Extensive photographs and graphics. Audiophiles praise our magazine: "Great Approach, helpful...Outstanding." Join us today!

High/Performance Review

PO Box 2989, Stanford CA 94305 USA

- Yes, start me with Vol. 3, 4 issues \$26.00 check or Mastercard/VISA enclosed
- I want Volumes 2 + 3, 8 Issues \$50.00 enclosed (reduced price offer)
- I want your best rate, Vols. 1 + 2 + 3, 12 Issues \$72 (reduced price)

Overseas & Canadian Subscribers: Check in US Funds Net on US Bank or International Postal Money Order. Add \$4.00 per volume for non-US surface mail delivery.

Mastercard VISA

Account No. _____

Expiration Date _____

Signature _____

Signature Required for Credit Card Purchase

Name _____

Street _____

City _____

State _____ Zip _____

For Questions: Telephone (408) 446-3131, M-F 10-4 (Pacific Time)

MULTI COMPONENTS

MCINTOSH, MARANTZ, CONRAD-JOHNSON, THRESHOLD, J.B.L. and other high-end, and collectable components bought and traded. You'll find that I usually pay more for your equipment and also sell at lower prices those components which I handle. I sell only used but am very concerned about your satisfaction. Please call and see that I could be your best alternative. Good buys on all my tonearms and turntables; many unusual pieces: Audio Research MCP2 \$750. Counterpoint SA2 \$485. Marantz 10B \$600. Rappaport amp (rare) \$650. Big Red cable 15' \$150. Sound Investments (718) 377-7282 noon to 3PM only! Wanted prerecorded reel to reel 1/2 track tapes.

PRESTO OFFERS FINEST EQUIPMENT Featuring: Conrad-Johnson, BEL, ProAc, Duntech, Chapman, Belles, VPI, Souther, VSP labs, Gyrodeck, Adcom, Nova, Zeta, KeVek, Alpha, Soundex and more. Best prices. We ship free in continental USA. PRESTO AUDIO, 3125 Williamsburg Dr. San Jose, CA 95117 (408) 378-8283 or 249-4987 MC/Visa. Write for specials.

PERHAPS THE EAST COAST'S LARGEST dealer in HIGH END used stereo. BOUGHT • SOLD • TRADED—STEREO EXCHANGE, 687 Broadway between 3rd & 4th Streets (opposite Tower Records) NYC 10012 (212) 505-1111.

QLN SPEAKERS; LINN HEADAMP; Audio Interface CST-80 40 ohm; Dynavector DV-17d; Denon DP-75 w/DK-260 base. 201-398-1216.

START WITH SEPARATES SYSTEM 1

(UNDER \$2700)

Turntable: Rega Planar 3
 Cartridge: Adcom XC/LT II
 Preamp: Adcom GFP-1A
 Tuner: Adcom GFT1-A
 Amplifier: Adcom GFA-2
 Speakers: Snell Type E II

SOUND BY SINGER

165 E. 33rd Street
New York, NY 10016
(212) 683-0925

AD

KIMBER KABLE HIGH PERFORMANCE SPEAKER WIRE

Strong in the West, headin' East.

ASK YOUR DEALER

Manufactured by:

RKB Industrial, Inc.
2058 Harrison Blvd.
Ogden, Utah 84401
(801) 621-5530

MULTI COMPONENTS

RM HIGH-FIDELITY—LONG ISLAND: Where musicality of the designs, a real listening room and the service makes the choice easy. Farmingdale, N.Y. Demonstrations by appointment (516) 420-9092. RAUNA of SWEDEN, PROMETHEAN, CREEK and more.

SOUTHER SLA-3 PLUS CLAMP \$350. Audio Interface CST-80H \$200. Dynavector 23R \$100. Linn 45 rpm adapter \$24. All Mint. Mark Zenon, 2301 S. Jefferson Davis Hwy., Apt. 1231, Arlington, VA 22202. (703) 521-0836 evenings.

TECH. SLP2 CD PLAYER & Halter 220A amp. (215) 567-4626.

TRADE-INS WELCOME

Carver, conrad johnson, Nakamichi, harman/kardon, Gold Aero tubes, Sonographe, AR turntable, Clements ribbon spkrs., VSP amplifiers, VPI turntable, NEC video and lots more! ADS spkr. sale now! Used specials—Macintosh MR-78 mint, \$699; conrad johnson PV-3, \$169. THRESHOLD AUDIO 409 S. 22nd St., Heath, Ohio 43056, 614-522-3520

21ST CENTURY AUDIO LTD For all of your high end audio needs at reasonable prices. Top brands such as Argent, Belles, C-J, DCM, Eagle, Grado, Pentagram, Perreux, Pyramid, SOTA, Splca, Stax, VPI and much more. Plus Computer and video items too many to mention. Call or write to 5041-Rising Sun Ave, Phila., Pa. 19120. (215) 324-4457. MC, VISA, Diners Club, & Carte Blanche welcomed.

TAPE RECORDERS

CROWN SX-724 R-R. 4 Track Stereo, walnut cabinet and tape counter. Excellent condition. (215) 674-5573.

HARMAN/KARDON, NAKAMICHI, TANDBERG, CROWN, REVOX, HAFNER, CARVER, NAD, DBX, ELECTRO-VOICE AND OTHER QUALITY COMPONENTS. BEST PRICES—PROFESSIONAL CONSULTATION. ALL PRODUCTS COVERED BY USA MANUFACTURER'S WARRANTY. AMERISOUND SALES, INC., P.O. BOX 24009, JACKSONVILLE, FL 32241. EAST: (904) 262-4000; WEST: (818) 840-0878.

NAKAMICHI LX-5; 3-HEADS, Dolby B/C, mint condition. List \$850, asking \$500. (201) 444-6987

PERHAPS THE EAST COAST'S LARGEST dealer in HIGH END used stereo. BOUGHT • SOLD • TRADED—STEREO EXCHANGE, 687 Broadway between 3rd & 4th Streets (opposite Tower Records) NYC 10012 (212) 505-1111.

CARTRIDGES TONEARMS

DIAMOND NEEDLES and STEREO CARTRIDGES at DISCOUNT PRICES for SHURE, PICKERING, STANTON, EMPIRE, GRADO, AUDIO TECHNICA, ORTOFON, MICRO-ACOUSTICS, SONUS, ADC and LAST, send S.A.S.E free catalog. LYLE CARTRIDGES, Dept. A., Box 69, Brooklyn, NY 11218. For fast COD service Toll Free 800-221-0906. N.Y. State (718) 871-3303. 9AM - 8PM except Sunday. VISA/MC AD

HIGHPHONIC CARTRIDGES WILL TRACK even difficult passages at one gram! Better specs, better sound! For brochure, write: Analog Excellence, Box 69A97, Los Angeles, CA 90069. Dealer inquiries invited.

with
PS AUDIO
you can afford to
enjoy your music

PS AUDIO • 3130 SKYWAY DRIVE • SANTA MARIA, CA 93455 • (805) 928-2631

CARTRIDGES/TONEARMS

JAPANESE STEREO OFFERS OVER 150 CARTRIDGES/TONEARMS, 50 MC transformers, 66 headshells, 100 accessories. Technics Stylus Gauge \$39; Namiki Direction Finder \$45. Call (213) 659-8550 for free lists.

KOETSU—THEIR MAGIC IS HEARD at Esoteric Audio at Farmington Hills.

SAEC TONEARMS ARE CONSISTENTLY #1 IN JAPAN. Superb engineering, quality construction, affordably priced. For full brochure write Analog Excellence, Box 69A97, Los Angeles, CA 90069. Dealer inquiries invited.

TALISMAN CARTRIDGES AND PREMIER MMT TONEARMS: Sonic sorcery for audiophiles. Audio Nexus, NJ, (201) 464-8238, (201) 730-2409.

THE ALCHEMIST/TALISMAN TOUCH—only at Esoteric Audio of Farmington Hills.

TUBE EQUIPMENT

ELECTRON TUBE SALES 6DJ8 6AN8A 6CA7 6L6GC 6550A EL34 KT77 KT88 EF86 Same day shipping from stock Industrial Tube Distributors since 1947. 4000 Types in stock. A R S Electronics, 7110 DeCells Place, Van Nuys, Ca. 91406, (818) 997-6200

FOLLOWING TUBE UNITS FOR SALE OR TRADE for Marantz 9's and 10B: MAC 240, 75, 225, A-116's (three), RCA's 100 watt (pair), RCA-England "Orthophonic," Knight, Scott (three), Fisher 100-1 tuner and SA-100 amp, Dynaco Mark III's custom modified by Musical Concepts with outboard power supplies. (314) 225-8340 (St. Louis).

FUTTERMAN OTL AMPLIFIERS—The ultimate tube amplifier with no reservations. No output transformer, no transformer coloration. The purest sound we have yet experienced. LANDES AUDIO, Rt. 24, Chester, N.J. 07930, 201-879-6889 AD

MOSCODE TUBE AMPLIFIER I - A synthesis of tubes and MOSFETS in order to create cost effective tube electronics. One of the true marvels of this year. Tube liquidity, better than transistor punch in the bass. 150 per channel with 8db headroom!!! Only \$900.00. LANDES AUDIO, Rt. 24, Chester, N.J. 07930, 201-879-6889 AD

EXTRAORDINARY PRODUCTS

Triplanar Tonearm, Phoenix Preamp, Klyne, Oracle & SOTA Regulated Power Supplies, Tiptoes, Tonearm Termination Box, MacMod Tonearm & Interconnect Cables, MacMod Crossover, MacMod Subwoofer

EXCEPTIONAL MODIFICATIONS

QUAD 405 amplifiers, Ittok, Mission, SME & Technics EPA-100 tonearms, Bedini, Belles & Spatial preamplifiers, QUAD 63, Rogers Studio I & LS3/5A speakers

Request a complete catalog from The Mod Squad, 542 Coast Highway 101, Leucadia, CA 92024.

(619) 436-7666

The Mod Squad

TUBE EQUIPMENT

TUBE TWEAKS, AUDIOPHILES—We speak your language. Top quality tubes & audiophile products at competitive prices. Large selection, imports & exotics. Specialty tubes can be your cheapest sonic improvement. Call for recommendations/prices. Dealer/manufacturer inquiries invited. Douglas Kent Smith Audio Consulting, 1792 Perryville Ave., Pittsburgh, PA 15212, (412) 322-1693

UNDERSTANDING TUBE ELECTRONICS is no secret to GSI. Our computer aided research into vacuum tubes has produced two stunning preamps at less than \$1,000 which look and sound like a lot more! Offering fully regulated quad-buffered power supplies, glass epoxy circuit boards, custom made polypropylene caps and more! Let us tell you more \$2.00 to GSI, 578 Nepperhan Avenue, Yonkers, New York 10701 Dealer Inquiries Invited

WANTED: MCINTOSH, MARANTZ, ARC, QUAD, DYNACO, LEAK, CJ, WESTERN ELECTRIC, LEVINSON, KRELL, TANNOY, ALTEC, JBL (SOLID STATE & TUBE), AMPS, SPEAKERS, 713-728-4343. MAURY CORB, 11122 ATWELL, HOUSTON TX. 77096

PARTS/ACCESSORIES

AMPLIWARE SIGNATURE "LIMITED EDITION", Ampliware III, and Ampliware IIA: Coming soon to Esoteric Audio of Farmington Hills. AD

ELECTRONIC CROSSOVERS: 6, 12, 18dB/octave. Kits from \$116. Transient-Perfect Crossover, \$175. Subsonic Filters, Bandpass Filters from \$25. Free Folder w/reviews. ACE AUDIO CO., 532-5th Street, East Northport, NY 11731-2399. (516) 757-8990.

ESOTEK SWX-12DB MULTIPLE BI-AMP X-OVER: Outputs for up to four bi-amp/sub-woofer systems. 12DB/OCT design, six x-over freq. available, \$119.00. Info write: ESOTEK Inc. 1412 SW 102nd #175A Seattle, WA 98146.

GOLD LION, "INDIA", TELEFUNKEN TUBES. CramoIn, Furman Sound, Hartley, Kimber Kable, LAST, Precision Fidelity, PS Audio, Sheffield, SONEX, VPI. VECTOR ELECTRONICS, 2030 NW Marshall #104, Portland, OR 97209. VISA, MASTERCARD, AMERICAN EXPRESS. 503-227-5641.

LOW DCR AIR CORE INDUCTORS ARE OUR ONLY PRODUCT! Wide selection of coils wound with twelve and sixteen gauge wire! Custom orders welcome! Lowest prices! Rush C.O.D. orders accommodated! Free Information! Wilsonics, 2111-M 30th Street, Suite 1138, Boulder, Colorado 80301, (303) 530-1067 evenings

In New England...



The knowledge, creativity and dependability you expect from a dealer who represents these and other major manufacturers.

Alpha	Oracle
Astatic	Plexus
Audio-Interface	Robertson
AudioPro	Signet
Audioquest	Snell
Belles Research	Sonographe
Boston Acoustics	SOTA
Bryston	Souther
Carver	Spica
Counterpoint	Stax
Denon	Sumiko
Dynavector	Talisman
ESB	Tandberg
Grace	Threshold
Keith Monks	Vandersteen
Magnepan	VPI
Martin Logan	and more...
Mission	VIDEO
ModSquad	NEC
Morel	Pioneer
Niles	Proton

5 listening rooms...New England's largest audiophile record dealer... Keith Monks record cleaning... Custom cabinetry... In-store service... All shipments pre-paid and insured in the continental U.S... MC/VISA/AMEX/Take 5 Charge

5 TAKE AUDIO

105 Whitney Ave., New Haven, CT 06510
(203) 777-1750

Mon., Tue., Wed., Fri. 10-6, Thurs. 10-8, Sat. 10-5

zero anxiety:

SOTA's New Turntable 'Spec'



SOTA STAR (in box)

How will you select your next turntable? By reputation or reviews or sound? SOTA says: Try our unique scale—Your Anxiety Quotient (or YAQs, measured in *Qualms*) Why spend big bucks only to fret about set-up, isolation, or speed constancy?

The SOTA is created by a physicist (D. W. Fletcher) and an engineer (R. A. Herman) so you don't have to be either. *Zero Anxiety* results when the designers do all the worrying. From the start! Certainly long before facing the ultimate trial—your living room!

After all, do you want a pet engineering project or trouble-free performance? Get a SOTA and find something else to worry about. Like what record to play!

The SOTA Sapphire (with optional vacuum) and the SOTA STAR Sapphire, our deluxe vacuum table, beautiful to eye and ear.

SOTA
Industries

P.O. Box 7075, Berkeley, CA 94707

GREENFIELD EQUIPMENT

Audio systems dedicated to the presentation of the art form.
THE MUSIC.

ACCUPHASE • ADCOM • ARISTON • AUDIO INTER-
FACE • BEVERIDGE • BERNING • CLASSE' AUDIO •
COUNTERPOINT • DISTECH • DYNAVECTOR • EAR
ELECTROCOMPANET • ELECTRON KINETICS • ENTEC
• GRACE • GRADO • HAFNER • ITC • JSE • KISEKI
• KIMBER KABLE • KLYNE • KOETSU • NEC •
ORSONIC • PRECISION FIDELITY • PROFILE • REGA •
SPECTRUM • SIDEREAL AKUSTIC • SOUTHER •
SPICA • STAX • SUPEX • THORENS • TRIAD • VPI •
VSP LABS • VAN DEN HUL

Auditions by appointment • Shipping and export facilities
7805 Greenfield Street • River Forest, Illinois 60305
312/771-4660

PARTS/ACCESSORIES

Noted audio critic Peter Moncrieff says

"IF YOU'VE EVER HAD A YEARNING TO MAKE
YOUR SYSTEM MORE DYNAMIC, THIS IS THE COMPO-
NENT TO DO IT WITH."

"So free of unwanted side effects, it is virtually impos-
sible to misadjust it. It also lowers the noise on analog discs.
The **RG SIGNATURE ONE**... by far the best device that's
ever come along for restoring the pure sound of music's
true dynamics."

For a complete copy of this review (IAR #33) and more
information contact **RG DYNAMICS**, 4448 W. Howard St.,
Skokie, IL 60076, 312-673-7003.

PETERSON PRESENTS EMERALD™—a unique, air-
dielectric, symmetrical, twinaxial Interconnect and
Tonearm Cable System of incomparable transparency
and musicality. Peterson Interconnects have been set-
tling performance and quality standards since 1979,
and EMERALD™ continues that tradition. Find out
what experience and established competence bring to
this complex technology. See your dealer or contact us
for information and no-risk trial terms. **PETERSON
AUDIO**, Dept. AM, 13665 SW Garrett Court, Tigard,
OR 97223. (503) 639-2401. Dealer Inquiries Invited.

SUBSONIC FILTERS, 18 or 24dB/octave (from \$98.50)
remove unwanted noise/thumps from passband. Free flyer
w/reviews. **ACE AUDIO CO.**, #532 5th St., East Northport,
NY 11731-2399. (516) 757-8990.

VSP LABS HIGH PASS FILTER 102, designed to elimi-
nate undesirable subsonic frequencies which are present
in all stereo systems, allows your amplifier or receiver to
devote 100% power towards music reproduction. \$189
retail value, selling for a limited time, factory direct, for
\$49.95 each. Call: (313) 769-5522 or write: VSP LABS, 670
Airport Blvd. Ann Arbor MI 48104.

CD PLAYERS

AUDIO DISCOUNTS OFFERS A LARGE selection of
CD players at discount prices. For more information
Mon. thru Sat. Please call 301-593-8833. Audio Dis-
counts, 1026 McCeney Avenue, Silver Spring, MD
20901. We honor Visa & M/C. AD

COMPACT DIGITAL DISCS AND PLAYERS!
In stock! Fast, FREE shipping. Also: Mitsubishi, Klipsch,
Nakamichi, Telarc, more (see our Haffler ad). **READ
BROTHERS STEREO** 593 King Street, Charleston, South
Carolina 29403. (803) 723-7276. AD

**HARMAN KARDON, NAKAMICHI, TANDBERG, CROWN,
REVOX, HAFNER, CARVER, NAD, DBX, ELECTRO-
VOICE AND OTHER QUALITY COMPONENTS. BEST
PRICES—PROFESSIONAL CONSULTATION. ALL
PRODUCTS COVERED BY USA MANUFACTURER'S
WARRANTY. AMERISOUND SALES, INC. P.O. BOX
24009, JACKSONVILLE, FL 32241. EAST: (904) 262-
4000; WEST: (818) 840-0878.**

SONY CDP-101 OWNERS: Perfectionist modification of
analog section (D-A converter onward with power supplies)
updates sonic performance many generations! Details
(514) 842-1693 evenings.

BLANK TAPE

TAPE WORLD TOLL FREE 1-800-245-6000				
TDK	MARCELL	DAIICHI	SONY	
MA-90 0:05 MA-90 4:59	TDK T120L750	5:30	SCOTCH T120L750 5:30	
MA-90 4:25	RL1580 2:59	TDK T120L750HG	7:29	SONY T120L750 6:49
SAV-90 2:19	UD120L190	1:59	MARCELL T120L750	5:30
AD-90 2:59	UD120L140	1:89	MARCELL T120L750HG	7:29
SA-90 1:05	UD90	1:39	KODAK T120L750	5:49
SA-90 1:29	UD80	1:59	FUJI T120L750	5:49
AD-90 1:09	LN90	1:19	FUJI T120L750HG	7:39
AD-90 1:49	LN80	1:09	SONY LUCKY80	2:29
D-90 1:07	KL3550R	6:49	SONY HI80	1:09
D-90 0:50	UT3500	4:99	FUJI FH180	2:29
			MEASHER HI8AS80	2:29

WE WILL BEAT ANY COMPETITOR'S PRICE ON THE TOTAL ORDER, INCLUDING ALL SHIPPING AND HANDLING CHARGES BY FAX.
3.75 Shipping on any size order in US, VISA, MC, no extra charge. COD Add 1.5. Minimum COD order 40.00. PA add Sales Tax. All orders shipped within 48 hours. M-F 8:30-5:00
220 Spring St. Box 361 Butler, PA 16001 412-873-8621

AMPEX PROFESSIONAL SERIES AUDIO TAPE SALE.
High quality open reel 1800' or 2400' on 7" reels, used
once. Case of 40, \$45.00. 10 1/2 X 3600' and Cassettes.
MC/Visa. Valtech Electronics, Box 6A, Richboro, PA 18954
(215) 322-4866.

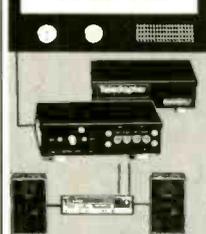
COMPACT DISCS

COMPACT DISCS AND ACCESSORIES

7 DAYS A WEEK — FREE CATALOG
CALL TOLL FREE
1-800-ALL DISC
IN CONN. CALL 1-452-0203
ALL DISC MUSIC, INC.
123 WHEELER RD. MONROE, CT 06468

BEST COMPACT DISC PRICES WORLDWIDE. CD's low
as \$8.99 single. Atlantic \$9.99. CBS \$11.99. London-DG-
Philips \$12.99. All labels stocked, discounted and shipped
from stock. Order by artist, title, label. We accept MC/Visa
(Exp. date), M.O.'s, Checks. \$2.25 shipping 1st disc, 50c
each additional. Not ready to order—then send \$2.00 for
greatest CD catalog plus \$25.00 of discount coupons!
CLASSIC DIVERSIONS, P.O. Box 1923, Evanston, IL
60204, (312) 441-6266.

ADD STEREO SOUND TO YOUR TV!



RIIONDES

TELEAPTER®

Model TE-200 easily connects between any TV or VCR and your stereo system's aux. or tape inputs. Teledapters matrix stereo circuitry takes a mono signal from the TV or VCR, and synthetically produces two stereo channels, so exciting and dimensional, you will think you're at the theatre. The TE-200 also matches the impedances and serves as an isolation interface. Order yours today, complete with all instructions, cables, and prompt 30 day refund guarantee if you're not satisfied. Only \$39.95 plus \$3.00 ship. Mail: check, MO, Visa, MC or DC # or call 24 hours, ask for our free catalog and the name of your nearest dealer.

TOLL FREE
1-800-251-8608
DEPT. 122, P.O. BOX 1316
COLUMBIA, TENN. 38402-1316



THE LEADER IN
LINEAR PHONO TRACKING™ Dealer inquiries invited.
(617) 828-5050
SOUTHER ENGINEERING CORPORATION
429 A York Street, Canton, Massachusetts 02021

AWAITING YOUR VERITAS
-AUDITION-
THE NEW INTERNATIONAL SOUTHER-SUCHY
INTEGRATED M/C CARTRIDGE/TONEARM

THE MOST TRUSTED AUDIO DEALERSHIP

Located in Rochester, New York and established by
pianist James Gala, **GALA SOUND** sells musically accurate
and correctly engineered audio components.

Audiophiles, musical institutions, and recording studios
interested in achieving the highest level of sound reproduc-
tion rely on **GALA SOUND** for definitive audio systems de-
signed for their specific needs and listen-
ing environments.

We deliver and install state-of-the-art
audio systems anywhere in the Continental
U.S. with a minimum purchase of \$7,000. For
lesser amounts, we ship you the audio com-
ponents of your choice the day you order.

Phone — please do not write — Mr. Gala
at (716) 461-3000. If Music is significant in
your life, you deserve an audio system from **GALA SOUND**.



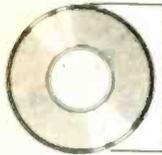
James Gala

MARK LEVINSON • THRESHOLD • McINTOSH
KEF • B & W • QUAD • MAGNEPLANAR • ACOUSTAT • POLK
ORACLE • THORENS • NAKAMICHI • KYOCERA • NAD
BANG & OLUFSEN • LUXMAN • BRYSTON • GRACE

GALA SOUND

650 Monroe Avenue, Rochester, N.Y. 14607
(716) 461-3000

COMPACT DISCS



New England Compact Disc Headquarters
Acoustat • AR • Boston Acoustics • B&W • Carver
Celebration • Denon • Dual • Fried • Heifer
Harrison/Kardon • Onkyo • Integra • Ortofon
Pyramid • Shure • Sony ES • Stanton • Thorens
Sound & Music
92 King St., Northampton, MA 413 584-9547

GOING PORTABLE? New **COMPACT DISC CARRIER** offers you safe, durable, compact protection for six discs. Hand made of top quality nylon with velour lining and velcro closure. Money back guarantee. Available in black, blue and red. Send \$12.95 plus \$1.50 postage and handling to: Shore Brothers Ltd., Box A, 2323 Corinth Ave. Los Angeles, CA 90064

REFERENCE RECORDINGS

In response to overwhelming demand from our customers and dealers, RR is pleased to announce the release of our first compact discs: "DAFOS" (RR-12CD), the now-famous percussion extravaganza featuring Mickey Hart of The Grateful Dead, Airtio and Flora Purim, and "TAFELMUSIK" (RR-13CD), popular Baroque favorites vividly played by Canada's original-instrument Baroque orchestra. These CDs contain additional music not included on the equivalent stereodiscs; for "DAFOS," Mickey Hart composed, performed and recorded a new piece! In order to duplicate as closely as possible the sound of Prof. Johnson's masters, we transferred these recordings from the machine on which they were made directly to the JVC digital system with no additional copying, editing or gratuitous processing. We think you will agree that these recordings represent the very best of what is possible with today's technology: the naturalness of RR's celebrated analogue techniques, available now with the sonic virtues and convenience features of compact disc. At your local RR dealer, or directly from us at \$18.98 each, postpaid in U.S., Visa/MC welcome. Reference Recordings, Box 77225X, San Francisco, CA 94107. Call free: 800-621-0854 ext. 107, or 408-745-7159. Dealer inquiries invited!

ROTEL *hi-fi*

Authorized Dealers

CALIFORNIA

Audio Basic, Claremont, CA
Havens & Hardesty,
Huntington Beach, CA
Absolute Audio, Orange, CA
Century Stereo, San Jose, CA

CONNECTICUT

Audio Etc., New Haven, CT

MARYLAND

Myer Emco Inc., Rockville, MD

MICHIGAN

Steketes Audio, Grand Rapids, MI

NEW YORK

New Paltz Audio,
New Paltz, NY

OHIO

Stereo Showcase,
Centerville, OH

SOUTH CAROLINA

Don Jones Stereo,
Greenville, SC

VIRGINIA

Myer Emco Inc., Falls Church, VA

WASHINGTON D.C.

Myer Emco, Washington D.C.

WASHINGTON

Audisar, Bellevue, WA

WISCONSIN

Audio Video Exchange,
Menasha, WI

CANADA

BRITISH COLUMBIA

Absolute Stereo, Coquitlam, B.C.
British Sound Ltd.,
Vancouver, B.C.

For More Information Contact:
Anglo-American Audio, PO Box 653, Buffalo, NY 14240 USA

COMPACT DISCS

COMPACT DIGITAL DISCS exclusively—from stock—classical, opera, jazz, film—catalog \$1.00, refundable with order—Ethel Enterprises, P.O. Box 3301, Dept. A, Falls Church, VA 22043

COMPACT DISCS—MOST TITLES \$11.99—\$13.99. 2,000 plus titles in stock. Free catalog plus monthly updates. Oz Records, 5246A Memorial Drive, Stone Mountain, GA 30083, (404) 292-5452.

★**WE SPECIALIZE** in audiophile and imported compact discs.

★We will **BEAT** any catalog price by one dollar per CD.
★We give **CREDIT** for used CD's in good condition.

Send \$1 for 50 page catalog to **SUPERSOUND**, P.O. Box 7082, Forest Park, IL 60130. Phone (312) 366-1300 12-5 pm

RECORDS

FREE ISSUE OF GOLDMINE, world's largest record collector's publication! Thousands of records of all types, eras for sale. Plus articles on recording stars, past and present. Rock 'n' roll, jazz, country, folk, blues. Every two weeks! 13 issues, \$22. **GOLDMINE**, Circulation Department AJY, 700 E. State St., Iola, WI 54990.

RECORD CLEANER—A+ Generic Anti-Static Record Cleaner Fluid offered by a major supplier of record cleaner products. Guaranteed. 8 oz. bottle only \$4.95 Post Paid. D-MAG Inc., 6746 White Dr., West Palm Beach, Fla 33407

VINYL DUST BUSTERS!

Resealable album jacket covers—Safeguards valuable albums from dust and dirt. Easy open, easy close zipper provides the ultimate protection for all 12" records! \$4.25 + \$1.50 P&H per twenty (Ca. residents add 6% tax). GE Kent, P. O. Box 1073, Santa Ynez, Ca. 93460

WE BUY AND SELL LIKE NEW LPS, Prerecorded reel tapes and cassettes. Thousands in stock, Catalog \$3.00. Protect your LPs, Poly, Paper, Cardboard jackets, Low Prices, Free Catalog, House Of Records, Hillburn, New York 10931.

AUDIOPHILE RECORDS

★**ALL THE AUDIOPHILE** labels: Sheffield, Reference, Proplus, Meridian etc.

★We will **BEAT** any catalog price by \$1 per LP.

★**LARGEST** stock of Japanese import Jazz in North America

★Fantastic **SAVINGS** on all Japanese Import titles, Mobile Fidelity, and Fresh Aire.

Get our newsletter and on our mailing list now. Send \$1 to **SUPERSOUND**, P.O. BOX 7082-A, FOREST PARK IL 60130. Phone (312) 366-1300 12-5 pm.

SYSTEMDEK

IIX

The **SYSTEMDEK IIX** represents the ultimate value/performance combination in turntables available today. This is accomplished by including such features as: oil-pump bearing, glass platter, lamb's wool record mat, 24 pole synchronous motor, belt drive, interchangeable arm board, real-wood base built about a steel frame and a unique 3-point hung suspension which allows quick and easy adjustment, even while a record is playing! All this at a surprisingly affordable price.

The **SYSTEMDEK IIX** is available; without tonearm, fitted with a Profile II (as shown); or Profile IIS tonearm.

Please write for further information.

DISTRIBUTED BY:

PRO-ACOUSTICS INC.

OASIS SPEAKER PEDESTALS

By: Rich Acoustic Labs

Oasis Speaker Pedestals are designed with proper tilt alignment and height to improve the total tonal balance, imaging, and base response of your speaker system.

— Dealer & Rep Inquiries Invited —

SOLID OAK OR WALNUT
(NO VENEERS)



6-1/2" H. x 11-1/2" W. x 10-1/2" D.

Send \$39.95 plus \$3.00 shipping to: Rich Acoustic Labs, 2401 Ross Clark Circle, Dothan, AL 36301. For C.C.D., Visa, MC, AE, call (205) 793-4746.

ECHELON



ECHELON AUDIO is proud to introduce the Eclipse series loudspeaker. A digital ready, state of the art system that overshadows the rest. High power handling - yet highly efficient. Computer designed and tested for extremely accurate performance. Come up to our level of listening pleasure, write:

ECHELON AUDIO

P.O. Box 8086

Gadsden, AL 35902-8086

Priced at \$1750 per pair



IN CANADA:
16677 Hymus Blvd.
Kirkland, Quebec
H9H 3L4

IN USA:
Waterfront Plaza
Newport, Vermont
05855

COMPACT DISC

SONY D-5 portable compact "DISC MAN" \$218

TECHNICS SL-P1 programmable \$239

TECHNICS SL-P2 programmable, wireless remote. \$299

TEAC PD 11 3 beam laser, 88.2 KHz, sampling programmable \$329

Hi-Fi, Video, TV: Most Brands - CALL!

AUDIO/VIDEO TAPE

SONY L750/T120... CALL
L750 UHG... \$6.48
T120 UHG... \$6.48

MEMOREX PRO T120... \$5.28

MAXELL T120 HGX... CALL
GOLD... CALL

MAXELL UD XL2 90... \$1.48
after 50¢ mfr. rebate

UD 35-90 reel \$4.48
XL 1 35-90B reel \$6.18

WORLD WIDE ELECTRONICS DISTRIBUTORS

240 Ivory St., Braintree, MA 02184

800-225-8656 ORDERS ONLY 10am-6pm EST M-F

MAIL ORDER: For liquidation, send certified check or money order. All prices subject to change without notice. 14 DAY P.O. RETURN. 20% OFF on all items. Handling charge for orders under \$100.00. For orders over \$100.00, no C.O.D. Mass. residents add 6% sales tax.

MASS ORDERS (617)843-7350

Electrified Discounters

203-937-0106

Lowest Possible Prices !!

MOST MAJOR AUDIO BRANDS!!

CD'S — HI-END AUDIO — CAR PRODUCT

COMPUTERS — (HARDWARE-SOFTWARE) — VIDEO

FULL WARRANTY — FAST DELIVERY

SEND FOR OUR CATALOGS!!



996 ORANGE AVE.
WEST HAVEN, CT. 06516



If You Read the Latest Issue of The Absolute Sound®

(And Just This One)

This is What You'll Find Out

- That three new Compact Disc players, reviewed sonically—the Yamaha, the Onkyo, and the NEC—do not sound alike. And, what's more, the accumulating evidence suggests that CDs are vastly inferior to the master digital tapes.
- What happens when three New Wave turntables are sonically compared—the VPI, the Pink Triangle, and the SOTA, with and without its startling new mat/clamp system. Goodbye Linn, hello future.
- What the latest generation of conventional (and not so conventional) cone speakers sound like, to wit: The \$12,000 Wharfedale Option One, the ProAc Studio 3, the Rauna Tyr (Sweden), the ESB 7/06 (Italy), and the Phase Tech (US). A year's subscription: \$20; \$22, Canada; \$35, Overseas (Air-mail).

Name _____

Address _____

City, State _____ Zip _____

Please send check or US money order to:

THE ABSO!UTE SOUND®

P.O. Box L,

Sea Cliff, New York 11579

To Order by phone: (516) 671-6342

9:30 am to 5:30 pm ET. Ask for Eden.

Visa, Mastercard and American Express accepted.

AUDIOPHILE RECORDS

AUDIOPHILE RECORDS OUT OF PRINT. Sheffield, Mobile Fidelity, Nautilus. 518-459-1396 (N.Y.), evenings. P. Plieger.

M.F.S.L. OUT OF PRINT BEATLES collection \$897. Hurry! STONES and SINATRA collections also. U.H.Q.R. Bizet's Carmen, Puccini's La Boheme. BEATLES MMT and White album. Some imports. Call Sound Advice (816) 361-2713.

MOBILE FIDELITY RECORD CLEARANCE. Sealed copies of most OMR's, UHQ's, and collections, priced from under \$50. Send stamped envelope for complete listing. Bruce Jones, Box 21-C, Convent Station, NJ 07961

UHQ SET PLUS SINGLES, MFSL-Beatle Box 171, Sinatra Box 115, singles; Crystal Clear Singles; Sheffield Missing Link II on. All new. Call evenings (406) 847-2633. No answer (406) 656-3670. Make offer.

WANTED TO BUY

MCINTOSH, MARANTZ TUBE COMPONENTS, Western Electric, Hartsfields, Patriclans. John Conrad, 1178 Blackbird, El Cajon, Ca. 92020 (619) 449-9155

NAKAMICHI 680ZX, SONY PT-77, CARVER C-4000, SONY PCM-701ES, JVC D-M3, BAKER, 8 VALLEYVIEW, NEWTOWN SQUARE, PA 19073.

QUADRAPHONIC OPEN REEL TAPES, RECORDS (whole collections), select equipment. Michael Robin, 120 Atlanta Place, Pittsburgh, Pennsylvania 15228. (412) 341-1686.

WANTED: EARLY RCA VICTOR prerecorded 7.5 ips 2-track stereo tapes: Also Sprach Zarathustra, Ein Heldenleben, Beethoven's Fifth, Tchaikovsky's Sixth, other titles. Contact Carleton Sarver, 256 West 88th Street, New York, NY 10024

WANTED: KLH TABLE RADIO. Prompt payment for either FM or AM/FM model in good condition. (415) 397-2718 or (415) 458-3940.

WANTED TO BUY

WANTED: MCINTOSH, MARANTZ, QUAD, TUBE AMPS. Old Tannoy/Jensen/JBL speakers. Garrard 301. Thorens TD-124. JHL Raw Drivers. Hartsfields, Patriclans. Western Electric Equipment. Tel: 818/576-2642, David Yo, POBx 832, Monterey Park, Ca. 91754

SERVICES

AUDIO PULSE SERVICE. Factory trained technicians. Write us about Model One update kits. White Labs, 10528 Lower Azusa Rd., Suite 192A, El Monte, CA 91731. (818) 446-5346.

AUDIO PULSE SPECIALISTS. Repairs—Modifications—Updates—Sales. WALT'S AUDIO SERVICE, 111 East Rialto Ave., Rialto, Calif. 92376. (714) 875-0776.

BUSINESS OPPORTUNITIES

AUDIO SALESMAN WHO WANTS TO LIVE IN TAMPA FLA. 2 YEARS EXPERIENCE REQUIRED. COMMISSION 7% of GROSS SALE. CALL SENSUOUS SOUND SYSTEMS 813-988-7059

DEALER AND STUDENT REPRESENTATIVES NEEDED For Denon And Nakamichi Cassette Decks And Turntables. Serious Inquires Only. AudioWorkShop, Box 18009, Seattle, WA 98118, 1-206-323-4987, Established 1967

EAST COAST BASED HIGH END ELECTRONICS MANUFACTURER seeks expansion capital and/or joint venture. Contact: AUDIO MAGAZINE, Classified Box No. 285, 1515 Broadway, New York, NY 10036.

HELP WANTED

WANTED: GENERAL MANAGER for small speaker manufacturer located in Florida. Please send resumé and salary requirements to AUDIO MAGAZINE, Classified Box No. 285, 1515 Broadway, New York, NY 10036.

Retailers—put

Audio®

on your counter... and welcome a great new sales partner!

We've got a plan to help build your sales...and ours.

You're invited to join AUDIO's Retailer Sales Plan. Simply offer everyone's favorite audiophile magazine in our handy display rack and you:

- chalk up 100% profit on every issue sold.



- build traffic as your customers come back for issue after issue of AUDIO.
- generate more interest in the accessories and equipment you carry.
- make more sales now!

For details, write to us on your letterhead.

Contact: Margaret Cole

AUDIO

1515 Broadway, New York, NY 10036

212-719-6568

TEST RECORDS

SEVEN STEPS TO BETTER LISTENING. FROM CBS TECHNOLOGY CENTER, is a high-precision test record for the novice. Set up your hi-fi system and tune it to the specific acoustics of your listening room. Make certain your equipment functions properly. Includes 16-page booklet by AUDIO's Edward Tatnall Canby which shows you how to perform the following "ears only" tests: Proper identification of left and right channels, phasing, loudspeaker balance, tone control settings, elimination of buzzes and rattles, proper adjustment of vertical and lateral-tracking forces, and much more. Send \$6.98 In check or money order in U.S. funds only; payment must accompany order. Allow four to six weeks for delivery. **AUDIO TEST RECORD**, P.O. Box 182101, Dept. 406, Cincinnati, OH 45218

TEST RECORDS FROM CBS TECHNOLOGY CENTER

STR 100 PHONO CARTRIDGE TEST RECORD, includes sweep frequency with sync for recorder; spot frequency; separation; compliance; vertical- and lateral-tracking; tonearm resonance, and more. \$10.00 each.

STR 112 PHONO CARTRIDGE TEST RECORD, includes square wave, graduated-tracking, and IM bands. \$15.00 each.

STR 120 PHONO CARTRIDGE TEST RECORD, includes ultra-sonic test tones, high-level low-frequency glide tones, standard-level and silent bands, and can be used with a graphic level recorder. \$15.00 each.

STR 130 RIAA FREQUENCY RESPONSE TEST RECORD, provides accurate means of calibrating professional recording equipment. Can be used with a graphic level recorder or, without automatic equipment, with the spot frequency bands. \$15.00 each.

STR 140 PINK NOISE ACOUSTICAL TEST RECORD, is designed for acoustical testing of loudspeakers in ordinary rooms and whole systems, and for psychoacoustic tests. Includes spot frequency tones with voice announcements and glide-tones in 1/2 octave bands from 30 Hz to 15 kHz synced for a graphic recorder. \$15.00

SQT 1100 QUADRAPHONIC TEST RECORD, the standard test disc for SQ decoding adjustment, has test bands for pickup measurements, setup of decoders, channel identification and balance. \$15.00 each.

Payment must accompany order and be either a check or money order in U.S. funds. Allow four to six weeks for delivery.

STR 100 Stereo Frequency Record \$10.00

STR 112 Square Wave, Tracking and IM Disc \$15.00

STR 120 Wide-Range Cartridge Disc \$15.00

STR 130 RIAA Frequency Response Disc \$15.00

STR 140 Pink Noise Disc \$15.00

SQT 1100 Quadraphonic Test Disc \$15.00

AUDIO TEST RECORDS, P.O. Box 182101, Dept. 406, Cincinnati, OH 45218

PUBLICATIONS

ARE YOU INTERESTED IN QUALITY, USED STEREO EQUIPMENT? Send for the **PLAY IT AGAIN SAM** newsletter—hundreds of listings—items for sale—items sought—published 6 times per year. \$8. 1-year subscription. Send today to **PLAY IT AGAIN SAM**, 12611 Madison Avenue, Lakewood, Ohio 44107. (216) 228-0040. Master Charge and Visa accepted.

MISCELLANEOUS

A BETTER SYSTEM? People who know stereo buy their sound direct. Now you can buy the finest in high fidelity components, including esoterics and autoscand, at unheard of prices. **DIRECT SOUND MARKETING** provides sensible expert advice, in-house service facilities, and factory fresh components on an in-stock basis. Discover America's best kept audio secret. Send \$1.00 for our Informative catalogue to **DIRECT SOUND MARKETING**, Dept. A, 3095 Bolling Way N.E., Atlanta, GA 30305 or call 404-233-9500. MC/VISA and AMEX accepted.

CLOCKS: The absolute finest ship's bell and mantel clocks. Discounted "high-end" send \$3 for catalog. San Joaquin Clockworks P.O. Box 60322 Dept.-A, Bakersfield, CA 93386

A SINGER'S DREAM!

REMOVES VOCAL FROM MOST STEREO DISCS

Our **VCCAL ELIMINATOR** can remove most or virtually all of a solo vocalist from a standard stereo record and leave most of the background untouched! Not an equalizer! We can prove it works on the phone. Write or call for brochure and demo record.

YOU SHOULD SEE US

For:

- Time Delay/Ambience
- Studio Echo/Reverb
- Tape Noise Reduction
- Parametric Equalization
- Electronic Crossovers
- Compressor/Expanders
- Mic Preamp/Mixers

We manufacture a full line of high quality audio and recording equipment. You will probably have to pay twice as much elsewhere to obtain comparable quality. Only Direct Sales make our prices and quality possible. Write or call for a 24 page brochure and demo record.

Write to: **LT Sound**, Dept. AU, P.O. Box 338, Stone Mountain, GA 30086. Phone (404) 493-1258
TOLL FREE: 1-800-241-3005 - Ext. 13

Prompt Insured Shipments

GUARANTEED SAVINGS

"Why Settle For Less When You Can Own The Best"

- Professional Advice • FREE Delivery & Set Up
- Relaxed "NO RUSH" Showroom • Financing Available
- Trade-ins Accepted • Custom Installation & Repairs

FEATURING OVER 60 BRANDS INCLUDING:

- ADS • Advent • Aiwa • AKG • Alpine • Amber • AR • Audio Control • Audio Source • Blaupunkt • Bose • Celestion • Concord • DBX • Denon • Dual • Dynavector • Energy Loudspeaker • Grace • Grado • Harman/Kardon • JBL • Kyocera • Mitsubishi • Onkyo • Ortofon • Pyramid • Robertson Audio • Scott • Sherwood • Signet • SoundCraftsmen • Sony • Sound Dynamics • Systemdek • Tandberg • Thorens • Warfedle/Diamond • C.J. Walker • And More...

CAR STEREO

- ADS • Alpine • Alphasonik • Altec • Blaupunkt • Clarion/Audio • Concord • JVC • AFS • KRIBET • Phillips • Sherwood • Sony • Unibox • And More...

Call or Write Harold Minto, Proprietor

performance audio/video

365 South Bayview Ave. (Corner Atlantic Ave.) • Freeport, Long Island, New York 11520

tel. (516) 378-4389

MC
VISA
AMEX

Just 35 min. from Manhattan by car or railroad.
Showroom Hours: Mon.-Fri. 12 noon to 7 p.m. Sat. 11 a.m. to 6 p.m.

Retail
Mailorder
Export

HAPPY Q YEAR!

Deal Q in 1985! Save more on the finest new & used audio/video components when you buy from America's competitive, experienced, reliable hi-fi specialists.

TOP OF THE YEAR SPECIALS!

Select One: MONSTER Interlink 4 (Imp. Interconnects)
GRADO MCE-41 Phono Cartridge
Any 2 WARNER (WEA) Compact Discs
33 ft. of MONSTER CABLE speaker wire.
19.85

Select One: HAFLER DH100A Preamp
FRIED Beta Loudspeakers (pr.)
DBX 224x Tape Noise Reduction
DBX 400x Route Selector
DBX 120x Subharmonic Synthesizer
PREMIER MMAT Tonearm
198.50

1,985. SONY* BMC-220k Betamovie 8
SONY* SL-HF300 Beta HiFi VCR

Prices good thru January 31, 1984

*Sorry, no mail orders on Sony.

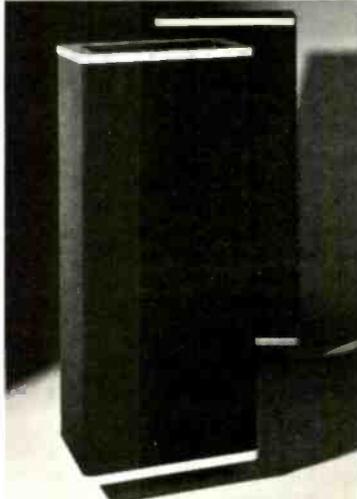


Shipping/handling not included.

95 Vassar St.
Cambridge, MA 02139

617 547-2727

VANDERSTEEN AUDIO DIMENSIONAL PURITY



MODEL 2C

Vandersteen Audio was founded in 1977 with the commitment to offer always the finest in music reproduction for the dollar. Toward this goal there will always be a high degree of pride, love, and personal satisfaction involved in each piece before it leaves our facilities. Your Vandersteen dealer shares in this commitment, and has been carefully selected for his ability to deal with the complex task of assembling a musically satisfying system. Although sometimes hard to find, he is well worth seeking out.

Write or call for a brochure and the name of your nearest dealer.

VANDERSTEEN AUDIO
116 WEST FOURTH STREET
HANFORD, CALIFORNIA 93230 USA
(209) 582-0324

NAKAMICHI · KOETSU · ACCUPHASE · LUX · MICRO SEIKI · GRACE · EUREKA

ALL JAPANESE HIGH-END DISCOUNTED

America's Largest Selection

OVER 100 CARTRIDGES, 50 TONEARMS, 30 TURNTABLES, 100 ACCESSORIES, & MORE

S2 PAGE CATALOG - \$3.00

JAPANESE STEREO

930 N. La Cienega Blvd., Los Angeles, CA 90069 (213) 659-8550

SAEC · HIGHPHONIC · SONY ES · ESPRIT · ENTRÉ · STAX · DENON · ORSONIC

MISCELLANEOUS

ABARGAIN: STAX SIGMA \$209, LAMBDA \$159, SRX MK3 \$129, SRD-7 \$68, SRE15 \$25, PROF LAMBDA/AMP \$509; GRACE F9E \$99, F9E STYLUS \$58, RUBY STYLUS, \$105, F9E RUBY \$155, 707II(B) \$130, 747 \$149; ACCUPHASE AC-2 \$255, AC-3 \$229; TECHNICS EPC205CIII \$85, EPC205CIV \$155, EPA500 \$245, TECHNICS STYLUS GAUGE \$49; DENON 103D \$165, 103C \$110, 303 \$198; DYNAVECTOR 23RS, DV-501 BOTH \$349, 17DII \$139, 17DS \$349, 20BII \$145, 10X4 \$85; KOETSU BLACK \$445, FR64FX \$265; AUDIO-TECHNICA AT-1100 (SIGNET SK-50) \$198; ORSONIC SHELL \$22; INTERCONN: BENSEI 3 \$35, 6 \$49, HITACHI; CD DISC \$12 P.P.; ALL UNUSED; FULL MFG WARRANTY; MFG STYLUS REPLACED; WANTED M.C. BODIES; BOX 273179, BOCA RATON, FL 33427 (305) 487-1048; BOX 6312, L.I.C. N.Y. 11106 (212) 784-2939.

AUDIO DISCOUNTS OFFERS THE FINEST lines of audio components (INCLUDING THE ESOTERICS) at DISCOUNT PRICES. If you're in the market for speakers, receivers, cassette decks, to the best in separate components including amps, pre-amps, turntables, cartridges etc. or a new CAR STEREO, our knowledgeable sales staff will be glad to assist you. For more information Monday thru Saturday PLEASE CALL 301-593-8833 or write to AUDIO DISCOUNTS, 1026 McCeney Avenue, Silver Spring, MD 20901. We honor VISA-MC and COD for your convenience. AD

MISCELLANEOUS

HARMAN KARDON, NAKAMICHI, TANDBERG, CROWN, REVOX, HAFLER, CARVER, NAD, DBX, ELECTRO-VOICE AND OTHER QUALITY COMPONENTS. BEST PRICES—PROFESSIONAL CONSULTATION. ALL PRODUCTS COVERED BY USA MANUFACTURER'S WARRANTY. AMERISOUND SALES, INC., P.O. BOX 24009, JACKSONVILLE, FL 32241. EAST: (904) 262-4000; WEST: (818) 840-0878.

J.S. BACH TRICENTENNIAL T-SHIRTS: 10.95ea. A true classic of a design for Bach's 300th Birthday. Screen printed on your choice of silver, tan, black or sky blue. Specify size: S,M,L,XL. Visa/MC orders call 1(800) 334-8987, or order by mail from: Gemini Shirts, PO Box 2707, Rocky Mount, NC 27801

MCINTOSH C32 \$899, C33 \$1375, C26 \$275, MX113 \$399, ARC SP3A1 \$375, BRB10 PREAMP \$299, BRB MC AMP \$69, DYNA PAS \$89, MACMR78 \$799, MR71 \$275, STAX SIGMA \$175, GOETZ GMS1 \$999, MAC MC3500 \$1500, ★713-7284343★

NAKAMICHI NAKAMICHI SHAMEFULLY LOW PRICES: Products Designed Especially For USA And Overseas Use. The More Information You Have The Better You Can Make Your Decision. Extremely Long Insured USA Warranties. Service Available Nationwide. Thousands of Satisfied Customers Worldwide. AudioWorkShop 1-206-323-4987.

20% TO 40% SAVINGS: NAKAMICHI, B&W, KOETSU, Denon, Tascam, NAD, Etc. VISA/MC, COD. AudioWorkShop 1-206-323-4987.

THEY DON'T DISCOUNT IT? WE DO! Get LOW PRICES on ALL types of audio equipment—including high-end and even esoteric products not normally discounted! Now we can save you money on the equipment you REALLY WANT. Extensive selection—no need to settle for second choice. Thousands of satisfied customers nationwide. Call us for price quotes or friendly, expert advice. Catalog \$1. 616-451-3868. VISA/MC/AMEX. THE AUDIO ADVISOR INC., BOX 6202, GRAND RAPIDS, MI 49506.

For America's best brands at America's lowest prices . . .

CALL S.C.A. TOLL-FREE!

800-221-0974

(In N.Y. State Call (718) 253-8888)

Save hundreds on top-name brands like Bose, A.R., Sansui, Shure, JVC, Technics & more. Call us today. Orders accepted by phone using your Visa or Mastercard. All merchandise is brand new & fully warranted. Free catalog by request.

STEREO CORPORATION OF AMERICA

Dept. AM, 1629 Flatbush Avenue Brooklyn, N.Y. 11210

Firm (Reader Service No.) Page

ADS(1)	110 & 111
Audiophile (2)	51
Audio Research (3)	81
Audio Source (52)	70
Audio-Technica (4, 5)	14, 106
Audiovox (6)	23
Azden (7)	20
Bose (8)	61
Brystonvermont (9)	20
B & W Loudspeakers (10)	109
Camel	98
Canton (11)	31
Carver (12)	105
CBS (13, 14)	4, 103
Cerwin Vega (15)	89
Custom Woodwork & Design	86
Denon (16)	Cover II & 1
Denon (17, 18, 51)	75, 93, Cover III
Discwasher (19)	88
Franklin Mint (20)	32 & 33
Harman/Kardon	26 & 27
Hifidelivision (21)	21
Illbruck (22)	112
JBL (23)	9
Madrigal (24)	108
Magnavox (25)	3
Maxell (26)	19
McIntosh (27)	104
NAD (28)	29
Nakamichi	55
Ohm (29)	87
Onkyo (31)	77
Ortofon (32)	7
PDMagnetics (33)	97
Plateau (34)	24
Polk (35)	101
Profile (36)	24
Reel (37)	85
Rogers (38)	69
Rotel (39)	66
Sansui (40)	11
Sherwood (41)	79
Shure Brothers (50)	100
Sony (42)	73
Soundcraftsmen (30)	16 & 17
Stanton (43)	68
Stax (44)	107
Studer Revox (45)	57
Tandberg (46)	95
TDK (47)	25
Technics (48)	Cover IV
Telarc (49)	91
Wild Turkey	5
Winston	63
Yamaha	84

CALL TOLL FREE 800-221-8180

23 PARK ROW, NEW YORK CITY, NEW YORK 10038

J&R MUSIC WORLD

SPECIALS OF THE MONTH

RECEIVERS

AKAI AA225 \$169.95
AKAI AA440 \$199.95
TECHNICS SA450 \$269.95
SANSUI ST170 \$269.95

COMPACT DISC PLAYERS

TECHNICS SL11 \$179.95
TECHNICS SL27 \$249.95
SHERWOOD CD100 \$229.95
TELCR PD11 \$199.95
HITACHI DA1500 \$269.95

TURNTABLES

TECHNICS SL15 \$149.95
TECHNICS SL015 \$179.95
TECHNICS SL030 \$209.95

CARTRIDGES

SHURE V15 \$109.95
SHURE V15 TYPE VIII \$129.95
AUDIO TECHNICA 122LP \$79.95
STANTON \$69.95

CASSETTE DECKS

AKAI CC1 \$159.95
TECHNICS CS170 \$159.95
TEAC PR64 \$199.95

STEREO-TO-GO

ANY BRAND 1.5W \$49.95
PANSORIC EX155 \$49.95
SANSUI SC100 \$49.95
SONY WM10 \$49.95
SONY WM100 \$49.95
SONY WM1000 \$49.95

EQUALIZERS/MIXERS

ANY BRAND \$29.95
NEW TDK FT2000 \$29.95
NEW TDK FT1000 \$29.95
TEAC T-120 \$29.95
PANSORIC 1-120 \$29.95

VIDEO TAPE

ANY BRAND 1.5" \$49.95
ANY BRAND 1.5" \$49.95

SUPER SPECIALS

NEW TDK FT2000 \$29.95
NEW TDK FT1000 \$29.95
TEAC T-120 \$29.95
PANSORIC 1-120 \$29.95

23 PARK ROW, DEPT. A2, NYC, N.Y. 10038

HOW TO ORDER BY MAIL: (1) PREPAY AND COUNTERSIGNED CHECK OR MONEY ORDER (2) CERTIFIED CHECK (3) CASH (4) CREDIT CARD (5) VISA (6) MASTERCARD (7) DISCOVER (8) AMERICAN EXPRESS (9) MONEY ORDER (10) CASH ON DELIVERY (11) CREDIT CARD (12) CASH ON DELIVERY (13) CASH ON DELIVERY (14) CASH ON DELIVERY (15) CASH ON DELIVERY (16) CASH ON DELIVERY (17) CASH ON DELIVERY (18) CASH ON DELIVERY (19) CASH ON DELIVERY (20) CASH ON DELIVERY (21) CASH ON DELIVERY (22) CASH ON DELIVERY (23) CASH ON DELIVERY (24) CASH ON DELIVERY (25) CASH ON DELIVERY (26) CASH ON DELIVERY (27) CASH ON DELIVERY (28) CASH ON DELIVERY (29) CASH ON DELIVERY (30) CASH ON DELIVERY (31) CASH ON DELIVERY (32) CASH ON DELIVERY (33) CASH ON DELIVERY (34) CASH ON DELIVERY (35) CASH ON DELIVERY (36) CASH ON DELIVERY (37) CASH ON DELIVERY (38) CASH ON DELIVERY (39) CASH ON DELIVERY (40) CASH ON DELIVERY (41) CASH ON DELIVERY (42) CASH ON DELIVERY (43) CASH ON DELIVERY (44) CASH ON DELIVERY (45) CASH ON DELIVERY (46) CASH ON DELIVERY (47) CASH ON DELIVERY (48) CASH ON DELIVERY (49) CASH ON DELIVERY (50) CASH ON DELIVERY (51) CASH ON DELIVERY (52) CASH ON DELIVERY (53) CASH ON DELIVERY (54) CASH ON DELIVERY (55) CASH ON DELIVERY (56) CASH ON DELIVERY (57) CASH ON DELIVERY (58) CASH ON DELIVERY (59) CASH ON DELIVERY (60) CASH ON DELIVERY (61) CASH ON DELIVERY (62) CASH ON DELIVERY (63) CASH ON DELIVERY (64) CASH ON DELIVERY (65) CASH ON DELIVERY (66) CASH ON DELIVERY (67) CASH ON DELIVERY (68) CASH ON DELIVERY (69) CASH ON DELIVERY (70) CASH ON DELIVERY (71) CASH ON DELIVERY (72) CASH ON DELIVERY (73) CASH ON DELIVERY (74) CASH ON DELIVERY (75) CASH ON DELIVERY (76) CASH ON DELIVERY (77) CASH ON DELIVERY (78) CASH ON DELIVERY (79) CASH ON DELIVERY (80) CASH ON DELIVERY (81) CASH ON DELIVERY (82) CASH ON DELIVERY (83) CASH ON DELIVERY (84) CASH ON DELIVERY (85) CASH ON DELIVERY (86) CASH ON DELIVERY (87) CASH ON DELIVERY (88) CASH ON DELIVERY (89) CASH ON DELIVERY (90) CASH ON DELIVERY (91) CASH ON DELIVERY (92) CASH ON DELIVERY (93) CASH ON DELIVERY (94) CASH ON DELIVERY (95) CASH ON DELIVERY (96) CASH ON DELIVERY (97) CASH ON DELIVERY (98) CASH ON DELIVERY (99) CASH ON DELIVERY (100) CASH ON DELIVERY (101) CASH ON DELIVERY (102) CASH ON DELIVERY (103) CASH ON DELIVERY (104) CASH ON DELIVERY (105) CASH ON DELIVERY (106) CASH ON DELIVERY (107) CASH ON DELIVERY (108) CASH ON DELIVERY (109) CASH ON DELIVERY (110) CASH ON DELIVERY (111) CASH ON DELIVERY (112) CASH ON DELIVERY (113) CASH ON DELIVERY (114) CASH ON DELIVERY (115) CASH ON DELIVERY (116) CASH ON DELIVERY (117) CASH ON DELIVERY (118) CASH ON DELIVERY (119) CASH ON DELIVERY (120) CASH ON DELIVERY (121) CASH ON DELIVERY (122) CASH ON DELIVERY (123) CASH ON DELIVERY (124) CASH ON DELIVERY (125) CASH ON DELIVERY (126) CASH ON DELIVERY (127) CASH ON DELIVERY (128) CASH ON DELIVERY (129) CASH ON DELIVERY (130) CASH ON DELIVERY (131) CASH ON DELIVERY (132) CASH ON DELIVERY (133) CASH ON DELIVERY (134) CASH ON DELIVERY (135) CASH ON DELIVERY (136) CASH ON DELIVERY (137) CASH ON DELIVERY (138) CASH ON DELIVERY (139) CASH ON DELIVERY (140) CASH ON DELIVERY (141) CASH ON DELIVERY (142) CASH ON DELIVERY (143) CASH ON DELIVERY (144) CASH ON DELIVERY (145) CASH ON DELIVERY (146) CASH ON DELIVERY (147) CASH ON DELIVERY (148) CASH ON DELIVERY (149) CASH ON DELIVERY (150) CASH ON DELIVERY (151) CASH ON DELIVERY (152) CASH ON DELIVERY (153) CASH ON DELIVERY (154) CASH ON DELIVERY (155) CASH ON DELIVERY (156) CASH ON DELIVERY (157) CASH ON DELIVERY (158) CASH ON DELIVERY (159) CASH ON DELIVERY (160) CASH ON DELIVERY (161) CASH ON DELIVERY (162) CASH ON DELIVERY (163) CASH ON DELIVERY (164) CASH ON DELIVERY (165) CASH ON DELIVERY (166) CASH ON DELIVERY (167) CASH ON DELIVERY (168) CASH ON DELIVERY (169) CASH ON DELIVERY (170) CASH ON DELIVERY (171) CASH ON DELIVERY (172) CASH ON DELIVERY (173) CASH ON DELIVERY (174) CASH ON DELIVERY (175) CASH ON DELIVERY (176) CASH ON DELIVERY (177) CASH ON DELIVERY (178) CASH ON DELIVERY (179) CASH ON DELIVERY (180) CASH ON DELIVERY (181) CASH ON DELIVERY (182) CASH ON DELIVERY (183) CASH ON DELIVERY (184) CASH ON DELIVERY (185) CASH ON DELIVERY (186) CASH ON DELIVERY (187) CASH ON DELIVERY (188) CASH ON DELIVERY (189) CASH ON DELIVERY (190) CASH ON DELIVERY (191) CASH ON DELIVERY (192) CASH ON DELIVERY (193) CASH ON DELIVERY (194) CASH ON DELIVERY (195) CASH ON DELIVERY (196) CASH ON DELIVERY (197) CASH ON DELIVERY (198) CASH ON DELIVERY (199) CASH ON DELIVERY (200) CASH ON DELIVERY (201) CASH ON DELIVERY (202) CASH ON DELIVERY (203) CASH ON DELIVERY (204) CASH ON DELIVERY (205) CASH ON DELIVERY (206) CASH ON DELIVERY (207) CASH ON DELIVERY (208) CASH ON DELIVERY (209) CASH ON DELIVERY (210) CASH ON DELIVERY (211) CASH ON DELIVERY (212) CASH ON DELIVERY (213) CASH ON DELIVERY (214) CASH ON DELIVERY (215) CASH ON DELIVERY (216) CASH ON DELIVERY (217) CASH ON DELIVERY (218) CASH ON DELIVERY (219) CASH ON DELIVERY (220) CASH ON DELIVERY (221) CASH ON DELIVERY (222) CASH ON DELIVERY (223) CASH ON DELIVERY (224) CASH ON DELIVERY (225) CASH ON DELIVERY (226) CASH ON DELIVERY (227) CASH ON DELIVERY (228) CASH ON DELIVERY (229) CASH ON DELIVERY (230) CASH ON DELIVERY (231) CASH ON DELIVERY (232) CASH ON DELIVERY (233) CASH ON DELIVERY (234) CASH ON DELIVERY (235) CASH ON DELIVERY (236) CASH ON DELIVERY (237) CASH ON DELIVERY (238) CASH ON DELIVERY (239) CASH ON DELIVERY (240) CASH ON DELIVERY (241) CASH ON DELIVERY (242) CASH ON DELIVERY (243) CASH ON DELIVERY (244) CASH ON DELIVERY (245) CASH ON DELIVERY (246) CASH ON DELIVERY (247) CASH ON DELIVERY (248) CASH ON DELIVERY (249) CASH ON DELIVERY (250) CASH ON DELIVERY (251) CASH ON DELIVERY (252) CASH ON DELIVERY (253) CASH ON DELIVERY (254) CASH ON DELIVERY (255) CASH ON DELIVERY (256) CASH ON DELIVERY (257) CASH ON DELIVERY (258) CASH ON DELIVERY (259) CASH ON DELIVERY (260) CASH ON DELIVERY (261) CASH ON DELIVERY (262) CASH ON DELIVERY (263) CASH ON DELIVERY (264) CASH ON DELIVERY (265) CASH ON DELIVERY (266) CASH ON DELIVERY (267) CASH ON DELIVERY (268) CASH ON DELIVERY (269) CASH ON DELIVERY (270) CASH ON DELIVERY (271) CASH ON DELIVERY (272) CASH ON DELIVERY (273) CASH ON DELIVERY (274) CASH ON DELIVERY (275) CASH ON DELIVERY (276) CASH ON DELIVERY (277) CASH ON DELIVERY (278) CASH ON DELIVERY (279) CASH ON DELIVERY (280) CASH ON DELIVERY (281) CASH ON DELIVERY (282) CASH ON DELIVERY (283) CASH ON DELIVERY (284) CASH ON DELIVERY (285) CASH ON DELIVERY (286) CASH ON DELIVERY (287) CASH ON DELIVERY (288) CASH ON DELIVERY (289) CASH ON DELIVERY (290) CASH ON DELIVERY (291) CASH ON DELIVERY (292) CASH ON DELIVERY (293) CASH ON DELIVERY (294) CASH ON DELIVERY (295) CASH ON DELIVERY (296) CASH ON DELIVERY (297) CASH ON DELIVERY (298) CASH ON DELIVERY (299) CASH ON DELIVERY (300) CASH ON DELIVERY (301) CASH ON DELIVERY (302) CASH ON DELIVERY (303) CASH ON DELIVERY (304) CASH ON DELIVERY (305) CASH ON DELIVERY (306) CASH ON DELIVERY (307) CASH ON DELIVERY (308) CASH ON DELIVERY (309) CASH ON DELIVERY (310) CASH ON DELIVERY (311) CASH ON DELIVERY (312) CASH ON DELIVERY (313) CASH ON DELIVERY (314) CASH ON DELIVERY (315) CASH ON DELIVERY (316) CASH ON DELIVERY (317) CASH ON DELIVERY (318) CASH ON DELIVERY (319) CASH ON DELIVERY (320) CASH ON DELIVERY (321) CASH ON DELIVERY (322) CASH ON DELIVERY (323) CASH ON DELIVERY (324) CASH ON DELIVERY (325) CASH ON DELIVERY (326) CASH ON DELIVERY (327) CASH ON DELIVERY (328) CASH ON DELIVERY (329) CASH ON DELIVERY (330) CASH ON DELIVERY (331) CASH ON DELIVERY (332) CASH ON DELIVERY (333) CASH ON DELIVERY (334) CASH ON DELIVERY (335) CASH ON DELIVERY (336) CASH ON DELIVERY (337) CASH ON DELIVERY (338) CASH ON DELIVERY (339) CASH ON DELIVERY (340) CASH ON DELIVERY (341) CASH ON DELIVERY (342) CASH ON DELIVERY (343) CASH ON DELIVERY (344) CASH ON DELIVERY (345) CASH ON DELIVERY (346) CASH ON DELIVERY (347) CASH ON DELIVERY (348) CASH ON DELIVERY (349) CASH ON DELIVERY (350) CASH ON DELIVERY (351) CASH ON DELIVERY (352) CASH ON DELIVERY (353) CASH ON DELIVERY (354) CASH ON DELIVERY (355) CASH ON DELIVERY (356) CASH ON DELIVERY (357) CASH ON DELIVERY (358) CASH ON DELIVERY (359) CASH ON DELIVERY (360) CASH ON DELIVERY (361) CASH ON DELIVERY (362) CASH ON DELIVERY (363) CASH ON DELIVERY (364) CASH ON DELIVERY (365) CASH ON DELIVERY (366) CASH ON DELIVERY (367) CASH ON DELIVERY (368) CASH ON DELIVERY (369) CASH ON DELIVERY (370) CASH ON DELIVERY (371) CASH ON DELIVERY (372) CASH ON DELIVERY (373) CASH ON DELIVERY (374) CASH ON DELIVERY (375) CASH ON DELIVERY (376) CASH ON DELIVERY (377) CASH ON DELIVERY (378) CASH ON DELIVERY (379) CASH ON DELIVERY (380) CASH ON DELIVERY (381) CASH ON DELIVERY (382) CASH ON DELIVERY (383) CASH ON DELIVERY (384) CASH ON DELIVERY (385) CASH ON DELIVERY (386) CASH ON DELIVERY (387) CASH ON DELIVERY (388) CASH ON DELIVERY (389) CASH ON DELIVERY (390) CASH ON DELIVERY (391) CASH ON DELIVERY (392) CASH ON DELIVERY (393) CASH ON DELIVERY (394) CASH ON DELIVERY (395) CASH ON DELIVERY (396) CASH ON DELIVERY (397) CASH ON DELIVERY (398) CASH ON DELIVERY (399) CASH ON DELIVERY (400) CASH ON DELIVERY (401) CASH ON DELIVERY (402) CASH ON DELIVERY (403) CASH ON DELIVERY (404) CASH ON DELIVERY (405) CASH ON DELIVERY (406) CASH ON DELIVERY (407) CASH ON DELIVERY (408) CASH ON DELIVERY (409) CASH ON DELIVERY (410) CASH ON DELIVERY (411) CASH ON DELIVERY (412) CASH ON DELIVERY (413) CASH ON DELIVERY (414) CASH ON DELIVERY (415) CASH ON DELIVERY (416) CASH ON DELIVERY (417) CASH ON DELIVERY (418) CASH ON DELIVERY (419) CASH ON DELIVERY (420) CASH ON DELIVERY (421) CASH ON DELIVERY (422) CASH ON DELIVERY (423) CASH ON DELIVERY (424) CASH ON DELIVERY (425) CASH ON DELIVERY (426) CASH ON DELIVERY (427) CASH ON DELIVERY (428) CASH ON DELIVERY (429) CASH ON DELIVERY (430) CASH ON DELIVERY (431) CASH ON DELIVERY (432) CASH ON DELIVERY (433) CASH ON DELIVERY (434) CASH ON DELIVERY (435) CASH ON DELIVERY (436) CASH ON DELIVERY (437) CASH ON DELIVERY (438) CASH ON DELIVERY (439) CASH ON DELIVERY (440) CASH ON DELIVERY (441) CASH ON DELIVERY (442) CASH ON DELIVERY (443) CASH ON DELIVERY (444) CASH ON DELIVERY (445) CASH ON DELIVERY (446) CASH ON DELIVERY (447) CASH ON DELIVERY (448) CASH ON DELIVERY (449) CASH ON DELIVERY (450) CASH ON DELIVERY (451) CASH ON DELIVERY (452) CASH ON DELIVERY (453) CASH ON DELIVERY (454) CASH ON DELIVERY (455) CASH ON DELIVERY (456) CASH ON DELIVERY (457) CASH ON DELIVERY (458) CASH ON DELIVERY (459) CASH ON DELIVERY (460) CASH ON DELIVERY (461) CASH ON DELIVERY (462) CASH ON DELIVERY (463) CASH ON DELIVERY (464) CASH ON DELIVERY (465) CASH ON DELIVERY (466) CASH ON DELIVERY (467) CASH ON DELIVERY (468) CASH ON DELIVERY (469) CASH ON DELIVERY (470) CASH ON DELIVERY (471) CASH ON DELIVERY (472) CASH ON DELIVERY (473) CASH ON DELIVERY (474) CASH ON DELIVERY (475) CASH ON DELIVERY (476) CASH ON DELIVERY (477) CASH ON DELIVERY (478) CASH ON DELIVERY (479) CASH ON DELIVERY (480) CASH ON DELIVERY (481) CASH ON DELIVERY (482) CASH ON DELIVERY (483) CASH ON DELIVERY (484) CASH ON DELIVERY (485) CASH ON DELIVERY (486) CASH ON DELIVERY (487) CASH ON DELIVERY (488) CASH ON DELIVERY (489) CASH ON DELIVERY (490) CASH ON DELIVERY (491) CASH ON DELIVERY (492) CASH ON DELIVERY (493) CASH ON DELIVERY (494) CASH ON DELIVERY (495) CASH ON DELIVERY (496) CASH ON DELIVERY (497) CASH ON DELIVERY (498) CASH ON DELIVERY (499) CASH ON DELIVERY (500) CASH ON DELIVERY (501) CASH ON DELIVERY (502) CASH ON DELIVERY (503) CASH ON DELIVERY (504) CASH ON DELIVERY (505) CASH ON DELIVERY (506) CASH ON DELIVERY (507) CASH ON DELIVERY (508) CASH ON DELIVERY (509) CASH ON DELIVERY (510) CASH ON DELIVERY (511) CASH ON DELIVERY (512) CASH ON DELIVERY (513) CASH ON DELIVERY (514) CASH ON DELIVERY (515) CASH ON DELIVERY (516) CASH ON DELIVERY (517) CASH ON DELIVERY (518) CASH ON DELIVERY (519) CASH ON DELIVERY (520) CASH ON DELIVERY (521) CASH ON DELIVERY (522) CASH ON DELIVERY (523) CASH ON DELIVERY (524) CASH ON DELIVERY (525) CASH ON DELIVERY (526) CASH ON DELIVERY (527) CASH ON DELIVERY (528) CASH ON DELIVERY (529) CASH ON DELIVERY (530) CASH ON DELIVERY (531) CASH ON DELIVERY (532) CASH ON DELIVERY (533) CASH ON DELIVERY (534) CASH ON DELIVERY (535) CASH ON DELIVERY (536) CASH ON DELIVERY (537) CASH ON DELIVERY (538) CASH ON DELIVERY (539) CASH ON DELIVERY (540) CASH ON DELIVERY (541) CASH ON DELIVERY (542) CASH ON DELIVERY (543) CASH ON DELIVERY (544) CASH ON DELIVERY (545) CASH ON DELIVERY (546) CASH ON DELIVERY (547) CASH ON DELIVERY (548) CASH ON DELIVERY (549) CASH ON DELIVERY (550) CASH ON DELIVERY (551) CASH ON DELIVERY (552) CASH ON DELIVERY (553) CASH ON DELIVERY (554) CASH ON DELIVERY (555) CASH ON DELIVERY (556) CASH ON DELIVERY (557) CASH ON DELIVERY (558) CASH ON DELIVERY (559) CASH ON DELIVERY (560) CASH ON DELIVERY (561) CASH ON DELIVERY (562) CASH ON DELIVERY (563) CASH ON DELIVERY (564) CASH ON DELIVERY (565) CASH ON DELIVERY (566) CASH ON DELIVERY (567) CASH ON DELIVERY (568) CASH ON DELIVERY (569) CASH ON DELIVERY (570) CASH ON DELIVERY (571) CASH ON DELIVERY (572) CASH ON DELIVERY (573) CASH ON DELIVERY (574) CASH ON DELIVERY (575) CASH ON DELIVERY (576) CASH ON DELIVERY (577) CASH ON DELIVERY (578) CASH ON DELIVERY (579) CASH ON DELIVERY (580) CASH ON DELIVERY (581) CASH ON DELIVERY (582) CASH ON DELIVERY (583) CASH ON DELIVERY (584) CASH ON DELIVERY (585) CASH ON DELIVERY (586) CASH ON DELIVERY (587) CASH ON DELIVERY (588) CASH ON DELIVERY (589) CASH ON DELIVERY (590) CASH ON DELIVERY (591) CASH ON DELIVERY (592) CASH ON DELIVERY (593) CASH ON DELIVERY (594) CASH ON DELIVERY (595) CASH ON DELIVERY (596) CASH ON DELIVERY (597) CASH ON DELIVERY (598) CASH ON DELIVERY (599) CASH ON DELIVERY (600) CASH ON DELIVERY (601) CASH ON DELIVERY (602) CASH ON DELIVERY (603) CASH ON DELIVERY (604) CASH ON DELIVERY (605) CASH ON DELIVERY (606) CASH ON DELIVERY (607) CASH ON DELIVERY (608) CASH ON DELIVERY (609) CASH ON DELIVERY (610) CASH ON DELIVERY (611) CASH ON DELIVERY (612) CASH ON DELIVERY (613) CASH ON DELIVERY (614) CASH ON DELIVERY (615) CASH ON DELIVERY (616) CASH ON DELIVERY (617) CASH ON DELIVERY (618) CASH ON DELIVERY (619) CASH ON DELIVERY (620) CASH ON DELIVERY (621) CASH ON DELIVERY (622) CASH ON DELIVERY (623) CASH ON DELIVERY (624) CASH ON DELIVERY (625) CASH ON DELIVERY (626) CASH ON DELIVERY (627) CASH ON DELIVERY (628) CASH ON DELIVERY (629) CASH ON DELIVERY (630) CASH ON DELIVERY (631) CASH ON DELIVERY (632) CASH ON DELIVERY (633) CASH ON DELIVERY (634) CASH ON DELIVERY (635) CASH ON DELIVERY (636) CASH ON DELIVERY (637) CASH ON DELIVERY (638) CASH ON DELIVERY (639) CASH ON DELIVERY (640) CASH ON DELIVERY (641) CASH ON DELIVERY (642) CASH ON DELIVERY (643) CASH ON DELIVERY (644) CASH ON DELIVERY (645) CASH ON DELIVERY (646) CASH ON DELIVERY (647) CASH ON DELIVERY (648) CASH ON DELIVERY (649) CASH ON DELIVERY (650) CASH ON DELIVERY (651) CASH ON DELIVERY (652) CASH ON DELIVERY (653) CASH ON DELIVERY (654) CASH ON DELIVERY (655) CASH ON DELIVERY (656) CASH ON DELIVERY (657) CASH ON DELIVERY (658) CASH ON DELIVERY (659) CASH ON DELIVERY (660) CASH ON DELIVERY (661) CASH ON DELIVERY (662) CASH ON DELIVERY (663) CASH ON DELIVERY (664) CASH ON DELIVERY (665) CASH ON DELIVERY (666) CASH ON DELIVERY (667) CASH ON DELIVERY (668) CASH ON DELIVERY (669) CASH ON DELIVERY (670) CASH ON DELIVERY (671) CASH ON DELIVERY (672) CASH ON DELIVERY (673) CASH ON DELIVERY (674) CASH ON DELIVERY (675) CASH ON DELIVERY (676) CASH ON DELIVERY (677) CASH ON DELIVERY (678) CASH ON DELIVERY (679) CASH ON DELIVERY (680) CASH ON DELIVERY (681) CASH ON DELIVERY (682) CASH ON DELIVERY (683) CASH ON DELIVERY (684) CASH ON DELIVERY (685) CASH ON DELIVERY (686) CASH ON DELIVERY (687) CASH ON DELIVERY (688) CASH ON DELIVERY (689) CASH ON DELIVERY (690) CASH ON DELIVERY (691) CASH ON DELIVERY (692) CASH ON DELIVERY (693) CASH ON DELIVERY (694) CASH ON DELIVERY (695) CASH ON DELIVERY (696) CASH ON DELIVERY (697) CASH ON DELIVERY (698) CASH ON DELIVERY (699) CASH ON DELIVERY (700) CASH ON DELIVERY (701) CASH ON DELIVERY (702) CASH ON DELIVERY (703) CASH ON DELIVERY (704) CASH ON DELIVERY (705) CASH ON DELIVERY (706) CASH ON DELIVERY (707) CASH ON DELIVERY (708) CASH ON DELIVERY (709) CASH ON DELIVERY (710) CASH ON DELIVERY (711) CASH ON DELIVERY (712) CASH ON DELIVERY (713) CASH ON DELIVERY (714) CASH ON DELIVERY (715) CASH ON DELIVERY (716) CASH ON DELIVERY (717) CASH ON DELIVERY (718) CASH ON DELIVERY (719) CASH ON DELIVERY (720) CASH ON DELIVERY (721) CASH ON DELIVERY (722) CASH ON DELIVERY (723) CASH ON DELIVERY (724) CASH ON DELIVERY (725) CASH ON DELIVERY (726) CASH ON DELIVERY (727) CASH ON DELIVERY (728) CASH ON DELIVERY (729) CASH ON DELIVERY (730) CASH ON DELIVERY (731) CASH ON DELIVERY (732) CASH ON DELIVERY (733) CASH ON DELIVERY (734) CASH ON DELIVERY (735) CASH ON DELIVERY (736) CASH ON DELIVERY (737) CASH ON DELIVERY (738) CASH ON DELIVERY (739) CASH ON DELIVERY (740) CASH ON DELIVERY (741) CASH ON DELIVERY (742) CASH ON DELIVERY (743) CASH ON DELIVERY (744) CASH ON DELIVERY (745) CASH ON DELIVERY (746) CASH ON DELIVERY (747) CASH ON DELIVERY (748) CASH ON DELIVERY (749) CASH ON DELIVERY (750) CASH ON DELIVERY (751) CASH ON DELIVERY (752) CASH ON DELIVERY (753) CASH ON DELIVERY (754) CASH ON DELIVERY (755) CASH ON DELIVERY (756) CASH ON DELIVERY (757) CASH ON DELIVERY (758) CASH ON DELIVERY (759) CASH ON DELIVERY (760) CASH ON DELIVERY (761) CASH ON DELIVERY (762) CASH ON DELIVERY (763) CASH ON DELIVERY (764) CASH ON DELIVERY (765) CASH ON DEL

THE BEST HANDLING CASSETTE TAPE.



The favorite cassette tape of serious audio enthusiasts is now ready to travel. Denon's new CarryClip™ lets you leave heavy, bulky cassette boxes at home, and still protect your music from dust and shock.

Get two free with each DX-7 two-pack you buy.

DENON

THE MOST MUSICAL CASSETTE TAPE

Nippon Gakki Co., Ltd. No. 14-24, 4-Chome, Akasaka, Minato-Ku, Tokyo 107, Japan

Denon America, Inc., 27 Law Drive, Fairfield, N.J. 07006
Queen Imports, 3950 Griffith St., Montreal, Quebec H4T 1A7, Canada

Enter No. 51 on Reader Service Card



Technics Linear Tracking and Quartz Drive. If your next turntable gives you less, you're settling for less of a turntable.

To create a turntable with either linear tracking or quartz drive is an achievement in itself. But to create a turntable with both linear tracking and quartz drive is pure Technics.

A Technics turntable with linear tracking gives you a tonearm that moves straight across the record. The way the record was originally cut. So you get none of the distortion or tracking error that are so common with conventional turntables.

Quartz drive is the most accurate drive system in the world. That means the wow and flutter that plagues conventional turntables is inaudible.

So Technics turntables, with both linear tracking and quartz drive, deliver performance few turntables anywhere can match.

The new Technics SL-J2 offers completely automatic operation: automatic speed selection, automatic disc size selection, automatic start, stop, return and more. There are front-panel controls. Including a digital display of the track number you're listening to. And all of this technology has been placed in a turntable about the size of a record jacket.

Technics turntables also feature the innovative P-Mount plug-in cartridge system. For optimum tonearm/cartridge performance and ease of cartridge installation.

So why settle for less. Explore the entire line of Technics turntables at a dealer near you.

Technics
The science of sound