

The  
Authoritative  
Magazine  
About  
High Fidelity

# Audio

NOVEMBER 1982 • \$1.50 • ©06030

DIRECTORY  
OF BLANK TAPE  
& NOISE REDUCERS

**EXCLUSIVE!!  
FIRST TEST!!**

**SONY'S NEW  
COMPACT DIGITAL  
DISC PLAYER**

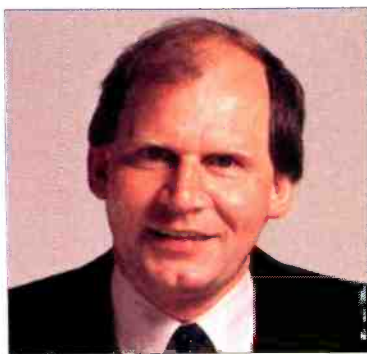
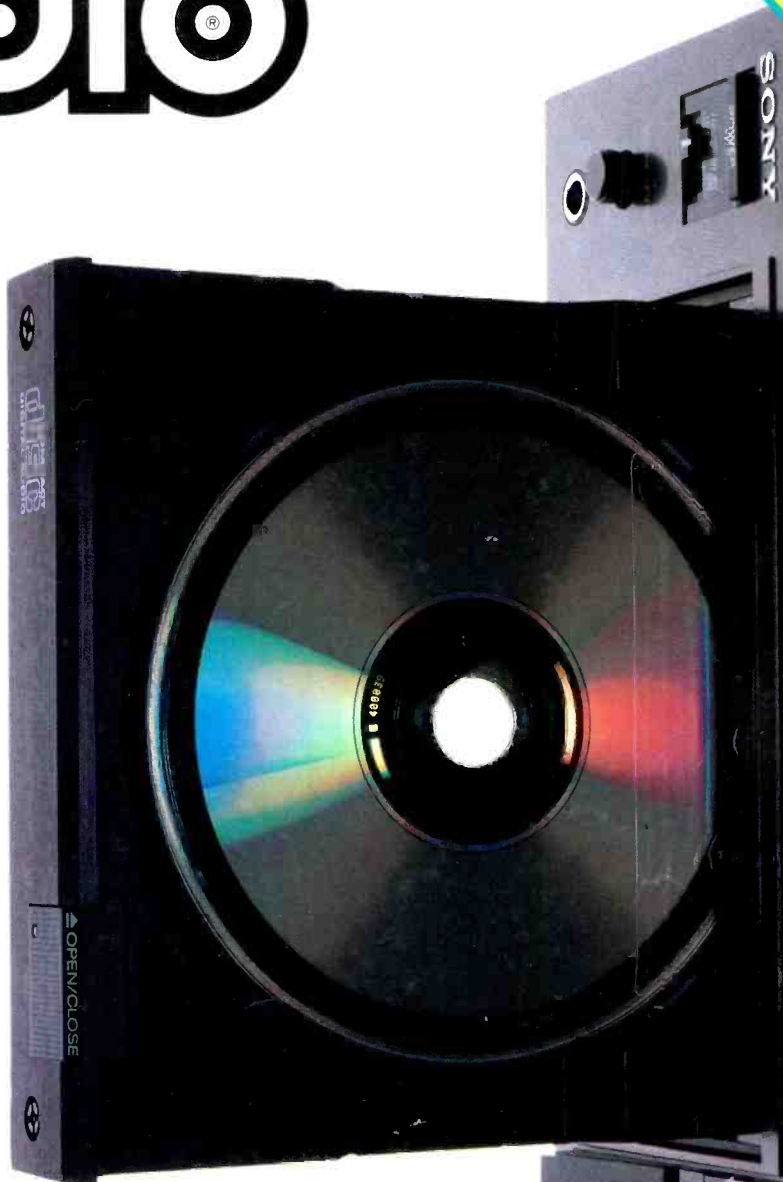
**REVIEWS:  
AKAI GX-F66RC  
CASSETTE  
DECK**

**SHURE V-15 V  
CARTRIDGE**

**CAMBRIDGE 310  
SPEAKER**

**MISSION 777  
POWER AMP**

**INTERVIEW:  
GODEHARD  
GUENTHER  
OF ADS—  
THE MAN WHO  
MADE THE  
MINI-SPEAKER**



# Achieve Mitsubishi in a sportscar that's charged with more than a turbo



# STARION

The charge begins the moment you slide into the cockpit of the Mitsubishi Starion — it's the exhilarating feeling of complete control.

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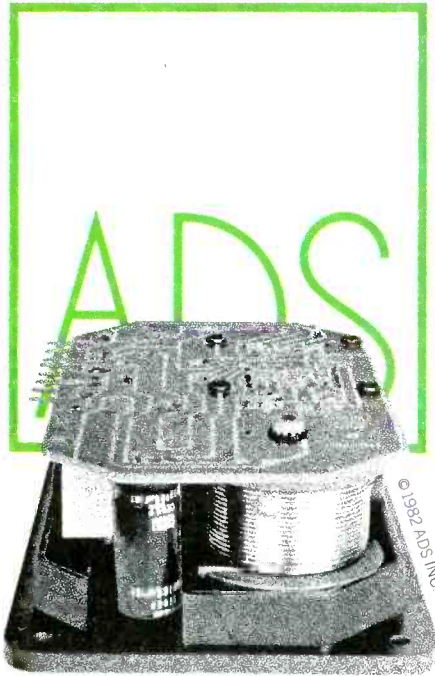
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# Audio

NOVEMBER 1982

VOL. 66, NO. 11



## The crossover network. A great place to hide.

You don't usually see crossovers in loudspeaker ads.

Because the crossover is the most embarrassing part of most loudspeaker systems; an electronic 'kludge' buried deep in the cabinet. Designed to cover up the deficiencies of mediocre drivers. Or, just to save money so that the speaker can be sold at a particular price.

The ADS crossover, above, is a different breed altogether.

All its components are computer grade, and mounted on a 'military spec' epoxy printed circuit board. Chokes are wound with wire imported from one country on ferrite cores imported from another.

It's one of the reasons an ADS speaker sounds better, and tighter in the low end. It is an elegant solution, in every way.

We bring it to your attention because it is one of many fastidious details which are part of every piece of equipment (regardless of price) which carries the ADS name.

Watch this space for more interesting facts. Or contact us.

Write Analog & Digital Systems, Inc., 221 Progress Way, Wilmington, MA 01887. Call 800-824-7888 (in California, 800-852-7777) Operator 483.

Or best of all, see an ADS dealer. We can only tell you how well they're made. He can show you how much better they sound.

**ADS. Audio apart.**



See page 36.

### FEATURE ARTICLES

DIRECTORY OF BLANK TAPE .....	30
DIRECTORY OF NOISE-REDUCTION UNITS .....	32
DIRECTORY OF MANUFACTURERS .....	34
FIRST LOOK: SONY'S DIGITAL COMPACT DISC PLAYER .....	36
Leonard Feldman .....	
ONE-BRAND SYSTEM REVIEW: FISHER SYSTEM R-70 .....	44
Leonard Feldman .....	
THE AUDIO INTERVIEW: GODEHARD .....	46
David Lander .....	

### EQUIPMENT PROFILES

AKAI GX-F66RC CASSETTE DECK .....	Howard A. Roberson .....	52
MISSION ELECTRONICS 777 POWER AMPLIFIER .....	Leonard Feldman .....	58
SHURE V-15 TYPE V PHONO CARTRIDGE .....	B. V. Pisha .....	63
CAMBRIDGE PHYSICS 310 SPEAKER .....	Richard C. Heyser .....	68

### RECORD REVIEWS

ROCK/POP .....	Michael Tearson, Jon & Sally Tiven .....	26
CLASSICAL REVIEWS .....	Edward Tatnall Canby .....	90

### DEPARTMENTS

SPECTRUM .....	Ivan Berger .....	6
AUDIO ETC .....	Edward Tatnall Canby .....	10
TAPE GUIDE .....	Herman Burstein .....	17
BEHIND THE SCENES .....	Bert Whyte .....	20
AUDIOCLINIC .....	Joseph Giovanelli .....	24
CLASSIFIED ADVERTISING .....		74
ADVERTISING INDEX .....		88
THE BOOKSHELF .....		89
VIDEO SCENES .....	Bert Whyte .....	95

See page 10.



The Cover Equipment: Sony CDP-101 Digital Compact Disc player.  
The Cover Photographer: Carl Zapp.

Audio Publishing, Editorial and Advertising Production Offices,  
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# HOW CAN SANSUI CLAIM THE WORLD'S ONLY DISTORTION-FREE RECEIVER? SIMPLE. WITH SUPER FEEDFORWARD DC AMP.

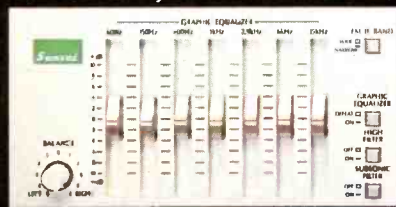
Creating technological breakthroughs is nothing new to Sansui. One of our most recent innovations, the unique Super Feedforward DC power amplifier system routes all types of distortion—harmonic, intermodulation, transient intermodulation, switching—you name it.

And it's the reason we can claim that Sansui's new top-of-the-line, 120-watt\* Z-9000 receiver is truly distortion-free.

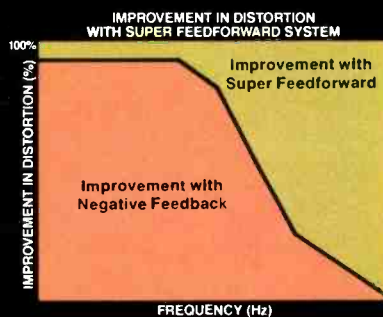
Simply stated, the Sansui Super Feedforward circuit is the perfect marriage between negative feedback and feedforward. As a result, you're never bothered by any type of distortion. You hear precisely what's on the records, tapes and broadcasts. Nothing added, nothing lost—just pure music.

## 7-band graphic equalizer for greater tone control.

Unlike receivers with conventional two or three tone controls, the Z-9000 provides total flexibility with a state-of-



the-art 7-band graphic equalizer that helps balance the sound in your listening room.



## Digital Quartz-PLL tuning is more precise.

While Super Feedforward alone is enough to outperform most receivers, the Z-9000 adds the pinpoint accuracy of drift-free digital Quartz-PLL tuning. To make sure it's as easy to use as it is precise, there's microprocessor-controlled pushbutton pre-selection of eight FM and eight AM stations. Plus automatic scanning to recall each preset station at the previously programmed volume level. Each time you touch the tuning button you can scan or go up and down the FM and AM bands, bringing in perfectly tuned stations even when they're a hairline away from each other.

## Extras add more pleasure to your listening.

The Z-9000 is loaded with high technology refinements that let you experiment with sound the way no other receiver can.

The built-in reverb unit with its own display can make your finest tapes and recordings sound even more magnificent by adding natural depth, extra brilliance and sound realism. The exclusive quartz/timer clock with three independent memory functions can be programmed to wake you up, lull you to sleep, and tape a broadcast in your absence. There are also high and sub-sonic filters and a preamp that handles both moving magnet and moving coil cartridges.

If the new distortion-free Sansui Z-9000 sounds too good to be true, satisfy yourself with an audition at your audio specialist. Or write today for additional details.



SANSUI ELECTRONICS CORPORATION  
Lyndhurst, NJ 07071; Gardena, CA 90248  
Sansui Electric Co., Ltd., Tokyo, Japan

\*120 watts per channel minimum RMS into 8 ohms, 20Hz to 20kHz, with no more than 0.005% total harmonic distortion.

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**Stop.** You're in for a very delightful surprise. Because something exciting has happened to TDK's Professional Reference Series of audio cassettes. Something exciting for your ears...and inviting for your eyes.

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And each tape in the Professional Reference Series comes with TDK's ultra-reliable, high-performance cassette mechanism which assures you of superior tape-to-head

contact, smoother, trouble-free running and a long, long playing life.

The new TDK Professional Reference Series with our bold, new look and great new sound—now more than ever, it's the machine for your machine.

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**AUDIO** (ISSN0004-752X) is published monthly by CBS Publications, The Consumer Publishing Division of CBS Inc., 1515 Broadway, New York, N.Y. 10036.

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**Dewey Decimal Number** 621.381 or 778.5

**Editorial Contributions** are welcomed but should be accompanied by return postage. Submissions will be handled with reasonable care, but the publisher 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.

**Printed in U.S.A.** at Nashville, Tenn. Second Class postage paid at New York, N.Y. 10001 and additional mailing offices.

**U.S. Subscription Rates:** 1 year \$13.94, 2 years \$22.94, 3 years \$29.94.

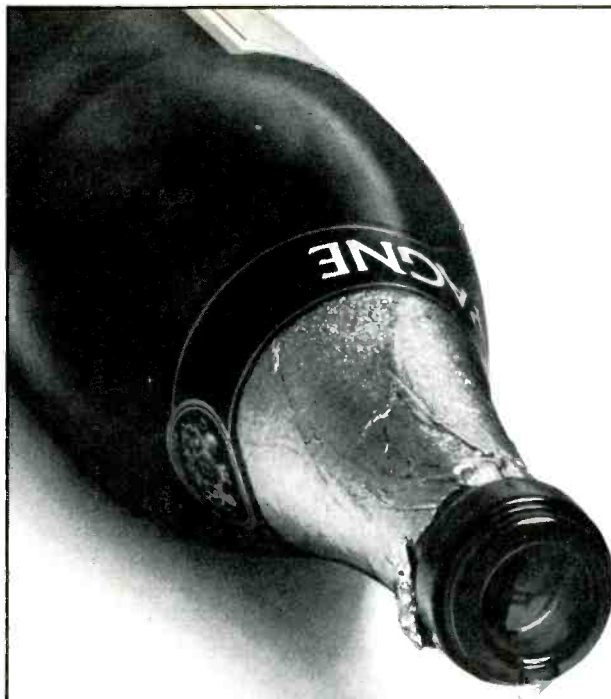
**Other Countries:** Add \$6.00 per year.

**Back Issues,** when available, \$5.00 postpaid.

**Audio Publishing, Editorial and Advertising Production offices,** 1515 Broadway, New York, N.Y. 10036.

**Audio Subscription Offices,** P.O. Box 5318, 1255 Portland Place, Boulder, Colo. 80322

**Postmaster:** Send change of address to P.O. Box 5316, 1255 Portland Place, Boulder, Colo. 80322.



## No hangover!

Hangover—a rather loose term to describe the stored energy resonance in a loudspeaker, the principal cause of coloration that immediately tells you you're listening to a loudspeaker.

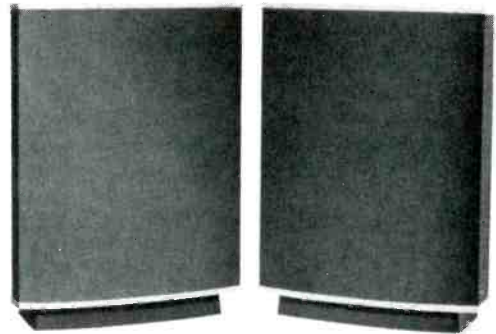
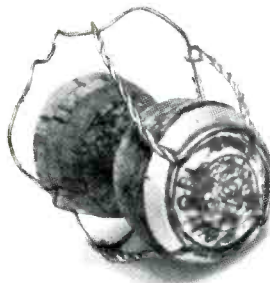
Take it away and there's a new world—the loudspeakers have nothing more to say—instead there's just the orchestra and the magic of the music.

If music is an important part of your life, then a pair of ESL-63 loudspeakers could be the best investment you've ever made.

Perhaps even something to celebrate about.

For further details and the name and address of your nearest QUAD ESL-63 retailer, write: QUAD, 425 Sherman Avenue, Palo Alto, CA 94306.

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## BROADBAND BITS

### Re: Spectrum

• There's a whole spectrum of news and other matters that does not easily fit the regular slots in *Audio's* format. This column of news, trends, observations and short interviews is intended to fill that gap.

Though I've been writing about audio for 20 years, this is the first time my byline will appear regularly in these pages. (I did write a column on

audio basics here, briefly, in the '60s, but under a nom de plume.) I've also been working with and writing about video, computers and such. Where they reflect on audio, this column will touch on them.

"Spectrum" will be mainly my column, but not exclusively. From time to time, you may find items signed off with the initials "E.P." That will be ye editor, getting his

### Digital Differences

Digital disc players don't sound alike. Neither do digital recorders. If you get a chance to A-B them, listen for it.

If perfect products sound alike, then these aren't perfect. But the imperfection probably lies less in the digital process than in the digital-to-analog conversion stages which turn the digital bit sequences into analog waveforms which our amplifiers, loudspeakers and ears can handle. It could also lie in the system's other analog circuits.

The differences are subtle—a bit more than differences between amplifiers, but far less than those between phono cartridges, let alone speakers. They'll be enough, though, to spark hot controversies; just as with today's audiophile equipment, the pleasure need not just be in listening to the music, but in comparing the equipment, too.

Enjoy the discussions, while they last. The equipment will be inching its way further toward unreachable perfection. At some point, the differences will tend to disappear.

Styling, though, will remain a point of difference. There seems to be two schools of design. The Sony DAD player we're testing this month is low-slung, to fit fairly unobtrusively into a component system. At first glance, one could take it for a standard cassette deck. We plan next month to test another player with a different styling approach: An upright design that lets you watch the record turning—and lets every audiophile who comes into the room know that you have a DAD player.



### Headphone Ban

In a way, the Walkman and its imitators have cleaned up the streets. Instead of hearing a loud handful of listeners with big, blaring "boxes," we now see myriad silent headphone wearers, marching to individual drummers.

Except, perhaps, in Woodbridge, New Jersey, where the Township Council voted unanimously to ban the wearing of headphones on the township's streets. (At press time, Woodbridge was about to vote on an ordinance amended by the state's Department of Motor Vehicles to allow headphone wearing by police and firemen on duty, refuse collectors, and heavy-equipment operators and to allow the use of hearing protectors.)

The ban would not affect headphone wearing in parks, on sidewalks or in other public places—only on the streets, where the Council feels that headphone listening is hazardous. A similar ordinance was discussed last summer in Chicago, and some states (such as Pennsylvania) have laws against wearing headphones while driving. Nonetheless, one car-stereo maker

recently announced systems with "Rideman" jacks, the name piously indicating that only the passengers should use them, and a Japanese company offers 6×9-in. rear-deck speakers with headphone jacks for passengers in the back seat.

Are headphones hazardous? Probably so, if they keep drivers and pedestrians from hearing horns, cries of alarm, and the noise of oncoming vehicles (the National Safety Council has no statistics on the subject yet). Whether they're hazardous or not depends a good deal on how loud you're listening; the lightweight, open-air headphones do let sound through, but loud music can mask that sound. And some listen loud enough that you can hear their headphones, fuzzily, for yards. Deaf people drive—but they're not simultaneously being distracted by music.

Columnist Richard Cohen of *The Philadelphia Inquirer* feels that the real reason for the ban is not the safety hazard but that people hate the Walkman-wearer's "having a good time that he or she will not share."

Two columns to the left, in the same paper, columnist Nick Thimmesch may have proved Cohen's point, fulminating against "this contemptible equipment" on the grounds that "the wide-smiling loon" who wears it is deaf to his fellow man. "What sort of society," asks Thimmesch, "... continually pumps out pacifiers ...?"

Meanwhile, I sometimes walk about with headphones on, myself. But when I do, I carefully look both ways when crossing streets, and I counsel headphoned readers to do likewise. Headphones are fine companions in the hospital bed, but who wants to be there?





# The Kyocera D-801 Cassette Deck with 3 motors and a direct driven dual capstan...

With only 0.02% WRMS wow and flutter.

If you think 3 motors impress you, think of what they can do for tape performance. One drives our dual capstans to insure constant and highly accurate speed with remarkable low wow & flutter of 0.02%. A second motor drives both the take-up and feed reels while the third motor gently positions the record/playback head against the tape surface. An innovative approach resulting in accurate head-to-tape positioning and optimal head azimuth alignment. But motors alone do not insure top

performance. That's where both Dolby\* B and C noise reduction circuits come in, along with a Sendust alloy tape head; electromagnetic braking on both take-up and feed reels; selectable bias and equalization for all types of tapes; 30-20,000 Hz response range; full LED function indicator; feather-touch controls; APMR for automatic program search; auto stop; auto repeat, memory and a full bank of operational controls concealed behind a flip-down access panel; plus the convenience of a

4-digit LED electronic timer/counter for precise elapsed time, remaining time, stopwatch and memory stop and registering time and/or counter reference of recorded programs... and more.

But our most impressive feature awaits at your local audio retailer... a demonstration of the D-801... it's just one of a very impressive list of distinguished audio components and systems from Kyocera... where the future is now!



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"The legendary process of 'setting up' a Linn Sondek is a simple skill, but still a skill. Hence the mystique."

#### Nice, BASIC Offers

Home computers have their audio applications. Among other things, I've used mine to generate tables of FM sensitivities in microvolts (for both 75- and 300-ohm impedances) versus dBf. My program is readily adaptable to simple dBf calculation, too, so you can input just one value and get one value back, if you don't need a table.

When I showed it to Len Feldman, he came back with a series of dBf/ $\mu$ V conversion routines for his Hewlett-Packard programmable calculator.

If you'd like a copy of these programs, send me a self-addressed, stamped envelope (Ivan Berger, Audio, 1515 Broadway, New York, N.Y. 10036), and mark "dBf" on your outer envelope.

#### Sondek Setup and Stylus Cleaner

The legendary process of "setting up" a Linn Sondek turntable is simply a matter of tightening several screws properly, adjusting the slack in the arm-connecting cord, and checking the motor pulley tilt. The folks from Audiophile Systems managed it in an hour and a half, complete with play-by-play narration; without that, it would have gone still faster.



It's a simple skill, but still a skill; hence Linn's suggestion that the dealer, trained, should do it—and hence the mystique, too.

With the Linn came the "Linn Sondek Stylus Cleaner"—a matchbook. A clean matchbook striking surface, we were told, is just right for rubbing accumulated record debris off a stylus. (Lead stearate, I think the man said.—E.P.) We plan a Linn test in future. If Linn doesn't like what we say, we know in advance what they'll do about it: The matchbook is subtitled "and Review Disposal Kit."



**PROTECT  
YOUR  
VALUABLE  
RECORDS**

**REPLACE YOUR STYLUS  
- NOT YOUR RECORDS**

Even a precision-crafted diamond stylus (needle) will eventually become worn, and a worn stylus will degrade your hi-fi system's sound quality... it may actually ruin precious records in just a single play! Have your stylus checked at least once a year and replaced if necessary. Insist on the name "Shure" on your replacement stylus and be assured of getting the full listening enjoyment your Shure phono cartridge was designed to produce. Send for AL635A, the complete guide to Shure styli.

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# Perfect reception



## No matter where you listen.

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Onkyo receivers are designed to handle all the particular problems perfect FM reception entails. Weak stations with their undesirable noise levels. Strong ones that can overload a tuner's front end.

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In fact, there's probably more high technology and value in an Onkyo receiver than in any other on the

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built-in CX™ decoders that when used with CX records let you experience a 20dB increase in dynamic range.

So, whether you select our flagship TX-61 model, our basic TX-11, or any of the four

receivers in between, one thing is certain. The sound will be clean, solid, punchy and unmistakably Onkyo. Our perfect reception will make for perfect listening



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200 Williams Drive, Ramsey, NJ 07443

**Nobody knows more about audio than Onkyo.®**

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## LIVE VS. RECORDED

**T**here's always something new for me at the Oregon Bach Festival, where I've been taking myself each year after the long Eastern winters. In 1981, you may recall, I discovered an interesting array of PZM microphones, two pairs mounted in four large rectangles of clear, heavy plastic, set out to pick up many of the Bach Festival concerts for broadcast. That was one of the early uses of the PZMs (Crown now has the trademark) for a full series of large scale classical concerts. This year, I was glad to find that KWAX FM ("Kaywax") at the University of Oregon in Eugene was still using the PZMs for Bach, but with some differences worth noting.

In 1981, a set of PZMs was placed on the floor just below the edge of the stage and tilted diagonally, to pick up a line of from one to five Bach solo voices, off to one side of the conductor. The two mikes were joined in mono and the result mixed down to locate the singers in the stereo-broadcast center. This arrangement took advantage of the flat response of the PZM out to wide angles, "half omni," for a very clear sound image of all the singers in the row. This year, somewhat to my surprise, the PZMs occupied different positions; the main miking was standard.

The reason, I suspect, was circumstantial or, should I say, logistic. This time we had a lot of varying solo positions on stage including the complete double array of the "St. Matthew Passion" with soloists on each side of the stage to match. The PZMs in plastic are easy to look at and through but not so easily moved. Big and bulky. So the little mikes took over again, while the smaller pair of PZMs took on the hanging job, at half stage, facing backwards to pick up the chorus which sang on risers directly behind the orchestra. These mikes cope beautifully with the severe transients generated by loud choral forces; the wrong-side, non-response of the half-omni pattern cuts down audience noise and the flat response out to wide angles gives a sharp, clear definition in stereo. I suspect there is no better microphone anywhere for chorus.

I discovered the larger pair of PZM squares in a brand-new location, hung



far apart a few feet out from the rear balcony. So—PZMs for ambience? Good idea. Very wide angle, low distortion at the ambient sides and, again, minimum audience pickup from the rear. In one concert I got to sit about 10 feet behind one of these and found myself viewing the entire concert straight *through* the mike, like a large, edgeless plate glass window. Do the larger squares, used here for ambience, afford any significantly lower bass? I wondered, and thought, no. More likely, the engineers were getting around troublesome low-bass resonances in the hall.

I quickly put the PZMs aside and went on to other things. This year, thanks to a lecture I gave as part of the Festival, I got very much into what we used to call "live vs. recorded" though not in the sense of hi-fi quality. A whole series of musical challenges came up, very neatly highlighting the remarkable differences between the impact of live music, all around us at the Festival, and recorded or broadcast music, often stemming from the very same sources on stage.

At my lecture on the musical values of recording as compared with live, I really felt a fish out of water. Live music in every direction, rehearsals, scurrying performers, students carrying instruments, practice rooms emitting scales and assorted blats—and I was

plonked right in the middle, to promote OUR kind of classical hi-fi. Never did it seem less important. I almost cringed as the first hi-fi sounds emerged from my borrowed equipment.

Live musicians, as we know, tend to deprecate our noble efforts to perpetuate their art on tape or disc or what-have-you. For them, the incomparable sound of living music, of actual performance, is simply beyond any mere recorded (or broadcast) experience. True, true! How could I disagree?

And yet—well, you've heard the arguments before. The bugaboo of tape editing—desecration of a high art! The loss of "spontaneity." (I might suggest that this includes spontaneous mistakes. Right?) The dampening of inspiration. Such a string of negatives. Can anything compare to the pure art of music in the very ACT of creation?

Well, yes, something can, and that is recorded music at its best. Though it is, to be sure, different.

I've been saying for a good part of my life that recorded music is now an alternative and equal means by which—no, not the best seat in the concert hall—the original score, the music itself, as left to us in notation by the composer, is made into sound once again. Live and recorded. Equals.

Our musicians, no doubt, must provide the manpower for both types and

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# You'll be sold on our DRS 900 amplifier after just one peak.

Our new DRS™ 900 amplifier will bring you as close as you can get to concert hall sound without buying a ticket. How? Power and lots of it. And after all, who knows more about high power amplifiers than Phase Linear? We became known for them back in the days when everyone's idea of good stereo was loud stereo.

If you could blow the windows out of your home, you had a good stereo. And nothing could blow out windows like an amplifier from Phase Linear. Well, the volume era is over. The quest for purity is on. The trouble is, you just can't

get pure sound reproduction out of a low power amplifier. You need lots of power...power for

purity. Advances in recording technology like direct-to-disc and digital audio disc recordings require enormous amounts of peak power. Without it, the amplifier simply clips the peaks leaving you without the full musical experience. For example, accurately reproducing the final cannon shot from a digitally recorded version of

Tchaikovsky's 1812 Overture can require 900 watts of peak power! And that's at reasonable volume levels. That much power is needed because the dynamic range (the ratio of the loudest note to the residual noise) of a digital audio disc is about four times that of a conventional record.

Our DRS 900 handled the previously mentioned cannon shot. No clipping, no distortion. Yet, the DRS 900 is conservatively rated at 150 watts per channel RMS (see specifications). You see, efficient power is the key. The DRS 900 has a dual voltage power supply. It operates at an efficient 150 watt capability. Then, when

the music approaches a peak requiring more dynamic headroom (more power to keep it from clipping), the

secondary supply kicks in, instantly providing up to 900 watts of peak power per channel. A conventional 150 watt amplifier has a peak power rating of

just about 300 watts.

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free at (800) 323-4815. In Illinois call (800) 942-8833. Or write us at 4134 N. United Parkway, Schiller Park, IL 60176. Oh, and remember to give us your address so we can send you a copy of "The Phase Linear Report: Power for Purity." It's an exciting analysis of audio amplification in the eighties. We think it should be required reading for anyone serious about audio.



**Power for Purity™**

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“Recordings are designed to bring music, large and small, into small spaces, not into auditoriums or concert halls.”

in all truth recording is not the easiest of their chores. But that's life. Musicians, like painters and sculptors and movie actors, must endure what the medium demands of them. And make the best of it.

One can argue this till kingdom come but a more objective approach is simply to point out WHY recorded music (classical) is so different as an equal alternative. That was the burden of my lecture (not hi-fi as such), and I did my best to illustrate a few of the basic differences, hoping maybe to dramatize things. The Oregon Type-writer Co. of Eugene, which has a "stereo loft" upstairs, helped me wonderfully in this via a pair of Heresy speakers (Klipsch), a top-line Yamaha table with Signet cartridge, and an equally good Yamaha preamp and control center, models not noted (things were a bit hectic at that point).

Lovely stuff! But set up in a busy rehearsal auditorium which I had hoped would be deadish in the sound for reasonable stereo. Instead, it was shiny-live, hard as nails and just awful for hi-fi—not one record I had brought with me sounded remotely like itself. Do you have any idea of the impact on good hi-fi of such a space? If not, please take your gear to room 198, the School of Music at the University of Oregon and see what happens. No offense, I hope, to the music school. Room 198 was set up for live-music rehearsals, not hi-fi.

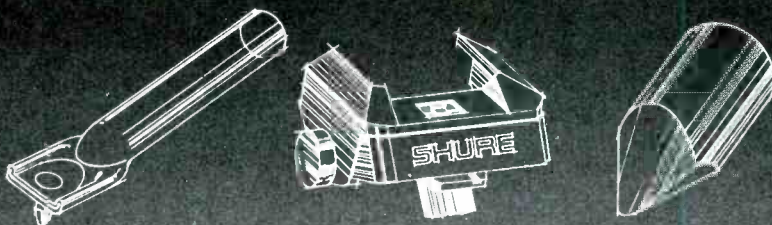
That, alas, was my first point, negatively speaking. We were in a very wrong place for recorded music—none worse. One of those differences. But I had the sense to realize, before we started, that with a good roomful of sound-deadening audience, the sound would not be quite as bad, and so indeed it turned out.

Recordings, I insisted, are designed to bring music, large and small, into small spaces, not into auditoriums or concert halls. The built-in liveness—one of the great discoveries of the art of recording—brings to our living rooms, automobiles, headphones, a remarkably good illusion of a much bigger space. But TWO big spaces, one built into the recording, the other in the playback, is sonic redundancy. I call it double liveness and it is destructive. It never works

All of which I patiently explained to the nice ladies with blue-gray hair who go to lectures like mine. Not easy to tell them the sound was poor, the effect lousy! But what could I do? Did my best. I fear that most of my illustrations went above the heads of the audience (but hit home with a minority of

real enthusiasts). Blank reactions to my jokes—could anything be worse? People exiting because the music was "too loud" (where have I heard that before? Alas, those who most often attend lectures (and concerts) are generally bewildered by any unsettling new ideas, I've observed. Not their

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"Tape editing, when done with artistry, is one of the greatest boons imaginable for the all-too-human musician."

fault. Can't really put blame. Those who do enjoy really make up for the problem.

You can play a recording in any hall you want, if it is an "absolute" recording, that is, recorded with no liveness of its own, like most early acoustics and many of the first electric 78s. Then

the recorded sound takes on the characteristics of the playback space, whatever it may be.

Another major point of difference between live and recorded music, maybe the most important of all, is repetition. Live, a musical performance is heard once—and is gone. In concert,

small mistakes, bits of insecure playing, even external interruptions like planes and buses and coughs, are transitory and harmless. We never hear them again. But the essence of recording is repetition, the whole intent of a recording determines the shape of recorded music. Repetition affects the wanted and the unwanted. If we respect the recording for what it is, we will tolerate no unwanted sounds that can become hideously repetitive, worse and worse as we learn to expect them, to hear them ahead of time. And so we have to achieve an unusual, even painstaking perfection in recorded music if the music is to be effective. Why object? The medium demands it. We can do no less.

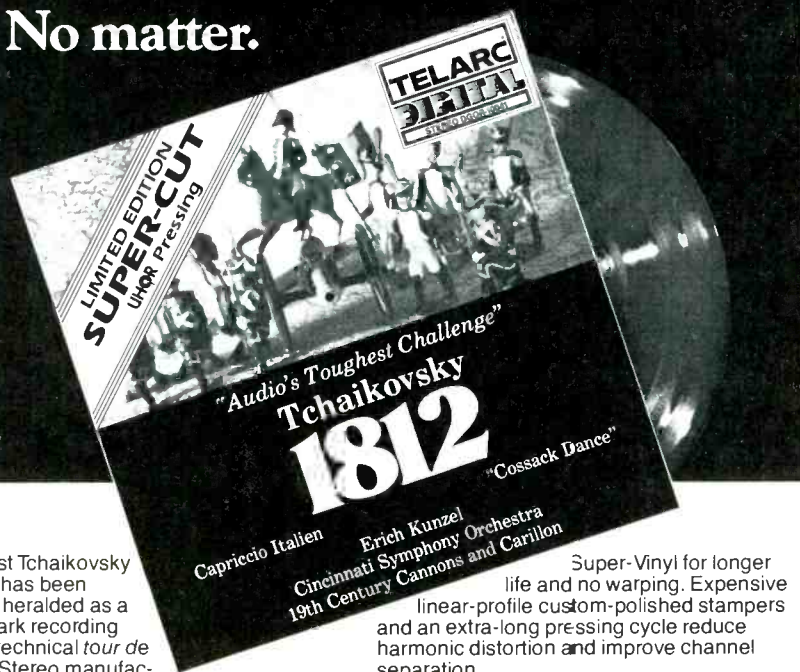
Thus tape editing, when done with artistry, is one of the greatest boons imaginable for the all-too-human musician who understands this. If you can be "spontaneous" for the length of a whole LP side without fluffs, with no disturbances, everything perfect—OK, then by all means be spontaneous. But few musicians can make that grade, as witness the ordeals (and non-spontaneity) of direct-to-disc recording. My book also says that direct-to-disc is contrary to nature—the musicians's nature. If you can repair an entire marvelous performance by intercutting between takes, avoiding some fatal tiny flaw, then by all means DO it. And praise the Lord for such blessings.

To show repetition's effect, I spoke a casual sentence to the nice ladies, something like "Now that was a really good recording." Then suddenly I put on a cassette on which I had recorded precisely those words 50 times over, never varying a trace. (I can do that after years of retakes on my edited radio programs.) Repetition gone berserk. I sounded like an idiot, which was my intention. I fear the good ladies were baffled, but no matter. Then I brought up another major aspect of recorded sound, the *relativity* of volume levels, as contrasted to the absolute level of any live sound. To make an orchestra louder on stage, you must ask them to play louder. To do the same in your living room, you merely tweak the volume control. In recorded music there IS no absolute level for any sound.

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"Time moves differently in recorded form. A second of unwanted silence seems as long as a minute."

ery day. And yet the very sense of recorded music and of our listening depends on this relative volume. Not only in the overall but in the relative volume of sounds within the recording. All very different from the sound of live music, if we make the comparison.

And there is another pervasive factor—time. Time moves differently in recorded form. A second of unwanted silence seems a minute. Long stretches of non-music in concerts do not bother us at all but in recording they are endless, and the extraneous noises seem 10 times as prominent. So we edit. If the sound is taped. Or we talk, talk, talk, to fill up the holes in a live broadcast. If I am right, KWAX at Eugene discreetly edits out a lot of "hash" from their supposedly "live" re-broadcasts of Bach concerts, a day after the performance itself. Performers and student conductors (a whole class of them) walking on and off stage at every pause, heels going clack-clack. Vast quantities of general noise, dreadfully loud and long on the air, no problem at the actual concert. So different! Editing is the saving grace.

I had a bright idea for illustrating the absolute volume level of live music, as compared with the same recorded. I snared a young harpsichordist, a student at the music school, who went along with my idea immediately. First, I played a recording of a Bach "English Suite" performed on the clavichord, a very intimate and personal instrument for home use. Then, with some drama, I turned to one side and there was—a clavichord. My young friend stepped up and proceeded to play the very same music on it live, note for note. She was a good sport! For, as we intended, those in the front audience rows heard only a tiny tingle of barely audible sound; those behind heard nothing at all. The live clavichord in that auditorium was out of its element, to put it mildly. But in the recording, it did very well.

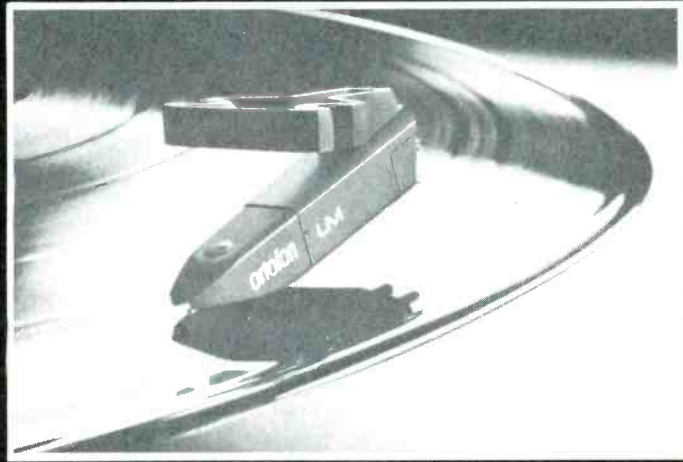
I thought it was a provocative demo, but the ladies (and the gents) were really at sea by this time. How could I treat Bach to such an indignity as total silence—not to mention the harpsichordist, whose own concert had been just the day before? But *she* understood! She loved it.

Oh, well, a lecture is a lecture. 

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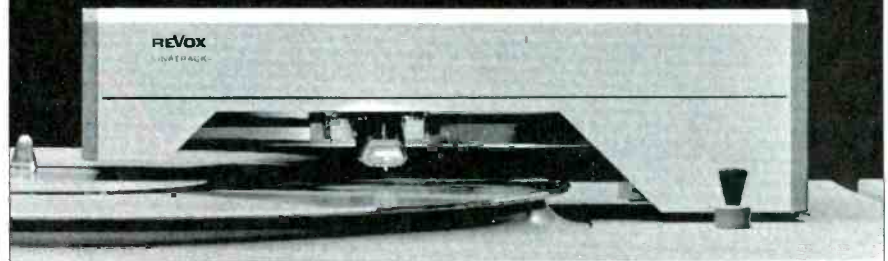
At 1½ inches, the B795's tonearm is the world's shortest. In fact, it's hardly a tonearm at all.

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crawl back before changing records. Because, with a flick of your fingers, the entire Linatrack® module pivots aside.

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## Loose Packing

*Q. I have a brand new high-quality open-reel deck. After fast winding, the tape seems to be loosely packed and to have a static charge. Do you think that the static charge is causing the loose pack? If not, what do you think is the cause?—Edgar Duskin Jr., APO, N.Y.*

A. Loose winding is probably due to insufficient back tension by the supply reel. I don't know whether static charges might aggravate the problem. It would be best for you to contact an authorized service shop to remedy the problem, which may require only a minor adjustment. In the meantime I suggest that you not rewind your tapes after playing them. This will at least avoid long-term storage with a loose pack.

## Not So Fast

*Q. A friend of mine told me that it isn't a good idea to wind or rewind a tape at high speed unless I play it back immediately at normal speed. Does this make sense?—Evan Studinski, Loyal, Wisc.*

A. Yes. If a tape is to be played within a few days, it probably doesn't do any harm to put it through fast forward or fast rewind before storage. But if it will be weeks or months before replay, it is wisest to operate the tape at normal speed before storage. Otherwise the tape may acquire a "set" corresponding to the strains of high-speed wind, causing distortion. The extent to which this happens depends on the particular tape deck. The more smoothly a deck winds the tape, the less likely it is that the tape will be deformed.

## Quality Means Money

*Q. With reference to professional open-reel tape decks versus the best of home open-reel decks, is the main reason professional machines are so much more expensive the fact that they have features which the home machines lack? Or is it that the professional machines are of higher quality?—Michael Levy, Santa Monica, Cal.*

A. The basic reasons for the high cost of professional tape machines lie in quality of performance and, perhaps more important, durability. To an extent, additional features also play a

part. A professional deck may be working eight or more hours a day, day in and day out, and must therefore be relatively immune to breakdowns. It may be easy to align and to service. It must be convenient and flexible in operation (for example, editing must be facilitated by appropriate features that enable the user to locate the exact spot where the tape is to be edited). In terms of performance quality, a professional unit is constructed to have very low wow and flutter, very little noise, very low distortion, and excellent response—although in these respects it may be substantially rivaled by top-notch home decks. Controls for alignment—bias, equalization, record level, record indicator calibration, etc.—must be readily accessible and easy to use. The bias oscillator must have extremely low distortion and excellent stability in order to minimize noise and avoid significant variation in frequency response. All of this substantially boosts the price tag.

## Choosing Heads

*Q. What is your opinion about the difference, in terms of frequency of response and distortion, between ferrite and permalloy heads in cassette decks?—Larry Sonnenberg Jr., Dayton, Ohio*

A. When ferrite heads first appeared, they had a very substantial advantage over permalloy heads in terms of life, lasting something like 10 times as long or more—which comes out to 20,000 hours of use or longer. On the other hand, they were more subject to distortion, and it was harder to produce a straight, narrow gap—straight for accurate recording, and straight and narrow for good high-frequency response in playback. Therefore, a number of manufacturers of high-quality decks declined to use ferrite heads.

But with time, improvements in ferrite heads were achieved, making them suitable at least for erasure and recording. Thus, some deck manufacturers used a combination of ferrite and permalloy heads. New varieties of permalloy heads, such as hard permalloy, were developed, increasing head life substantially. (Parenthetically, other high-quality types of heads, such as Sendust, were introduced.)

It is difficult to say for certain whether you are better off with ferrite or some other type of head. It is possible that the best ferrite is better than an inferior permalloy. However, if I had to choose, I would be inclined to choose nonferrite for playback and would toss a coin with respect to type of erase and record heads. In a field where things change very rapidly, I might be correct at the moment I write this and wrong by the time it appears in print.

## Collectors' Item?

*Q. I have a Model 4 Revere-Wollensak automatic cassette deck, which I bought in 1965. I am having difficulty locating prerecorded tapes that play properly on it, and I am unable to get it serviced by the manufacturer. I wonder if I should keep or sell it. Could it be a collectors' item?—E. J. Carco, Malden, Mass.*

A. You probably do have a collectors' item. The Model 4 used a special, single-hub cassette, whose tape fed to a take-up reel inside the deck during play, and then was rewound automatically. Tape speed was the same 1 $\frac{7}{8}$  ips as today's dual-hub "compact cassettes," and tape width was about the same; those were the only similarities.

Production of blank and prerecorded tapes ceased years ago. Service, however, may still be available. Contact Authorized Factory Service, at 97 Reade St., New York, N.Y. 10013. They say they can get some parts, and may be able to help you.

Finding a collector interested in buying it may not be easy. Orion Publishing (1012 Pacific St., Suite A-1, San Luis Obispo, Cal. 93401) issues a directory of audio equipment selling prices, but it may be more oriented towards normal used values than to value as an antique. Perhaps some of our readers can help?

## Reel Mates

*Q. I purchased a 7-in. metal reel for use as the take-up reel with my open-reel deck. A tag attached to the reel says to be "sure to use exactly the same type of reel for supply and take-*

**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.**

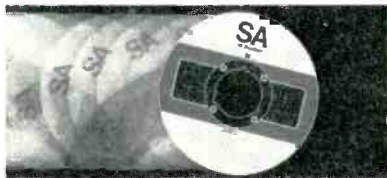
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TDK breaks through to new frontiers in open reel tape technology so that recording and playback standards can be moved higher and higher.

The first open reel tape to use TDK's famous Super Avilyn magnetic particle technology is the revolutionary SA/EE. Designed for new open reel decks with EE (Extra Efficiency) Bias/EQ settings, SA/EE has an MOL that's 2.5-3dB better than conventional (normal bias) ferric oxide tapes. And it has 2.5-3dB lower bias noise at 3 $\frac{3}{4}$  ips to give you twice the recording time with optimum reproduction quality.

TDK's GX tape was designed for live music mastering, disc-to-tape and tape-to-tape uses. Its ultra-refined ferric oxide particle formulation has a higher MOL,

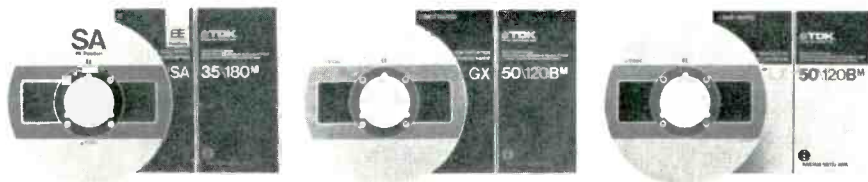
low distortion and a wider dynamic range. Its special backcoating reduces wow, flutter and static.



The perfect tape for broadcasts and audiophile uses is TDK LX. It delivers high output, low noise and lower distortion over an extended frequency range.

TDK open reel tapes have precision-engineered 10" metal or 7" plastic reels with perfectly circular hubs. And to keep our perfect tape perfect, use the TDK HD-11 Head Demagnetizer.

That's everything you need to know to keep up with the sounds of progress.



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"Try playing your tapes on another deck. If you encounter no problems there, it would seem your deck needs service."

*up." All of my recorded tapes are on plastic reels. Does it really make any difference whether one reel is plastic and the other metal?—Frank Fabian, San Francisco, Cal.*

A. Generally, it is safest to use the same kind of reel, although not necessarily of the same make, for supply and take-up in order to assure proper tape tension and smooth operation when recording or playing back. This is especially true for the large-hub reels often used for prerecorded tapes. However, some decks are more tolerant than others with respect to a difference in reels. Yours may or may not be one of the latter. It is best to query the deck manufacturer on this.

## Blocked Signals

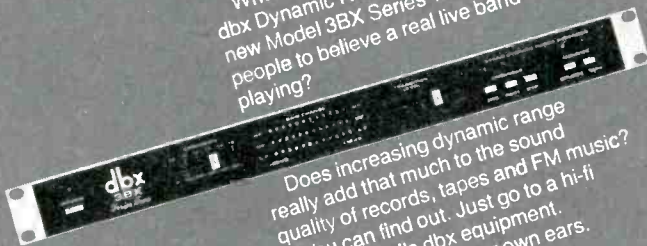
*Q. I bought a half-speed mastered phono disc and recorded it on cassette via a dbx noise-reduction unit and an 801 Omnisonic Imager. After playing back the cassette, the deck's left channel suddenly stopped working. I don't think there is anything wrong with the deck because it satisfactorily plays recordings made from conventional discs via the dbx and Imager. Why do I have trouble only with discs made from half-speed masters?—Saul Andrade, Prospect Heights, Ill.*

A. I haven't previously encountered your unusual problem. Are you sure that your cassette deck's left channel quits only when playing cassettes dubbed from an HSM (half-speed mastered) disc? Have you repeated the procedure enough times to rule out coincidence?

If it isn't a matter of coincidence, possibly there are frequencies on the HSM disc, occurring at sufficiently high amplitude that present a problem to your deck after you have dubbed them on tape. Sometimes, high signal levels at certain frequencies can drive the deck electronics into "blocking," so that for a period of time the electronics will not pass audio signals, although eventually the electronics recover. Try playing your HSM tapes on another deck, and if the tape causes no problems there, it would seem that your own deck requires service. The frequencies causing trouble may not be due to the HSM process itself but may arise from record warp. A

"Yes, officer. They've had that band upstairs for hours."

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M I N I S I Z E

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### Features of the MFS-6300 micro loudspeakers

**Frequency Response:** 200-20,000 Hz  
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**Maximum Input:** 20 watts  
**Sound Pressure Level:** 84 db/W/m  
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**Weight per Speaker:** 1 1/2 lbs. (.675 kg)  
**Power Requirements:** 12 V DC with adaptor (supplied)



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If you don't already own a walkaround cassette player we can send you the MFS-6300 speakers plus a MI-FI MFC-7400 cassette player for \$225 plus \$10 shipping. The

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BERT WHYTE

## GIVING RECORDS THE BRUSH-OFF

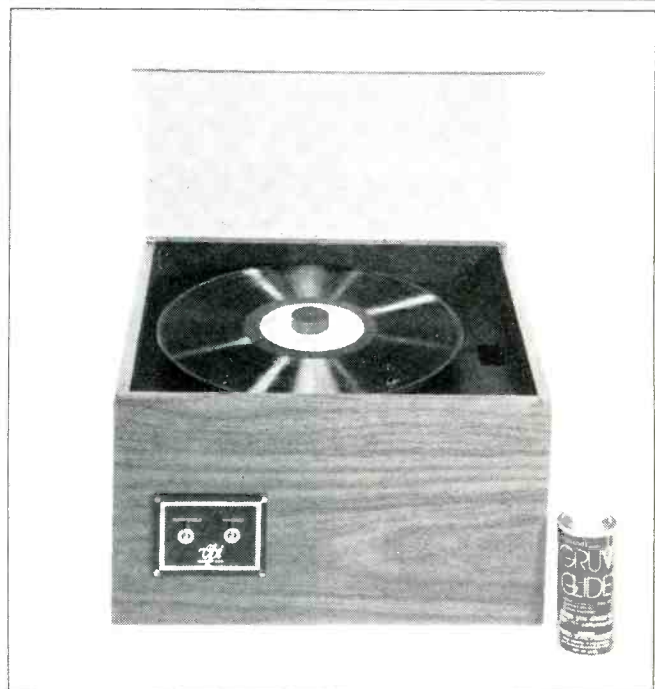
**T**his month some brief reports on diverse items of audio equipment which I have found to be particularly interesting and worthwhile.

The vinyl phonograph record can be a wondrous thing. If the requisite tender loving care has been applied in the plating and pressing processes and the vinyl is virgin and of unquestioned purity, one can enjoy rock or Rachmaninoff from immaculate record surfaces, blissfully free of the snaps, crackles, pops and other extraneous noises that plague record playback.

Unfortunately, the vinyl record is also an extremely fragile thing. The vinyl is relatively soft and is particularly prone to the generation of electrostatic charges. This attracts dirt and dust, which is deposited into the record grooves. To make matters worse, even at a tracking force of one gram, enormous instantaneous pressure and heat are generated at the stylus tip and the dust is ground into and welded to the record grooves. Surely, no thinking person handles records so carelessly that they are covered with oily, dust-catching fingerprints. However, people do leave records on turntables after playback, where dust can settle on them. Even the mere act of withdrawing and replacing the record in its protective sleeve can induce static charges. Cigarette smokers create their own particular problems. Some years ago, the late Percy Wilson of that venerable British journal "The Gramophone" made a series of studies which showed that fly ash produced by cigarette smoke was readily attracted by static charges on records. He also noted that heavy smokers created enough smoke so that various tars and other contaminants were deposited on vinyl records. From these studies, the well-known Keith Monks record-cleaning machine evolved. The efficacy of Keith Monks machines have been well documented and many of them are in use throughout the world. However, the high price of the Keith Monks cleaner has made it an item more for institutional and commercial use than for audio consumers. An "economy" model of the Keith Monks cleaner was introduced, but at \$995.00 it is still beyond the reach of most audiophiles.

The average audiophile appears to be fairly conscientious in caring for his

*Pristine surfaces result from treatment with the HW-16 cleaning machine followed by Gruv-Glide.*



records, a fact which has produced a myriad of commercial record-cleaning and anti-static devices and chemical agents. Many of these products are long on exaggerated claims of efficacy and short on actual results. Some are close to being outright frauds. Most merely rearrange the dust, and few indeed are those which are genuinely helpful. The main problem with most of these agents is their tendency to leave sticky residues in the record grooves, thus further exacerbating the dust problem. It also makes the stylus more prone to pick up this amalgam of grunge.

For some months now, I have been enjoying the benefits of immaculately clean records through the use of the HW-16 record-cleaning machine made by VPI Industries of Ozone Park, N.Y. Harry Weissfeld, the entrepreneurial head of VPI, has come up with a device that embodies many of the basic essentials of the Keith Monks machine, albeit in much simplified form. The HW-16 measures 15½ in. W × 14¼ in. D × 9 in. H. The cabinet is walnut veneer, and the top cover is of smoked plexiglass. There is a 12-inch turntable platter driven by a very high torque motor at 18 rpm. The turntable spindle is threaded to accept a 1¼-inch Lucite

hold-down clamp. The turntable is activated by a toggle switch on the front panel of the unit. On the underside of the plexiglass cover is a vacuum suction chamber, and when the lid is in the closed position the chamber is connected to a high-capacity vacuum pump. A four-inch brush with a high density of specially shaped nylon bristles is supplied, as is a plastic squeeze bottle of 25% isopropyl alcohol. When using the HW-16, a record is snugly clamped to the turntable by the threaded Lucite clamp. The brush is saturated with the alcohol (I also dribble a thin stream of alcohol around the middle of the modulated portion of the record) and positioned so that the tips of the bristles engage the grooves in the direction of record travel. The turntable is switched on and the brush held against the record for about 20 seconds. The brush is then removed, the top cover closed, and the vacuum device activated by another front-panel toggle switch. I have found in practice that more efficient removal of the alcohol/dirt sludge can be accomplished by exerting a moderate downward pressure on the cover in the area over the vacuum device. The vacuum is maintained for about 15 seconds, and then both turntable and vacuum

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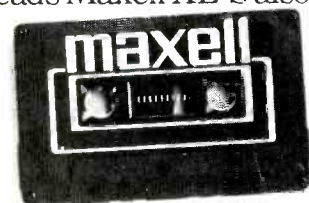
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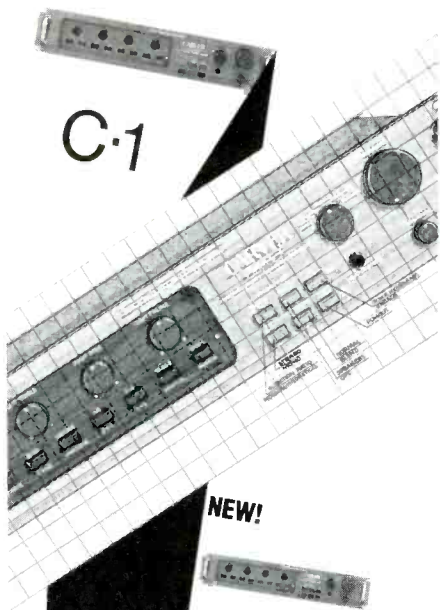
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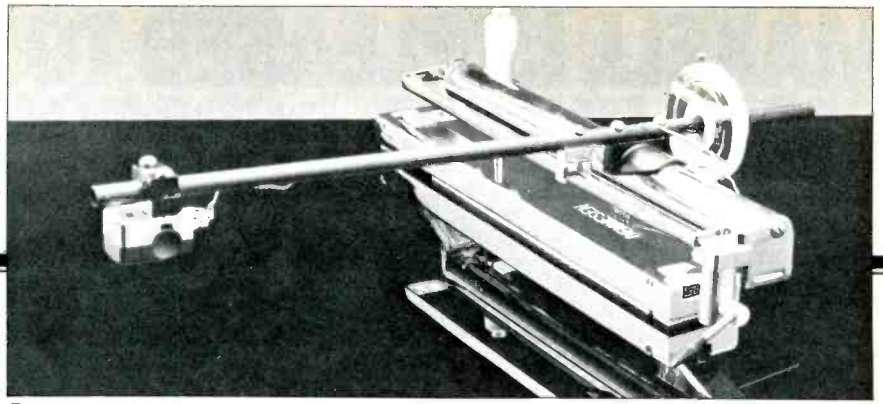
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Dennesen ABLT-1 air-bearing tonearm

are switched off. The record is removed, the brush flushed clean under running water, and the procedure repeated on the other side.

I have found the HW-16 to be an outstanding performer. The record surfaces are microscopically clean and are so pristine they look new! It must be noted that the machine does not attenuate the sounds of scratches or other surface blemishes, but a lot of the crackly, steady-state noise due to dirt in the grooves is substantially reduced.

A few notes on my experiences with this unit. Even though the alcohol solution is on the record surfaces a relatively short time, some slight leaching of ingredients in the vinyl compound which migrate to the surface does occur. This causes a slight increase in "stiction" (stick/slip friction) on the record. This condition can be overcome by a very light application of Gruv-Glide. It should also be noted that the alcohol cleaning process is not anti-static and in fact induces a moderate charge on the record. Thus, the Gruv-Glide not only lubricates the grooves but also reduces static on the record. Alternatively, the freshly cleaned record can be zapped with a Zerostat anti-static pistol. Brand-new records may look great to the naked eye, but the grooves are actually full of record-jacket lint, cardboard motes, vinyl shreds and other assorted debris. Run the brand-new record through the HW-16 and you'll have a better chance of getting and keeping quiet record surfaces.

Another point is that ethyl alcohol (ethanol) causes less leaching than isopropyl or methanol. To get ethanol of the highest purity, one can buy a quart of 100-proof vodka, which means the fluid is 50% alcohol. Dilute this bottle with a quart of distilled water and the result is a half-gallon of 25% ethanol. The price of the HW-16 is \$295.00. Not cheap, but obviously it is a good item for an audio club, or the cost can be shared among several friends with extensive record collec-

tions. The HW-16 is simple, efficient and is most highly recommended.

In the July 1982 issue of *Audio*, my colleague Barney Pisha gave an excellent review of the Dennesen ABLT-1 air-bearing linear tracking tonearm. I am also using one of these remarkable tonearms, and feel that the accolades Barney gave to this arm are fully justified. It is true the Dennesen ABLT-1 is a bit tricky to set up. Overhang adjustment must be precise, and the tonearm must be *absolutely* level. Satisfy these two parameters, and the air bearing provides the frictionless tracking that permits the arm to operate without lag or deviation from true tangency to the record groove.

I bring up the Dennesen tonearm because of a particular incident. In my column last month I mentioned Professor van den Hul in connection with the new EMT/van den Hul moving-coil phono cartridge. At the SCES, the Professor had given me a cartridge to try. At home, I had mounted it in one of the best conventional pivoted tonearms, and during a visit the Professor listened to it and pronounced that I had set it up properly, especially in regard to the all-important azimuth. I was pleased by his comment. However, I remarked that I really wanted to use the cartridge in the spare arm tube of the Dennesen tonearm which I had not yet set up. The Professor promptly called for tiny screwdriver, long-nosed pliers, etc. and proceeded to install the cartridge in the Dennesen arm. After everything was adjusted we played the same passage from the Mahler Fourth Symphony, at the same level as when the cartridge was in the conventional tonearm. The differences were dramatic. Bass was much fuller and better defined, midrange had more clarity and projection, the treble was smoother, imaging was more precise, and the gain in depth perception was marked. This was a most convincing demonstration of the superiority of the Dennesen air-bearing tonearm. For those who can afford it, this is unquestionably the tonearm of choice. ▲



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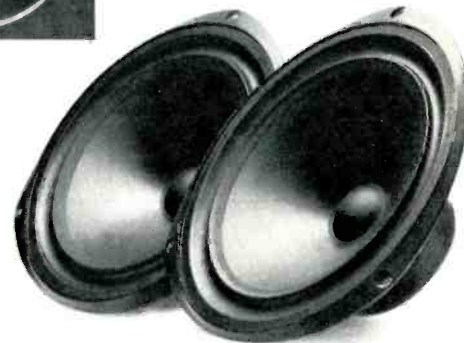
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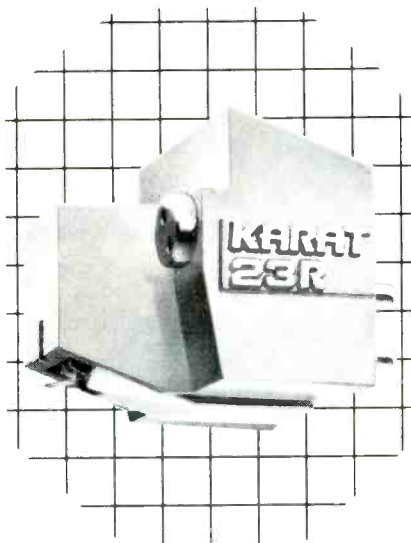
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## AUDIOCLINIC

JOSEPH GIOVANELLI

### Separates vs. Receivers

*Q. What is the difference between a preamplifier and a power amplifier? What are the advantages and/or disadvantages of a receiver as opposed to separate components?—George Swytnyk, Chicago, Ill.*

*A.* A preamplifier incorporates most or all of the sound system's basic controls, such as volume, source selector and tone controls, together with an RIAA-equalized, low-level, phono cartridge input circuit. Its output is usually a low-current signal of about 1 volt.

A power amplifier turns the preamplifier's signal into higher current signals with enough power to drive your loudspeakers. It requires no controls, though it may have a few. An integrated amplifier combines the circuits of a power amplifier and a preamplifier into one single box.

A receiver combines an integrated amplifier with an FM or FM/AM tuner. Receivers are more compact and less expensive than the separate components they replace. But separates let you choose the best component of each type for your use (e.g., an ultra-sensitive tuner with a medium-power amp, or a high-powered amp with a less sensitive tuner), and you can replace components one by one as your requirements change or sufficiently better ones become available.

### Truth in FM Stereo

*Q. All my local FM stations but one leave their stereo pilot signals on from sign-on to sign-off, even when broadcasting mono material. Why?—Louis Goldstein, Grove Hall, Mass.*

*A.* In the early days of stereo FM, when broadcasters had few stereo recordings to play, the FCC required that stations turn off their pilot signals when the material being broadcast was monophonic. Now, virtually all recordings are in stereo, and it's rare for anything to be broadcast monophonically except announcements and occasional old performances.

Because of this, and because (especially in small stations) the engineer in the control room may be busy doubling as announcer, record-puller and phone answerer, the FCC has relaxed the requirement.

No harm is done except with stations whose stereo signal is marginal

at your location, but which could be received monophonically. And you'd have to switch your tuner to mono for such stations, even when they were really broadcasting in stereo.

### Tying the Knot

*Q. Would joining several speaker wires to form a longer one affect the signal traveling to the speaker, assuming sufficient wire gauge?—Kin P. Gee, New York, N.Y.*

*A.* Splicing short cable sections to make up one, long cable should not really cause problems if you make really good splices, preferably soldered, so that the two wires of the splice are intimately bonded. Also be certain to insulate the splice to prevent shorts.

### Buzz in Headphones

*Q. Why do I hear a buzz in my headphones but not in my speakers when I turn on my electric blanket? Is it a ground problem? And if so, how do I correct it?—Jim Buck, Flemington, N.J.*

*A.* When listening to headphones, you don't hear ambient noise which might otherwise mask noises in the signal. And with most stereo systems, the volume control is set quite low for headphone listening, bringing the maximum signal down closer to the amplifier's noise level.

Headphone junction boxes with volume controls and resistors may help by letting you raise the volume setting. You might also eliminate the buzz by placing an a.c. line filter between your stereo system and your power outlet, or between the blanket and the outlet. Use a transient-type line filter (such as those sold by GE or Radio Shack) if the noise is produced by high-voltage spikes. Otherwise, you'll need LC (inductor-capacitor)  $\pi$  filters or other 60-Hz, low-pass filters in the line.

I do not believe that grounding has any influence on your problem.

### FM Double-Dialing

*Q. The other night, I was listening to an FM station at 96.9 MHz. Then I turned the dial and picked it up again at about 107. Why?—Darryl Frank, Conewango Valley, N.Y.*

*A.* It's probably a signal-overload problem; you're apparently close enough to the transmitter, or have a

good enough antenna, to get more signal from this station than your tuner can take.

This happens because of the nature of the almost universal superheterodyne receiver setup. A local oscillator circuit in your tuner beats against the frequency of the desired signal to produce an intermediate frequency (i.f.) of 10.7 MHz. If the incoming signal is strong enough, though, it can beat with harmonics of the local oscillator to produce images of that station at one or more additional frequencies within the FM band, a problem known as spurious response.

Perhaps realigning your tuner can reduce the problem. I suspect, however, that the best approach is to attenuate the signal at the antenna terminals so that it is no longer strong enough to create the conditions you describe.

#### Tuner Aging

*Q. Your magazine reviewed a Sony synthesized tuner, and based on that review, I bought one. I ran A-B tests of my old receiver's tuner section versus the new tuner. Certainly, the Sony unit was everything your reviewer said it was.*

*It may be that I am now accustomed to that tuner, but I feel it has aged in the last two months. It is now performing in less than the optimum manner. From my experience with tube equipment, I know that aging can and does occur. Could such aging possibly have occurred with this transistor tuner as well? If it has, are there any simple, internal adjustments which can be made to "peak" the circuits back to optimum performance?—Arthur Venitt, Jamaica, N.Y.*

**A.** No question about it, equipment does age with time. Two months, however, does not seem long enough for the effects of such aging to occur. Should it happen that something has indeed gone wrong with the tuner, no simple adjustments can fix it.

With increased familiarity with your new tuner, your judgments may have

**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.**

become more critical; distortion may be heard, you may now notice something wrong with the highs, etc. Or you may be growing aware of the poor quality of all too many FM broadcasts. In an effort to obtain the maximum coverage from their transmitters, stations often process the audio signal in var-

ious ways, hoping for better signal-to-noise ratios or louder sounding signals than would otherwise be the case. These results are obtained, but at the expense of overall program quality.

Today's tuners may well be better than is necessary to extract the best that many stations have to offer. **A**

## ANALYZE

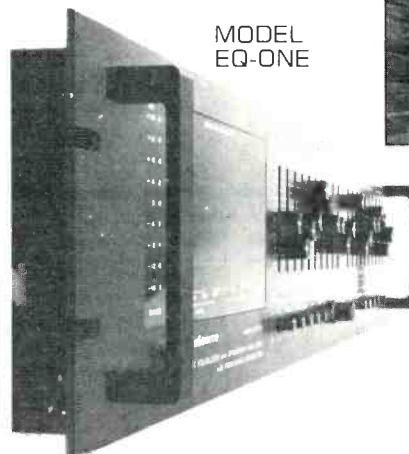
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## SONGS WITHOUT SUGAR

**Night and Day:** Joe Jackson  
A&M SP-4609, \$8.98.

Sound: B Performance: A

Joe Jackson's *Night and Day* is a bold and courageous production. Coming off his dour and commercially disastrous *Beat Crazy* and his *Jumping Jive* one-shot of '40s swing numbers, he has returned to the arena with his back turned to the snappy pop trappings of his successful *Look Sharp* and *I'm the Man* albums. Indeed, only the kick-off number, "Another World," can be described as a real rocker.

In the interim, Jackson's songwriting has blossomed into new tableaux and new sounds. Jackson eschews rock here; the dominant rhythms are salsa and tango, fitting for an album that proclaims it was "Written and Produced in New York City." "Target" and "(Everything Gives You) Cancer" are two very strong pieces about paranoia, both with exquisite Latin breaks that have a spacey feeling before smartly coming back to Earth for resolution. "Chinatown" also employs Latin accents to spin a graphic blood and guts yarn.

Yes, the album is full of very pointed songs, and the three mentioned are excellent examples. So is "Real Man," a very serious examination of male sexual stereotypes both straight and gay, always coming back to the tart refrain "Now and then we wonder who the real men are." Here the arrangement features sweet-and-sour strings which also help stage the song that follows it, the ballad finale, "A Slow Song," all 7½ minutes of it. It's about how you never hear slow songs on the radio, or for that matter anything which would provide some refreshing variety. Jackson's voice picks up a fine edge on the refrain lines, "I get tired of DJs/ Why is it always what he plays?" It is a powerful, big statement of a song with a stunning arrangement, full of dynamic swings, and hardly calculated to win friends at radio stations. Jackson has never been one to sugarcoat his sentiments before, and he has not started doing it on *Night and Day*.

Uncommonly excellent sound adds a lot to the success of the album. The sonic basis is Jackson's piano plus percussion on the Latin-influenced songs and strings on the ballads. Su-



perb clarity allows texture and detail to shine with great warmth. Surprisingly, there are no guitars, which encourages and helps achieve an intimacy rare for a pop album.

Joe Jackson faces the danger that *Night and Day* may not reach its audience. It appears likely that it will fall through the cracks of radio formats, into the nether world where artistic excellence, even brilliance, but no airplay for exposure, traps great work by artists like Rickie Lee Jones, John Martyn, and Joan Armatrading—yes, and Joe Jackson, too. This is music that fits no category but its own, and there are more and more cases like it all the time.

Michael Tearson

**The Envoy:** Warren Zevon  
Asylum 60659-1, \$8.98

Sound: B Performance: B+

It's not a pretty world. It's not just the political crises and the threats to world peace, there are the more personal things. Danger that can up and threat-

en Mr. John Q. Random at will. With no apparent reason.

That is the world according to the songs of Zevon. A place where "The Envoy" himself is a diplomatic Superman whom the President ships to the world's trouble spots.

It's a world in which "The Overdraft" is a little too big and the check writers took it on the lam rather than face time. It's an age where a quietly deranged guy will go to Memphis to disinter Elvis Presley to hear him sing spirituals about those heavenly mansions "Jesus Mentioned." It's a place where someone's source for pills gets bumped off by a Beverly Hills doctor who went off his nut. It's a time when you spend your vacation getting root canal, but however unlikely, there is still hope for love.

Warren Zevon remains one of the most literate of songwriters. He tells stories of people pushed up to and beyond the edge. As he has from his first Asylum album, Zevon uses a slick West Coast studio sound that only the most elite of session men can give

you. But he gets more bite out of their playing than anybody else does. And his songs need that kind of commitment. His production style is not glossy, slick or tricky. It simply does the job effectively.

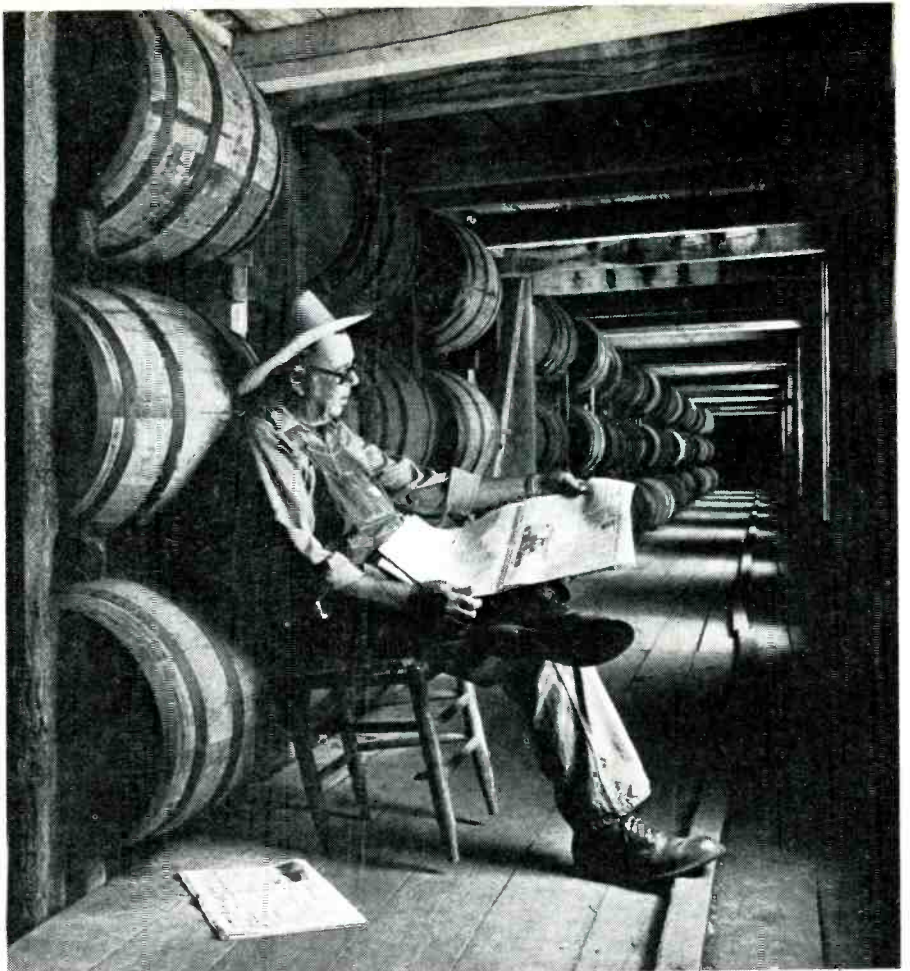
Zevon has paced and programmed the album extremely well. Rockers are matched by the more tender numbers which in turn receive support from more upbeat songs. And he often merges thematic and musical continuities. That mournful, folk-guitar-strumming Elvis/Jesus fanatic in "Jesus Mentioned" is followed by the suspiciously hokey/cheery sentiments of "Let Nothing Come Between Us." That poor pillhead of "Charlie's Medicine" is succeeded by the ironic "Looking for the Next Best Thing," a psychological kind of "Low Budget." That in turn is followed by "Never Too Late for Love," which marries bright and optimistic lyrics to a dour and depressing melody. In Zevon's world, ambivalence is the best escape, but love helps.

The excitable Warren Zevon has been through hell the last couple of years, much of it highly publicized. With the bottle well behind him, *The Envoy* finds him back looking and sounding hard and tough and wiser.

Michael Tearson



Illustration: Rick Tulka



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**Mirage:** Fleetwood Mac  
**Warner Bros. 23607-1, \$8.98.**

Sound: B Performance: B+

The chemistry of the ensemble makes Fleetwood Mac special. That and their propensity for coming up with songs that have universal appeal.

On the new album, possibly the final studio collaboration of this Big Mac, the songs neatly divide up by writer. Christine McVie's are heart songs, directly about matters of the heart and led by the splendid pop song "Hold Me." Stevie Nicks' songs are starting to sound perilously refried from earlier ideas. "Gypsy" is "Rhiannon" meets the melody from "Dreams." "Straight Back" is "Daughter of Dreams" meets the melody from "Edge of 17." To a one, the Lindsey Buckingham songs are the most quirky, with the most fascinating sonic concepts. The Ping Pong vocals and kaleidoscopic arrangement of "Eyes of the World" and

his wonderful chorus for "Book of Love," a new song not the oldie, that restates the age-old musical question of who wrote the aforesaid book, are examples. Buckingham's lyrics cut close to the bone, so close that they are as enigmatic as nursery rhymes.

Each of the writers has built-in weaknesses that would become monumental if spread over a whole album, but are negligible in the group's round-robin setting which emphasizes the writers' complementary strengths.

*Mirage* is played square enough in the known Fleetwood Mac sound to enable their massive following to feel at home. The production features luxurious tapestry effects by the voices, and the recorded sound is suitably first-rate.

You get the feeling that *Mirage* will stand the test of time beautifully. The best of the songs have a simplicity that may seem slight at first but over time insinuate day by day as staples. An

even more important sign is how well little kids take to Fleetwood Mac in much the same way that they still love the early Beatles catalogue. Now that is universal.  
*Michael Tearson*

**Imperial Bedroom:** Elvis Costello & The Attractions  
**Columbia FC 38157.**

Sound: B+ Performance: A-

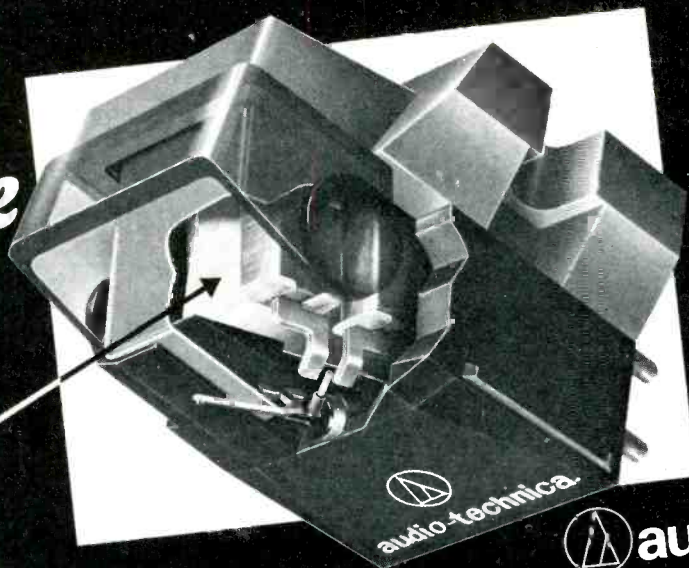
It's such a pleasure to hear Elvis Costello recorded in a manner which suits his artistry that the listener is distracted from the content of the record. Finally, an Elvis record without Nick Lowe's comic book drums and toy keyboards, and the true depth in sound and rich textures evident here are able, at last, to bring out the best in Costello's songs. Geoff Emerick is responsible for this sensible approach, and having worked with McCartney and The Beatles in an engineering capacity, he not only knows his way around the console board, he also knows when to leave well enough alone when it comes to arrangements.

There are so many references to drinking on this record that one can assume that Elvis' perspective is more than slightly tinged with alcoholic sensibilities. And now that New Wave's golden age has passed, the manic approach often possessed by the rhythm

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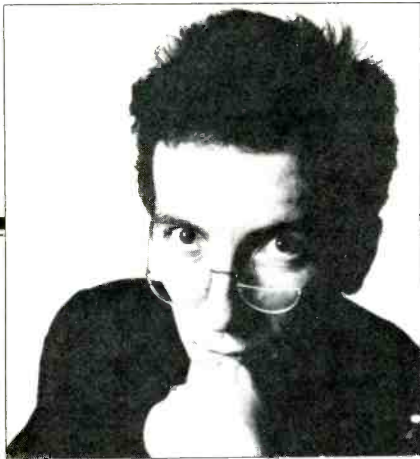
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section seems to have vanished. What emerges is the mature Elvis Costello whose milieu is the smoke-filled room rather than the hip club. "The Long Honeymoon" is the kind of tune The Band, Neil Diamond, or Burt Bacharach could have come up with; "You Little Fool" could be covered by Crystal Gayle or Conway Twitty; "Man Out of Time" evokes chord structures straight out of 1965 Beach Boy/Byrds/Phil Spector hits. *Imperial Bedroom* shares little with Costello's peers from the 1978 vintage, save for a knowledge and a respect for the greats who came before him, and a total disregard for 1982 middle-of-the-road album oriented rockers (Foreigner, Survivor, REO, etc.). For all intents and purposes, Elvis is writing closer to straight pop or country rather than the Chuck Berry rock ("Pump It Up") or Motown-Stax derived rhythm & blues songs ("Get Happy!") he has been associated with in the past.

But his trick is in defying the rules of format that pop has lived by. For, instead of going straight to the hook/chorus every chance, he avoids such pitfalls. There are more bridges and channels on *Imperial Bedroom* than repetitive segments—every time you think you know what part of the song to expect, Costello pulls out a wild card and throws you for a loop. He's deliberately throwing curves at every opportunity; that's part of the beauty of this record. Like classics such as *Pet Sounds* and *Let It Bleed*, the album not only stands up to repeated listenings but demands full attention.

For those who thought that an adult Costello would never emerge, *Imperial Bedroom* is a revelation of Declan McManus' maturity. If, like many, you were quick to dismiss Elvis after his last two cast-off efforts, *Imperial Bedroom* is a reward for your impatience. And if you never were impressed with the lad or Punk, you might want to give this record a spin and find yourself liking it.

Jon & Sally Tiven

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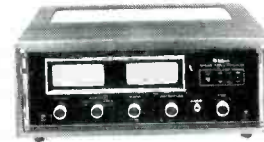
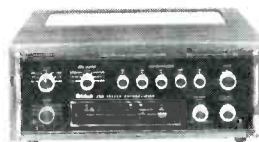
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# SON OF DIRECTORY

## BLANK TAPE

MANUFACTURER	Brand	Tape Type—See Code	Cassettes					Open-Reel				Notes	
			C-30	C-45	C-60	C-90	C-120	1200 Feet	1800 Feet	2400 Feet	3600 Feet		
AIRKO MAGNETICS	Airko EHC	I	.75	.85	.95	1.25	1.55						
AIWA	AIWA	IV			8.70	11.90							
AUDIO MAGNETICS	Tracs Tracs O Series Tracs TRX-I Tracs TRX-II Tracs Metal	I I I II IV		1.29	1.39 2.09 2.49 2.79	1.95 2.69 3.09 3.49 9.98	2.39						
BASF	Performance Professional I Professional I Super Professional II Professional III Metal IV Chrome EE Ferro LH	I I I II III IV IV			2.99 3.99 4.69 4.69 4.49 8.65	4.19 5.49 6.29 6.29 5.99 11.50	5.19			19.99 12.99		49.99†	†10½-inch metal reel; for EE-capable decks, back-coated.
CERTRON	High Energy Ferex I Ferex II High Density Low Noise	I I II I I	1.29 .99	1.39 1.09	1.99 3.00 3.00 1.59 1.19	2.59 3.99 3.99 2.09 1.59	2.99						
DENON	DX1 OX3 DX5 DX7 DXM	I I III II IV			2.75 3.99 5.00 5.00 8.60	3.85 5.60 7.00 7.00 12.00							
DIRECT-TO-TAPE RECORDING	Direct I Direct II Agfa Pro I Agfa PEM369 Agfa PEM468 Ampex 642 Ampex 407 Ampex 456	I II I I I I I			2.95† 3.75† 2.10	3.50†† 4.50†† 2.50	3.70		8.65 8.55	10.30 5.45 9.95			†C-68; ††C-96.
ELECTRONIC HOMES CO.	Grandmaster Grandmaster GST Correct Replacement DE	I II II I			2.99 2.99 2.49 2.99	3.99 3.99 3.49 3.99	4.99			18.00			
FUJI	FR-Metal FR-II FR-I ER DR	IV II I I I		7.15† 4.90† 4.90† 3.60† 2.95†	7.95 5.45 5.45 4.10 3.40	10.75 7.50 7.50 5.75 4.75							†C-46.
IRISH MAGNETIC INDUSTRIES	Irish 2000 Irish 7000 Irish 261 Emerald Emerald O31, O41 Irish 231, 241, 251	I I I I I I	1.50		1.75 2.10 1.10 .66	2.15 2.70 1.50			3.90 8.95	4.10 11.25	17.40		
JVC	ME-46P ME-60P ME-46 ME-60	IV IV IV IV		11.50† 9.50†	13.50 11.00								†C-46.
KENWOOD	MD CD ND N	IV II II II			9.25 4.25 3.45 2.70	11.55 5.75 5.07 3.45							
L.J.S.	Lear Jet Stereo	I			1.99	2.99	3.99						
LORANGER ENTERTAINMENT	Loran Loran Loran	I II IV		5.25† 5.25†	5.75 5.75 12.70	7.95 7.95 15.75							†C-46.
LUXMAN	XN	IV				14.95							
MAXELL	MX UD-XL I UD-XL II	IV I II		8.99†	9.99 4.59 4.59	11.99 6.39 6.39							†C-46.



TAPE TYPE CODE I = Normal Ferric II = Chrome/Chrome Equivalent III = Ferrichrome IV = Metal Particle	MANUFACTURER	Brand	Cassettes										Open-Reel				Notes
			Tape Type—See Code										1200 Feet	1800 Feet	2400 Feet	3600 Feet	
			C-30	C-45	C-60	C-90	C-120										
	MAXELL (Continued)	XL I-S XL II-S UD LN XL II 35-90 XL II 35-180 XL I 50-60B XL I 50-120B XL I 35-90B XL I 35-180B UD 50-60 UD 50-120 UD 35-90 UD 35-180	I II I I II II I I I I I I I		3.19† 2.19†	5.29 5.29 3.49 2.39	7.29 7.29 5.19 3.59	6.99 4.69		11.29	19.99	30.59††	54.59	††2500 feet.			
	MEMOREX	Metal IV High Bias II MRX I	IV II I	2.79	2.99	4.59 3.19 3.19	6.29 4.79 4.79	6.39									
	3M	Scotch Metafine Scotch Master I Scotch Master II Scotch Dynarange Scotch Highlander Scotch Dynarange 211, 212, 213, 214 Scotch 206, 207	IV I II I I I	7.19†	7.99 4.49 4.79 2.99 1.89	10.29 5.79 5.99 4.79 3.29	6.59 4.79		6.29 9.39	8.39 10.79	12.59	16.59	†C-46.				
	MIS	Xtend Range	I	1.25	1.50	1.75	2.00										
	MR. CASSETTE	Toyota Mr. Cassette Mr. Cassette	I I II			1.99 1.99 1.99	2.99 2.99 2.99	3.99 3.99		14.99							
	NAKAMICHI	ZX SX EX II	IV II I			6.50 4.00 3.70	9.00 5.85 5.40										
	PD MAGNETICS	Tri-Oxide Ferro 500 Crolyn 1100 Metal	I II IV			3.49 4.69 8.99	4.99 6.79 11.99										
	PIONEER	Pioneer Pioneer Pioneer	II IV I			9.25	8.25 4.75										
	PRD-FI TAPES	One Two Three	I II II				2.79 4.29 5.49										
	REALISTIC	Supertape Metal Supertape Hi-Bias Supertape Gold Realistic Concertape Supertape	IV II I I I I	1.59 1.99†	2.69	6.99 3.99 2.99 1.99 .88	8.99 4.99 3.99 2.79 1.25	4.99 3.49 4.99†	5.79	5.49 6.49	6.49	7.99 11.49	With head-cleaning leader tape. As above. As above. †Three cassettes.				
	REVDX	631	I									40.00					
	RKD TAPE	Ultrachrome Broadcast I XD	II I I		2.49	4.49 3.99 2.99	5.99 5.49 3.99										
	SONY	LNX HFX SHF EHF UCX-S FeCr Metallic FeCr ULH SLH FeCr	I I I II II III IV IV I I I		2.05 2.75 3.35 3.70 5.00 3.90 7.00	2.25 3.10 3.80 4.15 5.00 4.40 8.45	3.15 4.25 5.20 5.75 7.00 6.10 11.50	4.05 5.45	9.00	14.00 11.50	39.00 31.00		Ferrichrome. Ferric oxide. Elcaset, ferric oxide. Elcaset, ferrichrome.				
	SWIRE MAGNETICS	Laser UHD/II Micra 6XL	I I		1.29 .99†	1.69 1.29	1.99 1.59	2.29 1.89					†C-40.				
	TOK	MA-R MA SA-X SA AD-X AD D SA "EE" GX LX	IV IV II II I I I I I I	2.09	2.29†	8.99 6.69 4.99 4.39 3.89 3.29 2.49	11.99 8.99 6.99 6.19 5.49 4.79 3.39	3.99	10.95 9.95	15.95 12.95 10.95	29.95†† 27.95††	41.95†† 34.95†† 30.95††	†C-46; C-180, \$5.59. ††10½-inch metal reel; for EE-capable decks. Back treated. As above; without treatment: 1800 feet, \$9.95; 3600 feet, \$27.95.				
	YAMAHA	MR CRX CR NR	IV II II I			6.71 5.05 4.40 3.40	9.03 6.97 6.20 4.90										

# NOISE-REDUCTION UNITS

MANUFACTURER	Model	NR Type	Function: Closed Loop = C, Open Loop = O, Transient = T		Application: Tape Rec = R, Phone = P, FM = F, Video = V, Universal = U		Simultaneous Encode/Decode?	Degree of Noise Reduction, dB @ Hz	Record = F, Playback = P, Both = RP	Frequency Response, Hz to kHz, ±dB	Price, \$	Notes
ADVANCED ANALOG SYSTEMS	AAS 450	DNR	O	U			14 @ 7.8k	P	0.3	40-20 ±0.5	195.00	
ADVANCED AUDIO SYSTEMS	C-X 420 DNR-450 DNR-900	CX DNR DNR	C O O	P U U			14 @ 7.8k 14 @ 7.8k†	P P P	0.3	10-20 ±0.3	115.00 229.95 298.95	With rack mount, \$249.95. †Switchable for steeper cut on AM, VCR and other limited-bandwidth sources.
BURWEN	DNF 1201A  TNE 7000A	Dynamic Noise Filter  Transient Noise Eliminator	O  T	U  RPV†			30 @ 5k, 5-14 @ 400, 38 @ 10k	P  P	0.2  0.2	12-20 ±0.3  20-20 ±0.5	350.00  350.00	Tested, <i>Audio</i> 1/78.  †Not for FM multiplex or CD-4 records; tested, <i>Audio</i> 1/79.
DBX	21 222 224 228	dbx II dbx II dbx II dbx II	C C C C	RP RP RP RP	No Yes No		40 @ All 30 @ All 40 @ All 40 @ All	P RP RP RP	0.2 0.5 0.5 0.5	30-15 ±0.5 30-20 ±1 40-20 ±0.5 40-20 ±0.5	109.00 219.00 299.00 499.00	Disc playback input & switch. As above. As above plus 1 to 1.5 dB expander.
FISHER	NR-500	Super O	C	R	No		40 @ All	RP	0.08	20-30	190.00	
HEATHKIT	AD-1706	3-Band Dynamic Notch Filter	O	U			10 @ 4k-15k, 3 @ 2k	RP	0.1	20-20	274.95†	†Kit; 7-kHz low-pass filter and 8-dB expander inc.
INTEGREX	4ch Dolby  DFM	Dolby B  Dolby B	C  C	RF  RF	Yes  No		9 dB  9 dB	RP  P	0.05  0.05		250.00  99.50	Record level control; calibration osc.; cal. reel or cassette, \$9.00; kit, \$150.00. Sel. EQ, 25/75 μS.
JVC	NR-50	Dolby C, Super ANRS, ANRS/Dolby B	C	R	No		20 @ 1k-10k (C), 10 @ 5k (Super ANRS & ANRS)	RP	0.12	20-20 ±1	220.00	Calibration osc.
LT SOUND	NR-4 NR-8	† †	C C	R R	No No		30 dB 30 dB	RP RP	0.065 0.065	18-24 +0, -3 18-24 +0, -3	350.00 595.00	†Compatible with dbx I, 4-channel. †As above; 8-channel.
MXR	156 119 132	CX Compressor  Expander	C C O	P R U	No		21 dB	P RP RP	0.15 0.15 0.05	30-20 ±1 20-20 +0, -1	119.95	2:1 compressor, no tape monitor. Variable expansion to 1.6:1, discriminates noise from music.
NAKAMICHI	High-Com II  NR-200  NR-100	2-Band Compressor  Dolby B, C  Dolby C	C  C C	RP  RPV R	No Yes Yes		20 @ All 20 @ 2k-8k, 18 @ 1k, 10 @ 2k (B) 20 @ 1k	RP  RP RP	0.1  0.1	20-20 ±1 20-20 ±1	480.00 450.00 230.00	Subsonic and MPX filters, 50-dB meters, calibration osc.; L, R, and master record gain. As above.  For Nakamichi 1000ZXL, 700ZXL, and 700ZXE decks; powered and controlled by deck; tested, <i>Audio</i> 8/82.
PHASE LINEAR	220	CX	C	P			20 dB	P	0.08		120.00	240-V power opt.
PHOENIX SYSTEMS	P-518-S P-82-CX	Compressor CX	C C	R P	No		20 dB	RP P	0.5 0.08	20-20 +0, -3 10-100 +0, -1	99.00 109.00	2:1 compressor; kit, \$65.00; parts and boards also available. Kit, \$69.00; board and some parts available.
PIONEER VIDEO	R-1000	CX	C	V			14 dB	P	0.12		80.00	For LaserVision videodiscs.
RG DYNAMICS	X-15 Pro-20	Expander Expander	O O	U U	No No		15 dB 20 dB	P P	0.15 0.1		279.00 449.00	
SAE	5000	Impulse	T	U				P	0.1	20-20	225.00	
SANYO	Plus N33	Super D	C	R	No		40 @ All	RP	0.08	10-30 ±1	299.95	Mike/line mixing.
SONY	NR-500	Dolby C	C	R	No		20 @ 2k-8k, 18 @ 1k	RP		20-20 ±3	190.00	
SOUND CONCEPTS	SX-80 SX-80V	CX CX	C C	P PV			20 dB †	P P	0.1 0.1	20-20 ±0.25 20-20 ±0.25	119.00 119.00	Peak-expand switch for non-CX sources, convertible to SX-80V; kit, SX-1, \$76.00. †20 dB, switchable to 14 dB for LaserVision videodiscs; kit, \$76.00.
TASCAM	RX-9	dbx I	C	R	†		27 dB (wtd.) 23 dB (unwtd.)	RP			650.00	†Automatic encode/decode switching; 4-channel, plug-compatible with TASCAM 22-4 open-reel recorder.
TEAC	DX-2A	dbx I	C	R	Yes		30-40 @ All	RP	0.2	40-15 ±1 30-20 +1, -3	475.00	

ADVENT

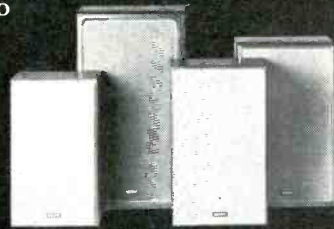
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For example, our newest change is the Advent "Direct Report" tweeter. It is a parabolic rather than hemispheric design. And the special phase plate for the tweeter has been tapered to improve dispersion. Stereo Review liked it as much as we did. They said, "We cannot recall ever having measured a front-radiating dome tweeter whose dispersion equaled that of the new Advent design."

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# A TAPE DECK SO ADVANCED IT HAS A FEATURE THAT FINDS NOTHING.

We call it  
Blank Search.  
You'll no  
doubt call it the  
best thing to happen to recording since  
magnetic tape.



Because, the Pioneer CT-9R tape deck with Blank Search finally puts an end to the old Fast Forward/Stop/Play/Reverse/Stop/Play method of finding where your last recording left off and the next one can begin.

Now, all you have to do is push a button and let the tape deck do the work. It'll find the blank area that's long enough to tape on, back up to the last recorded piece, leave a four second space and stop, ready to record.

And there's more wizardry where that



came from.  
Like Index  
Scan, Music  
Search, Blank Skip  
and a Real Time

Counter that reads out the amount of tape left in meaningful minutes and seconds instead of meaningless inches. In other words, features that will revolutionize the way you record and listen to tapes.

But don't thank us.

Thank the little brain that made it all possible. A tiny microprocessor that makes the CT-9R more than a tape deck, it makes it smart.

Smart enough to make your music easier to listen to. Even smart enough to make your music sound better, with Automatic Bias Level Equalization.



What Auto B.L.E.

means, to those without a degree in electronics, is that the tape deck automatically analyzes the tape being used (no easy task with over 200 different tapes on the market) and then adjusts itself for optimum recording with that tape. Improving the quality of your recordings faster than you can say "wow and flutter."

Auto B.L.E. aside, all of the CT-9R's features, from Blank Search to Blank Skip, do only one thing.

Let you spend a lot less time looking for your music.

And a lot more time listening to it.

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I feel as though I am a witness to the birth of a new audio era. After all of the demonstrations at trade shows here, in Japan, and in Europe where the revolutionary compact digital audio disc player had been demonstrated by others, I finally have a Compact Disc player in my own lab, complete with an assortment of Compact Discs. There are, of course, many unknowns still to be resolved. Sony was unable to tell me *when* their elegant Model CDP-101 will be available in the U.S. The best estimate is that it will be in early to mid 1983. Neither could Sony tell me exactly how much it will cost, although an announcement made in early

September in Tokyo pegged the Japanese price at 168,000 yen which, at a current conversion rate of about 250 yen to the U.S. dollar, puts the price for Japanese audio enthusiasts at around \$670.00. Judging by the way other Japanese electronic products are priced, you can figure that the price will be about 25% to 30% higher when the player becomes available here.

While availability and price may be of interest to retailers and audio enthusiasts waiting to snatch up the first shipment of DAD players to arrive in the near future, my main interest was to listen and to measure. I had been impressed by the sound quality of

**EXCLUSIVE  
FIRST LOOK!!!**



# SONY'S DIGITAL COMPACT DISC PLAYER

LEONARD FELDMAN

these small digital audio discs so many times that I wanted to see for myself, with a Sony Esprit system, if they were really as good as I had thought. To put it in as few words as possible: They are—and then some!

So much has been written about the compact digital audio disc, a joint development of Sony and Philips of Holland, that I don't think I need repeat the basic principles of operation of the disc and its player. It has been argued by some that once digital players and discs become standard, there will be no difference between





**“The disc makers say that they should have at least 300 titles available when the CD system is released.”**

one player and another, nor will there be a difference in sound quality between audio systems. In short, these arguments suggest that I and others like me will be out of work! I doubt, however, that this will occur, for while the disc format has been standardized and probably will be ultimately adopted by all audio hardware and software manufacturers, the way in which manufacturers of players choose to implement these standards with innovative product features and conveniences will still vary from unit to unit. After all, LP records are standardized too, but no one would say that all turntable systems are alike. Further, there are still analog portions in all of these players, which can easily sound different.

In the case of the CDP-101, Sony really has put its best foot forward and produced a fitting player for the beginning of the true digital disc era. Everything about its black front panel connotes elegance and space-age electronics. After the power switch at the upper left has been turned on, the digital display area at the right of the disc-loading drawer displays the numeral 1. Touch the “Open/Close” button on the disc drawer, and it opens smoothly. Then, simply drop the disc you want to play into the drawer (no centering, no spindle to fumble with) and touch either the “Play” button or the “Open/Close” button once again. The drawer now closes slowly, centering the disc on the internal drive spindle. If you pressed the “Play” button, disc play begins in a few seconds. If you closed the drawer by means of the “Open/Close” button, you have the option of touching the “Play” button to initiate play, or you can depress one of the automatic music sensor buttons (forward, in this case) to select the number of whichever track of the disc you desire.

The album notes for each disc list the numbers for the tracks and the program material of each one. If, during the playing of a disc you wanted to go back to an earlier track, you would press the “backward” automatic music

sensor button. In addition to displaying the track chosen (or that is being played), the digital display area also indicates when the player is searching for a selected track. A flashing red light shows that a disc is being loaded and brought up to playing speed. The digital display tells how many minutes and seconds of a selected track have already been played, and a touch of the “Time Remaining” button indicates playing time remaining on the side of the disc. A “Reset” button below the display returns the laser-optical pickup to the first selection on the disc. Three repeat-play buttons offer several options, specifically, repeat of the track being played, repeat play of the entire disc or repeat of specifically designated material (from one point to another) on the disc.

“Play” and “Pause” buttons perform pretty much the same functions as they do in a cassette deck, and are labeled with the now-standard arrows and double-vertical lines. Four additional buttons—two with double arrows pointing in each direction and two with triple arrows—allow fast-forward or fast-reverse play *while listening to the program material*. These functions are completely analogous to the fast-scan functions now found on most videotape recorders, except that as the buttons are held down, there’s no audible change in pitch of the music, just a fast sampling of what’s on the disc so that you can elect to stop at a desired spot. While line audio output levels from this unit are fixed in level (and rather higher than I normally would expect for connection to the high-level inputs of a preamplifier or integrated amplifier or receiver), a headphone jack at the lower left of the front panel is tied into a level control just above it which does permit you to adjust headphone volume.

A slim, hand-held wireless (infrared) remote-control module, powered by two AA batteries, duplicates just about all of the front-panel functions, including the memory repeat options, fast audible scanning and track selection. In addition, a set of buttons numbered 0 to 9 allows you to “direct access” any track number on a disc without having to “step” through lower or higher numbers to reach that track. According to Sony, this remote control

unit (RM-101) will be included with the CDP-101 at no extra cost.

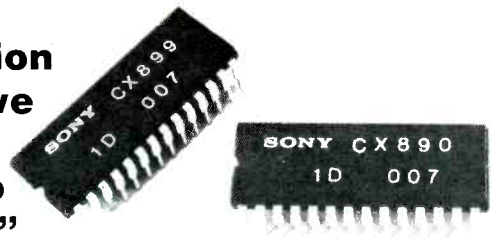
Analog signals are extracted from the rear of the CDP-101 via a pair of phono-tip jacks, but there are other, less obvious switches and terminals to be found back there as well. There is, for example, a sync output which works in conjunction with several of Sony’s logic-IC cassette decks. When the “Pause” button on the disc player is pressed, a pause occurs in a recording you might be dubbing onto a cassette (though I can’t imagine why anyone would want to dub from digital disc, with its 90 dB plus of legitimate dynamic range, to an analog cassette tape). There’s a “beep” on-off switch which works in conjunction with the hand-held wireless remote control unit that is supplied with the player. When this switch is on, the system beeps to indicate that remote instructions have been received. Another switch, labeled “Anti-Shock,” is, I was told, intended to add stability to the laser tracking system. However, in all my tests I couldn’t detect any difference in operation with or without the switch turned on. Finally, a multi-terminal socket labeled “Accessory Port” is intended for connection of a more elaborate remote control unit which Sony markets as a separate product.

Some of the intricacies of the optics and electronics of the CDP-101 are described in the sidebar for those who would like to know more about how a laser pickup can be made to track pits that measure approximately 0.5  $\mu\text{m}$  across by 0.11  $\mu\text{m}$  deep and are inscribed in tracks that are only 1.6  $\mu\text{m}$  apart. If you’re like me, you’ll probably want to read that description *after* you find out how the lab measurements of performance turned out and, even more importantly, how the music reproduced from compact digital discs sounded.

I had hoped to have a specially made test disc containing various test signals for my use in the lab. Unfortunately, I am still waiting for that test disc which is now winging its way from California to my lab in Long Island, courtesy of the U.S. Postal Service. Deadlines being what they are, I decided to present data sent to me by Sony. I have absolutely no reason to believe that these data are in any way



# "Separation remained above 90 dB for all but the very highest audio frequencies."



doctored or fudged, since it is entirely consistent with what I would expect from a compact digital audio system employing a 16-bit quantization code, a 44.1 kHz sampling rate, and an error-correction scheme as sophisticated as the one being used for this disc system and player.

Frequency response, plotted in Fig. 1, was transcribed from a graph supplied by Sony, along with a plot of separation versus frequency. Separation is rated above 90 dB for all but the very highest audio frequencies (above 15 kHz) where it decreases slightly to 88 dB at 20 kHz. This same graph also depicts S/N as 96 dB below 0-dB reference level.

Figure 2 is a plot of total harmonic distortion versus frequency. THD, according to Sony's measurements, is under 0.003% from 60 Hz up to 8 kHz, increasing slightly above that frequency until it reaches just over 0.01% at 18 kHz, the highest frequency at which THD was measured. As I write these numbers, I find it difficult to remember that I am talking about a disc player!

No data were supplied regarding wow and flutter, probably because it is not measurable. In a digital disc system, the term wow and flutter is meaningless, since the recovered digital code is first stored in the system's memory and then released "bit by bit" in a precisely timed order governed by a quartz clock.

Figure 3 is a drawing of a spectrum analyzer plot observed at one of the line output terminals of the CDP-101 while a test disc was reproducing a constant 1-kHz tone. As you can see, if there were any harmonic distortion components generated, they occurred well below the noise level which was already down some 95 dB or so below the peak reference level of the 1-kHz spike seen at the left of the plot.

Finally, in Fig. 4, the same sort of spectrum analysis was conducted by Sony using a 10-kHz constant tone. Again, no harmonics are visible, and the noise floor remains well above 90 dB below the 0-dB reference level.

With results such as these for the player, I'm not sure that my test equipment would have been up to the job of measuring the performance of the CDP-101 even if the test disc had ar-

*Continued on page 43*

Fig 1—Frequency response, separation, and noise level.

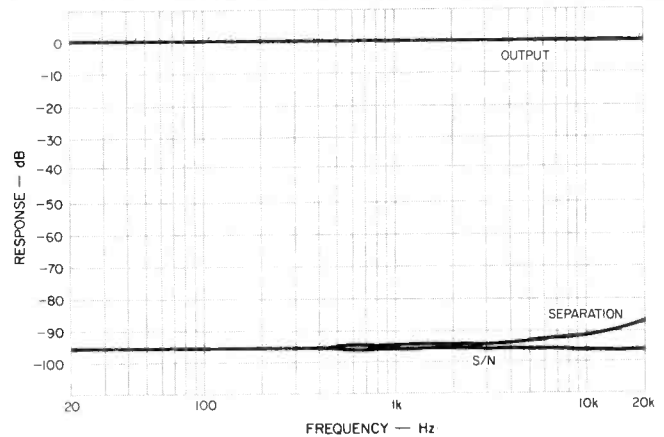


Fig. 2—THD vs. frequency.

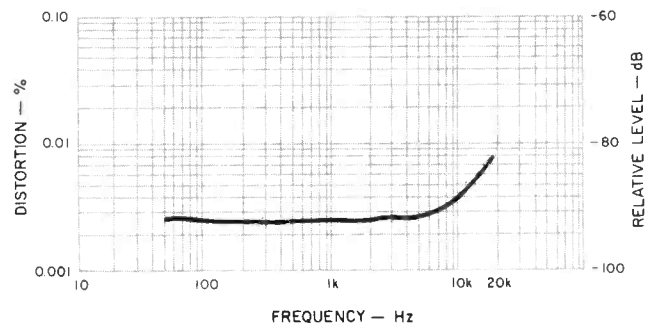


Fig. 3—Spectrum analysis of 1-kHz output signal.

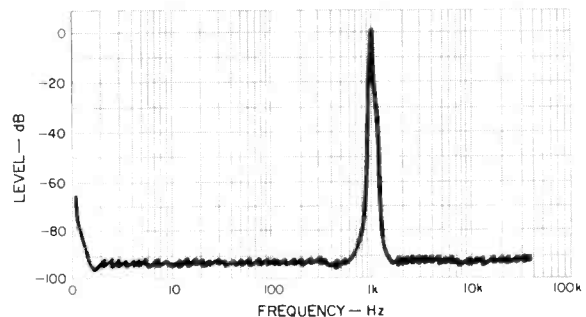
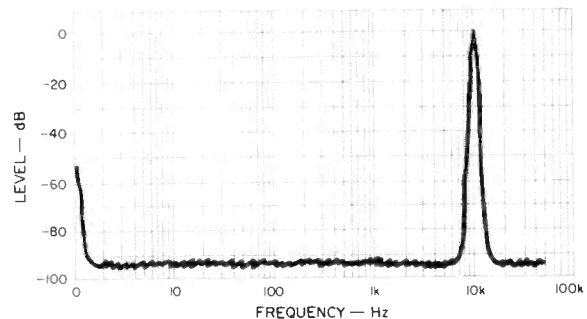


Fig. 4—Spectrum analysis of 10-kHz output signal.



# COMPACT DISC: OPTICS

The basic structure of the now-standard digital audio disc is detailed in the diagrams of Fig. B1. Since the laser beam impinges upon the disc from its underside, it passes through most of the thickness of the disc before focusing on the actual signal surface, which is beneath a plastic protective film near the upper surface of the disc. The 1.2-mm transparent layer of the disc plays an important part in the pickup process. The refractive index of the transparent cross-section is 1.5, so that while the spot size of the laser beam impinging upon the outer surface of the disc is around 0.8 mm in diameter, through refraction it becomes as small as  $1.7 \mu\text{m}$  by the time it reaches the signal surface as illustrated in Fig. B2. One of the important consequences of this refraction process is that a bit of dust or a scratch on the outside surface of the disc is effectively only a tiny fraction of its real size when its "shadow" reaches the signal surface.

In fact, dust particles or scratches of less than  $0.5 \mu\text{m}$  cause no error in signal readout. Information tracks consist of tiny pits impressed in tracks running outward from the inside of the disc at a pitch of  $1.6 \mu\text{m}$ . To put it perhaps more dramatically, 60 tracks of such pits would fit in the width of one groove of a conventional LP record! Obviously, to trace such minute information tracks accurately requires an extremely advanced optical system.

A simplified optical pickup system is illustrated in Fig. B3. A laser diode (LD) is placed at the focal point of a collimator lens having a relatively long focal length. The emitted laser beam passes through the collimator lens to make its rays parallel and is then brought into focus on the signal surface after passing through another objective lens. Between the two lenses is a Polarization Beam Splitter (PBS), a kind of prism incorporating dielectric membranes that serves to direct the beam from the laser diode to the signal surface and the reflected

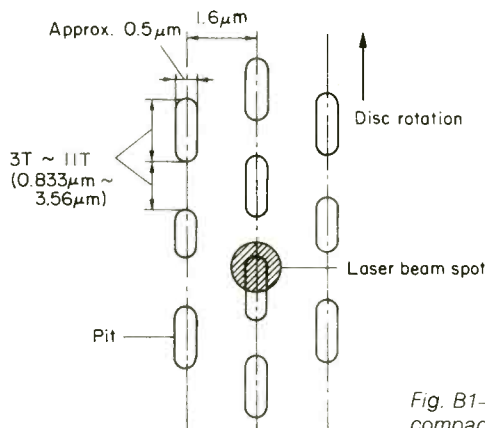
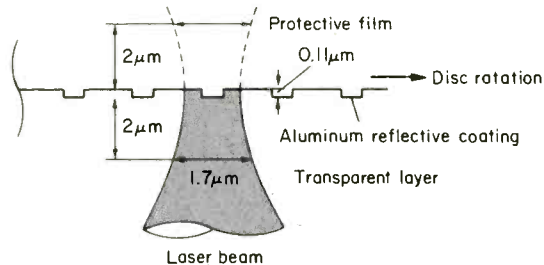
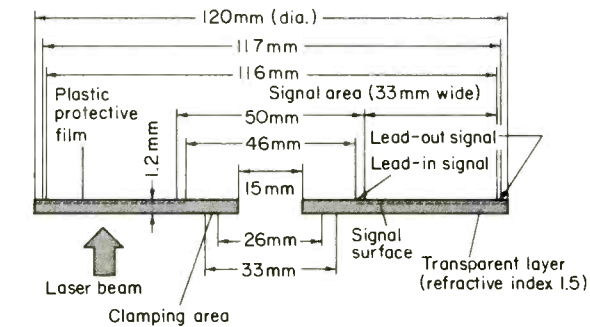


Fig. B1—Dimensional details of the compact digital audio disc.

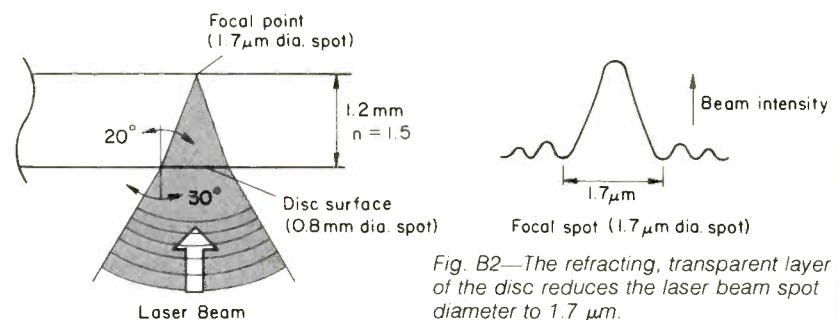


Fig. B2—The refracting, transparent layer of the disc reduces the laser beam spot diameter to  $1.7 \mu\text{m}$ .

# CS AND ELECTRONICS

beam from the surface to the photo diode (PD). The arrangement prevents horizontally polarized beams that go onto the signal surface from being diverted to the photo diode, while vertically polarized beams which reflect from the signal surface are diverted and reflected to the photo diode. The quarter-wave plate (QWP) controls the polarization of the outgoing and returning beams, ensuring that all the returning light is deflected to the photo diode.

Depth of focus employed in the system is only  $\pm 2 \mu\text{m}$ . Vertical irregularity of the typical digital disc as it rotates is more than 100 times that great. Therefore, a servo system must be used to move the objective lens up and down so that the laser beam remains in perfect focus; the diagrams in Fig. B4 explain how focus is maintained. The "beam" diagram at the right of this figure shows how the vertical component of the beam is concentrated on the focal point of the convex lens; the cylindrical lens has no effect upon this beam component. The horizontal beam component is refracted as it passes through the cylindrical lens and makes a focal spot at a shorter distance. If the photo diode, PD, is positioned at the point where the vertical component of the beam intersects with the diffused horizontal component of the beam, a circular pattern impinges upon the photo diode. When the distance between the disc surface and the convex lens is increased, both focal points come closer to the lens, as indicated by the dotted lines in the beam diagram. The pattern becomes elliptical, as shown in the upper three squares of the diagram at left in Fig. B4. Similarly, when the distance between disc surface and the convex lens is reduced, the pattern becomes elliptical again, but rotated 90° in terms of its major and minor axes.

A focus error-control signal is obtained by dividing the photo diode into four areas (A, B, C and D), as illustrated in the lower diagram of Fig. B4. Next, the output

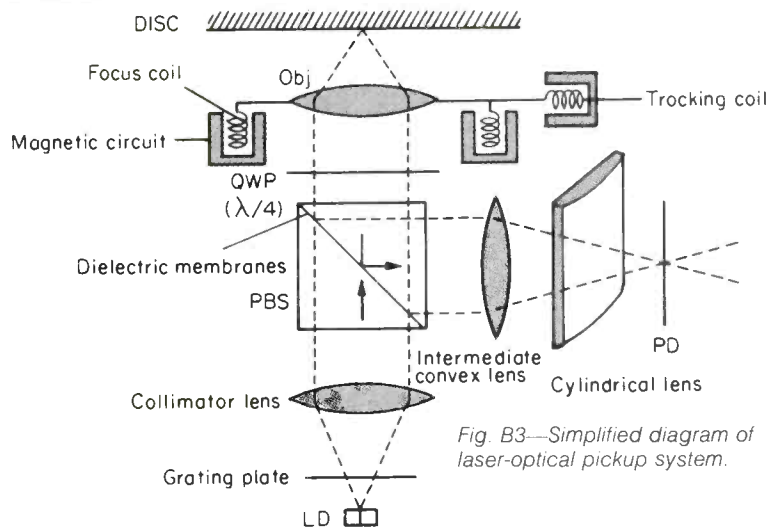
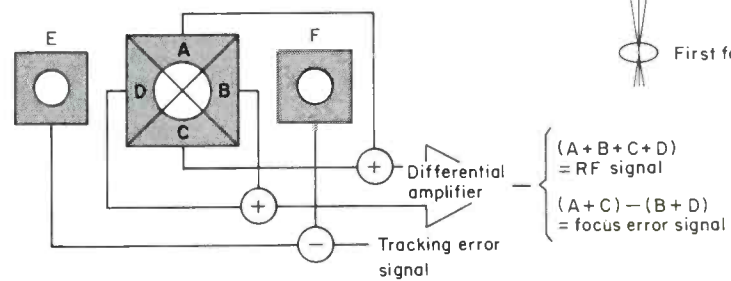
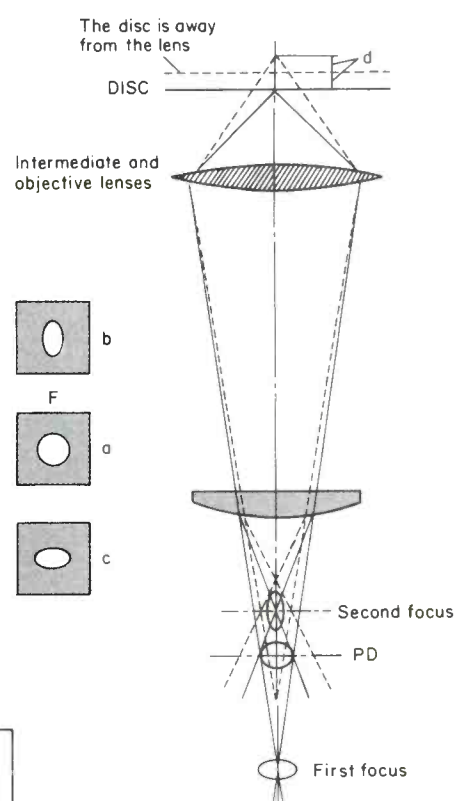
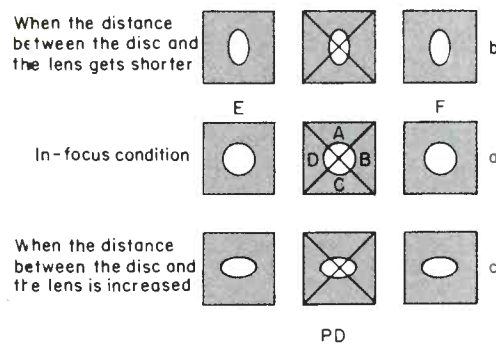
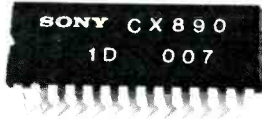
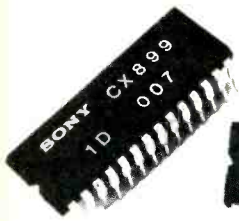


Fig. B3—Simplified diagram of laser-optical pickup system.

Fig. B4—Focus and tracking servo-control systems used in the CDP-101.





## “Recording techniques will need to be reevaluated as we enter the digital disc era.”

of the differential amplifier must be supplied to a lens drive system so that the focus error-control signal  $([A + C] - [B + D])$  always remains zero. In that way, the signal surface always remains in focus with respect to the laser beam impinging upon it.

Extra patterns E and F seen in the diagrams of Fig. B4 are used to keep tracking “on target” in a left-to-right sense. A spot of laser light must be produced on each of these three patterns. The grating plate in Fig. B3 serves this purpose; its diffraction effect yields the required three spots from a single laser diode.

The relative position of the spots on the signal surface is depicted in Fig. B5. If the main spot, M, deviates from the signal track, an imbalance arises between the portion of spot “E” which overlaps a pit and that of spot “F.” The value of signal picked up at the photo diode obtained by subtracting “F” from “E” represents the left-to-right tracking error signal. This signal

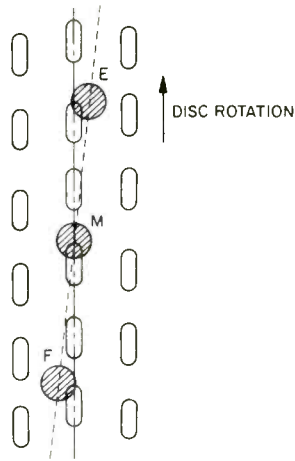


Fig. B5—“Three-spot” laser beam system used to servo-control lateral tracking of pickup.

ultimately drives the tracking coils represented in Fig. B3, moving the objective lens bilaterally with respect to the direction of the beam.

The control system just described

is known as the “three-spot method.” The lens drive mechanism is an electromagnetic device similar to the voice-coil of a loudspeaker. The drive mechanism as a whole is also referred to as a two-axis system since it is capable of adjusting the lens position in two planes, up and down and from left to right.

No attempt will be made here to give you a full account of how the electronics of the CDP-101 operates. Suffice it to say that the system uses three Large Scale Integrated circuits which make up the demodulator and error-correction circuitry. These, together with a 16k RAM (random access memory) constitute the so-called “black box” which is the essence of the electronics converting digital signals back to analog signals that can be fed to the high-level inputs of any audio amplifier. For those who would like to delve into the matter a bit further, reproduced here, as Fig. B6, is a block diagram of the entire CDP-101 player, from disc to recovered audio signal. L.F.

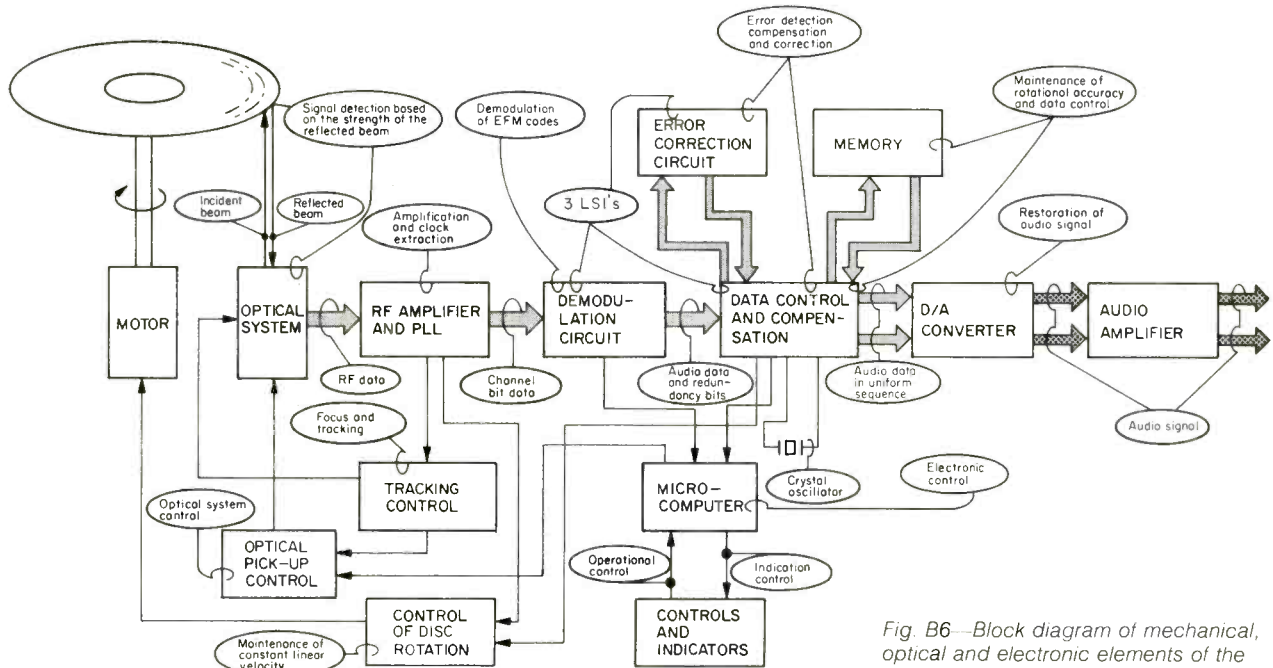


Fig. B6—Block diagram of mechanical, optical and electronic elements of the Sony CDP-101.

**"I am convinced that, sooner or later, the analog LP record will have to go the way of the 78."**



## SONY CDP-101 DIGITAL AUDIO DISC PLAYER

### Published Specifications

PLAYER

**Number of Channels:** 2.

**D/A Conversion Format:** 16-bit linear.

**Sampling Frequency:** 44.1 kHz.

**Quantization:** 16-bit linear.

**Signal Readout Method:** Optical, using semiconductor laser with 0.78- $\mu$ m wavelength.

**Frequency Response:** 5 Hz to 20 kHz,  $\pm 0.5$  dB.

**Dynamic Range:** Greater than 90 dB.

**S/N Ratio:** Greater than 90 dB.

**Channel Separation:** Greater than 90 dB at 1 kHz.

**Harmonic Distortion:** 0.004% at 1 kHz.

**Wow and Flutter:** Not measurable.

**Line Output Level:** 2.0 volts, nominal.

**Dimensions:** 14 in. (335 cm) W  $\times$  4 $\frac{1}{8}$  in. (105 cm) H  $\times$  12 $\frac{3}{4}$  in. (325 cm) D.

**Weight:** 16.7 lbs. (7.6 kg).

**Price:** See text.

### DISCS

**Diameter:** 4.72 in. (120 mm).

**Thickness:** 0.047 in. (1.2 mm).

**Rotation:** Counterclockwise (viewed from readout side).

**Track Pitch:** 1.6  $\mu$ m.

**Linear Playing Speed:** 1.2 to 1.4 m/sec (47 $\frac{1}{4}$  to 55 $\frac{1}{8}$  ips).

**RPM:** Approximately 500 to 200 (constant linear velocity).

**Playing Time Per Side:** Approximately 60 minutes.

**Price:** See text.

**Company Address:** Sony Dr., Park Ridge, N.J. 07656.  
For literature, circle No. 94

I'm a little concerned about another aspect of this coming digital disc introduction. Unfortunately, certain record companies have been selling what are purported to be "digital discs" for several years now. Of course, you and I know that what is meant by the term "digital disc," which has been emblazoned on the jackets of these completely analog vinyl groove-type records, is that they were made from *digital master tapes*. But will the average record collector understand the difference, or will he or she say that "This is nothing new—digital discs have been around for years"? I hope the minute size of these true digital discs, the totally new players that will soon be available, and the sheer magnificence of the sound delivered by Compact Discs will enable enough people to realize that here is something really new and revolutionary.

As for availability of discs, by the time the players become available in this country, there should be at least 300 album titles available (about two-thirds from the Polygram group of European recording companies, the rest from CBS-Sony of Japan). Beyond that, I can only hope that other record companies—most of whom have been complaining of downturns in sales—will see the importance of this new development and make the capital investment needed to start producing these discs.

One final bit of good news. The price in Japan for a Compact Disc works out to about \$15.00. When you consider that the discs contain an hour or more of music, that's actually a bit lower than the price of a present-day so-called "audiophile" disc of the direct-to-disc or digitally mastered variety. The analog record has been with us in essentially the same form for 105 years, and it's not something any of us is willing or ready to discard easily. But after my experiences with this first digital audio disc player and the few sample discs that were loaned to me, I am convinced that, sooner or later, the analog LP will have to go the way of the 78 shellac record. I can't tell you how long the transition will take, but it *will* happen!

rived in time, but I'm going to give it a try when that disc does arrive and let you know the results next month.

I was fortunate enough to get my hands on seven different compact digital disc albums. Some of the selections on these albums were obviously dubbed from analog master tapes, but even these were so free of any kind of background noise that they could, for the first time, be thoroughly enjoyed as music. There's a cut of the beginning of *Also Sprach Zarathustra* by Richard Strauss, with the Boston Symphony conducted by Ozawa, that delivers the gut-massaging opening bass note with a depth and clarity that I never thought possible for any music reproduction system. But never mind the specific notes or passages. Listening to the complete soundtrack recording of "Chariots of Fire," the images and scenes of that marvelous film were recreated in my mind with an intensity that would just not have been possible if the music had been heard behind a veil of surface noise and compressed dynamic range.

My listening was not confined to the

classics. A popular repertoire sampler demo disc from Polygram, like its classical counterpart, contains a mix of digitally mastered as well as good analog-mastered selections. The Moody Blues' "Nights in White Satin" and Abba's rendition of "Head Over Heels" were particularly outstanding. Not all of my reactions concerning the music were positive, but what negatives I had were totally unrelated to the new digital disc format or to the player. Rather, it became quite obvious to me that recording techniques are going to have to be reevaluated as we enter the digital disc era. This applies particularly to the pop-music genre, where tricks of the trade (multitrack, overdubbing, flanging, time delay, and exaggerated EQ) have all grown up in an analog world. They don't always work in the clean and totally transparent world of digital, which is totally unforgiving of sloppy or uncalled-for studio tricks and gimmicks. While I'm not suggesting that all the tricks of the pop recording trade must be abandoned, many of them are going to have to be used much more carefully.

## ONE-BRAND SYSTEMS

# FISHER SYSTEM R-70



If you've been regarding all one-brand systems as low-fi compromises in the quest for "true" high fidelity, you may want to reconsider your opinion after hearing about the Fisher System 70.

The R-70 goes far beyond the usual one-brand system in terms of the components that are included. Besides the usual amplifier, tuner, turntable, cassette deck, speakers and equipment cabinet, the system includes a 12-band graphic equalizer and a unifying component called a remote control center. This last device not only serves as a means of tying all the other elements together but also acts as the receiving point for all operating instructions fed to the system via the supplied remote control transmitter, which uses infrared light. The remote

control transmitter has a remarkable number of functions that it can initiate. Not only will it switch from tuner to phono to tape deck functions at the touch of a button, but having selected the program source type you want, you can then adjust overall volume, select preset stations on the tuner, operate all the tape deck's transport, record and play functions and even initiate record playing on the turntable. There are no fewer than 23 separate buttons on the hand-held remote unit. The system can also be operated from the front panel of the control center, insofar as switching from one program source to another and changing overall listening levels are concerned. The graphic equalizer, however, must be controlled from its own front panel.

The CA-550 integrated amplifier de-

livers in excess of 70 watts per channel of audio power into 8-ohm loads at less than 0.009% THD. Its front panel has two rows of LEDs which are calibrated directly in watts of output power. A record-output selector operates independently of the program-selector pushbuttons so that it is possible, for example, to record a radio program while listening to a record or a tape. The arrangement also permits duplicating from one deck to another while listening to radio or phono reproduction. Conventional bass and treble controls are included; this is something of a redundancy in view of the presence of the graphic equalizer.

Besides synthesized tuning, the FM-550 tuner features automatic or manual tuning along with 12 (six AM and six FM) station presets with electronic

memory. Station frequencies are digitally displayed, and five LEDs indicate relative incoming signal strength. Inter-station muting, mono/stereo selection, and an MPX filter are all activated by means of front-panel pushbuttons.

The DD-350 cassette deck features direct-drive operation and includes metal-tape capability and a full-logic IC electronic solenoid control system. Without the MPX filter activated (and I saw no reason to activate it when recording from the FM-550 tuner, which has excellent subcarrier product rejection

in stereo), frequency response of the tape deck was far better than claimed in the published specs, even when I used ferric-oxide (Type I) tape.

A degree of programmability is built into the MT-9000 turntable. If you press the "Start" switch (either on the unit itself or on the hand-held remote) six times, for example, record-play will begin with the sixth band on the disc. In addition, repeat play of a record can be programmed, directly or remotely. The turntable came supplied with a magnetic stereo cartridge bearing the

model designation MG-100S, and I was quite pleased with its trackability and frequency response.

I did not subject the loudspeakers supplied with the R-70 to any lab testing, but it's worth noting that they come with stands, are three-way systems, and weigh 51 pounds apiece. Each ST-925 speaker cabinet measures 31½ in. H × 18¼ in. W × 13½ in. D deep, and response claimed for the systems extends from 40 Hz to 20 kHz (with no tolerances given).

Most of the significant measurement results for the System R-70 are summarized in the accompanying ratings chart. Without a single exception, every measurement I made turned out to be at least as good as (and in most cases better than) the specifications released by Fisher. What's more, some of the test results would be regarded as impressive by anyone considering the components on a unit-by-unit basis. For example, 48 dB of stereo FM separation is an excellent figure, as is the stereo distortion reading of only 0.1%, the 0.04% wow and flutter measured for the cassette deck, and the superb record/play response of that deck using either high-bias (chrome equivalent) or metal tape. Whatever the source of the phono cartridge in the system, it exhibited reasonably good frequency response, aided in part by the excellent playback response characteristics of the phono preamp section of the CA-550 integrated amplifier. While I don't have provision in the ratings chart to record the basic performance of the R-70's graphic equalizer, I did measure its performance separately and can attest to the fact that it is not likely to add any audible distortion to the system.

When I run into one-brand systems as good as this, I regret the fact that there simply isn't enough space in these reports to really delve into some of the technical details of the design of the individual components. Each of these well-designed audio components could easily merit a full-scale "Equipment Profile" of its own. Add to that the elegant control unit which integrates the entire system and increases operational flexibility, and it becomes clear why Fisher has captured such a large share of the one-brand system market.

Leonard Feldman

## ONE-BRAND SYSTEM RATINGS

**Manufacturer:** Fisher Corp. **Model:** System R-70  
**Company Address:** 21314 Lassen St., Chatsworth, Cal. 91311.  
**Cabinet Dimensions:** 19 in. W × 46½ in. H × 17¾ in. D.  
**Price:** \$2,400.00. For literature, circle No. 98

Component & Specification	Claimed	Measured	Rating
<b>Power Amp Section (CA-550)</b>			
Power/Channel, watts	70.0	80.65	♪♪♪
Rated THD, %	0.009	0.006	♪♪♪♪
<b>Preamp/Control Section (CA-550)</b>			
Freq. Response, Phono, ±dB	RIAA ±0.5	RIAA +0.1, -0.3	♪♪♪
Phono S/N, dB	75	75.5	♪♪♪
<b>FM Tuner Section (FM-550)</b>			
50-dB Quieting, Stereo, dB	35.9	36.0	♪♪♪
S/N, Stereo, dB	70	75	♪♪♪
THD, Stereo, 1 kHz, %	0.1	0.1	♪♪♪
Separation, 1 kHz, dB	46	48	♪♪♪
Alt. Chan. Selectivity, dB	75	77	♪♪♪
<b>Turntable/Cartridge Section (MT-9000)</b>			
Freq. Response, Hz-kHz, ±dB	N/A	20-20, ±2.0	♪♪♪
Separation, 1 kHz, dB	N/A	28	♪♪♪
Rumble, DIN B, dB	-70	-70	♪♪♪
Wow & Flutter, % wtd. rms	0.035	0.032	♪♪♪
<b>Cassette Recorder Section (DD-350)</b>			
Freq. Resp., Hz-kHz, ±3 dB			
Normal Tape	40-14	32-17	♪♪♪
Chrome Tape	40-15	32-19	♪♪♪
Metal Tape	40-15	32-20	♪♪♪
S/N, Best Tape, dB (with NR)	62	64	♪♪♪
Wow & Flutter, % wtd. rms	0.04	0.04	♪♪♪

### Rating System

♪ = Poor; ♪♪ = Good; ♪♪♪ = Very Good; ♪♪♪♪ = Excellent; ♪♪♪♪♪ = Superb.

### General Comments

**Power Amplifier:** Sound quality very good, with adequate dynamic headroom. Phono section has precise frequency response (equalization). **Turntable & Cartridge:** Well matched to each other, with low overall system noise and wow and flutter. **Tuner:** Very well designed, stable and sensitive enough for all but weakest fringe areas. **Cassette Deck:** Good logic control features, but might have included Dolby C for such a costly system. **Graphic Equalizer:** A nice addition to the system; too many companies treat this component as an option at extra cost.

**Overall Comment:** I liked the way the central control unit ties all the components together, though careful reading of the manuals is necessary. The hand-held remote is a very worthwhile addition. An "umbrella" type instruction sheet would have been helpful if supplied in addition to the manuals for each component.

**Overall Rating:** ♪♪♪





# GODEHARD GUENTHER

## The man who made the Mini-Speaker

*The unwavering blue eyes are set deeply in his skull. His strong nose arches over a cleft chin, and there's something so extraordinarily intense about his gaze that the eyes impale you. Except that the corners are crinkled from laughter, being stared at by this pair of eyes would probably be a disconcerting experience.*

*But it isn't, because Godehard Guenther, Ph.D. and President of Analog and Digital Systems, has a strong sense of humor, one very near the surface. Part of him is still the mischievous boy who illegally broadcast tape-recorded programs over a home-built radio transmitter in his native town of Bochum, West Germany. Part is the gifted physicist, diverted from the Skylab space projects to sound and large-*

*ly responsible for such audio innovations as the mini-speaker. Yet another part is the entrepreneur whose company's enviable success says all that need be said. It seems some benevolent schizophrenia works for this man who, on his 39th birthday, described himself as three 13-years-olds.*

*Today, at 43, Guenther is no less whimsical, in spite of responsibilities which span the Atlantic and keep him from his home outside Boston, his wife and two daughters most of each month. While interviews must be scheduled further in advance now, they are still informal. Yet Godehard Guenther still responds to questions in a soft and warmly accented voice as his blue eyes fix on the questioner and, flashing, seem near laughter.*

ing the evenings. I recorded by remote turn-on during the day, and played it back over AFN's own frequency during the night.

*How powerful was your transmitter?*

It was very small, something like three or four watts, and it was limited by the mountains in the area; so in one direction it went seven or 10 miles and in another direction it went only a few miles.

*Wasn't all this illegal?*

Oh, it sure was. I tried to speak English as fluently as I could, but of course, they tracked me down and I got caught in the end. But it took almost a year. I shouldn't have used my English. I should just have replayed AFN without saying anything—on their own frequency.

*How did they identify you?*

Well, the German government is very efficient, and they have the Post Office in charge of all communications. As you know, there's a monopoly in Germany for anything that has to do with audio, video, telephone or telex. They had these search cars out with all kinds of direction-finding equipment looking for the source.

*This would have been in the '50s. Did you like American rock and roll?*

Well, actually I was not a rock and roll freak. I was a Bach freak. My favorite composer was and still is today Johann Sebastian Bach.

*Did you listen to classical music as a boy?*

*When did you first get interested in hi-fi and music?*

Oh, when I was maybe 12 or 13 years old. I was more interested in music than I was in hi-fi, but I was also interested in electromechanical things with music. It was natural that since I wanted to store music and play music, I got interested in electronics, which wasn't hi-fi in those days.

*Did you have a record player at home?*

A funny one with a steel needle, when I was little. When I turned 14 I had a little better one. It already had a real stylus. I built my own amplifiers. I built my own tape recorder, and I built an FM

station—but that was a little later, more like when I was 16.

*Tape recording was very new in those days.*

Yes, and, of course, as a teenager I didn't have money, so I earned money doing odd jobs and bought a motor. I talked a fellow in a machine shop into drilling holes in a chassis, found a head—and in the end I had a real recorder that was working.

*What did you record?*

I recorded AFN, the Armed Forces Network, which I played back to my pals in school who couldn't listen to it because the radio station was off dur-

**"In America, bigger tends to be better; in Europe, smaller things are considered as being better."**

Almost exclusively.

*What did you think of becoming when you grew up?*

Oh, you know, anything from a train conductor to a truck driver—all those wonderful children's dreams. As I got older I developed an interest in music, architecture and general engineering. I opted to study physics because that seemed like the only field where you could get an overview of all the engineering disciplines and where you could still do your studies at a university rather than at a technical school like MIT. A technical school in Germany is a much different operation, much more regimented, whereas universities are more liberal, more free and offer a greater amount of material.

*You came to the U.S. in 1967 to work on Skylab.*

Right. I was assistant professor (as you would probably call it here) at the University of Heidelberg then, and I was invited by the National Academy of Sciences for a two-year program to work with Werner von Braun's staff in Huntsville [Alabama] at Marshall Space Flight Center. I ended up on a Skylab project, which of course took much longer than two years. In the end I stayed.

*How did the transition from space scientist to hi-fi entrepreneur occur?*

It was very natural. I had always been interested in good design and music, and there was one company in Germany whose products appealed particularly to me, a company by the name of Braun. They were famous for their industrial design, but they also happened to make very fine loudspeakers and good electronic equipment. I tried to import their equipment as a hobbyist, mostly because of the looks and the loudspeaker performance. That's how I got into this at the start.

*How could you do this from Huntsville?*

Well, if you're in Huntsville, Alabama, and you work on Skylab, you need communication with schools like MIT and UCLA that are involved in state-of-the-art technologies, as well as with manufacturers of hardware like Boeing and McDonnell-Douglas, General Dynamics and those people. Therefore I had a lot of travel to do. You couldn't just sit in your laboratory. A satellite project of that magnitude requires a team approach.

*So you played hi-fi sales manager on those trips.*

Yes. I scheduled the weekend to be part of my assignment.

*And you visited stores on the weekends. How much business could you do that way?*

Oh, I ended up doing about a million dollars a year.

*That made you about as big as some pretty well-known small speaker companies of that era. How did the Braun people feel about it?*

The Braun people liked what I was doing, because it was a life study of a market that had been described to them as very difficult—probably unachievable—because of what I liked about their product, the stark looks. People compared Braun speakers to refrigerators, for example, which is exactly what I liked about them.

*Apparently, though, you found buyers out there. At least some of the American people must have responded the way you did.*

The American people didn't like the looks of the speakers at all, but they did like the sound. At the time these speakers were much more linear than the competition, and therefore they seemed to have a greater level of clarity and definition. That overcame the obstacle of the funny looks.

*When did you decide to make hi-fi your full-time occupation?*

That happened in 1972, after Braun's parent company, the Gillette Corp., decided to appoint an official distributor, Malcolm Low, the "L" of KLH. I had the choice of either staying with my space research projects or teaming up with Malcolm Low and moving to Boston, and I opted for the latter. Malcolm ran the company for a couple of years and then went on to another venture. And I took it over.

*Your first speakers were Braun. Then they carried the name ADS/Braun. Then the Braun was dropped altogether. Why?*

The only way the Braun speaker business could grow in the United States was to come down to a reasonable cost and to offer an appearance that was appealing to a greater audience. Therefore, these speakers had to be manufactured in the United States. Braun and Gillette were nice enough to give me access to their engineering

department, and I in turn reciprocated by helping my people design things that they wanted to have for Germany—electronic products. So we entered into a licensing arrangement, which I eventually outgrew because my needs for the U.S. became so different that we had to manufacture from scratch. During the transition from Braun to ADS we also changed the manufacturing depth in the product itself. Initially we used Braun drivers and networks with U.S.-made boxes and shipping cartons, whereas in the end we had to manufacture all our drivers from scratch, as we're doing today.

*Your company has been built on a series of innovations, and one of the first was the mini-speaker. Why did you set out to design a speaker with a one-liter enclosure?*

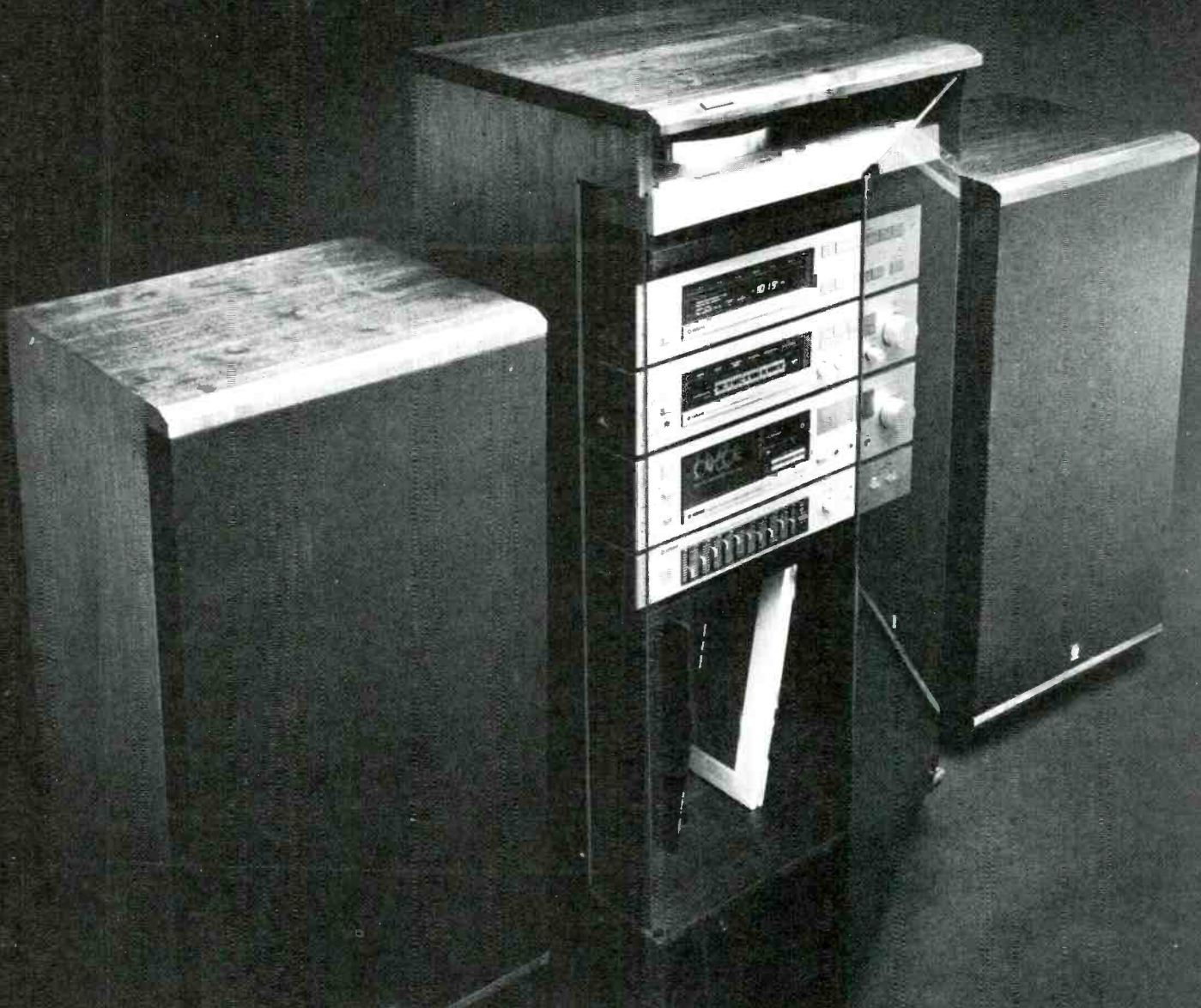
If you are from Europe, you have a different outlook on goods, on things. In this country, which is a big, wide-open country, bigger tends to be better. In Europe, smaller tends to be better. I was conditioned to that way of thinking, and I never liked the idea that speakers had to be very big. This idea was shared by Franz Petrik, Braun's chief loudspeaker designer; the two of us and Gary Streeter, chief engineer for ADS, got together to design something that sounded big but was physically small, just to prove a point. The original engineering took almost two years. We introduced it as an automotive product, because I didn't think anybody in this country would accept such a little loudspeaker for home use. So we had to apply it to an environment where the small size was indeed a virtue. Only one year later did we introduce it as a home product.

*Didn't that product employ digital technology?*

Yes, it did. In the car, where you have only a 12-volt d.c. supply and you need to overcome the engine noise, you need a lot of electric power to drive the loudspeakers. Also, the laws of physics tell you that the smaller a loudspeaker is for a given bass response, the less efficient it will be. Therefore, we needed an extra-great amount of power for this fellow in the car, and we had to use a digital switching power supply to power our amplifiers.

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*Marvin Hamlisch*  
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**YAMAHA**

"Mr. Nakamichi opened his briefcase and out came the Model 250, so I opened my desk and took out my 2002 speaker/amp combo."

*Was it your Skylab experience that taught you how to do this?*

Certainly so, yes. In those days these types of converters were only used in space applications because the switching devices were quite expensive. But Gary [Streeter] found a device on the marketplace that looked reasonable.

*This was back in the mid-'70s when companies like Jensen were only just discovering they could sell a pair of car speakers for as much as \$100—and those were designed for flush-mounting. Here you had this curious component that looked like a shrunken home speaker, a box that mounted on the rear deck of a car with brackets. Whatever made you think you could sell it?*

Actually, our first model was wedge-shaped.

*But what gave you the idea that a car speaker should look like a wedge? Were there such things then?*

No. There certainly were not. But I believe that form should follow function, and that was a very functional form. It was also reasonable in tooling, and therefore we chose that form. Whether it would sell, we certainly didn't know. It was a gamble. It was not so much meant to be a marketable product as to show the technology we were capable of. And it served both purposes. It helped us sell our loudspeaker, and the ADS brand was instantly established. And interestingly enough, there was a very small but very, very open market for these devices.

*When did you team up with Nakamichi to market your speakers and their tape recorder as a car system?*

Well, Mr. Nakamichi was so impressed with our first [mini-speaker] system that one day he came to my office and said, look, Dr. Guenther, you can make these great little loudspeakers. If you could somehow find a way to eliminate this external amplifier you need, we could maybe match it up to a cassette deck and we would have a gorgeous, marketable package. I said, well, yes, that sounds great. If only I had such a cassette deck I would be all set. And he opened his briefcase, and out came this tiny little Nakamichi 250, and I opened my desk, and out came my 2002, which had the amplifiers inside the little speaker without being any

bigger, and all we had to do was design a connecting cable (which actually was quite a problem).

*You later designed a digital preamp for the car.*

Yes. That was one of the projects we did for Braun. But Braun's interest wasn't strong enough to financially support it, and ADS was too small a company to manufacture it for our own use.

*And now you've come full circle. You split with Braun, as did Franz Petrik, who went to work for you. And suddenly we find you're now heavily involved with Braun again. What, precisely, is your relationship with them?*

We've started a joint venture with Braun's parent company, the goal of which is to take over Braun's hi-fi operation altogether and integrate it into ADS.

*Talk about the tail wagging the dog! The child grows up and swallows Daddy. Doesn't this strike you as somewhat Freudian [laughter]?*

No. I rather think of Braun as my mother that taught me all these things, and when my mother got a bit ill I tried to save her and took her with me to a nicer place.

*What specifically happened to Braun?*  
Braun has been very successful as a manufacturer of small appliances. It's now a billion-deutsche mark corporation in Germany—that's about a half billion dollars—and its tremendous success in the appliance field has shifted the emphasis of management a bit away from hi-fi; and they need to concentrate on their main business. This provided me with the opportunity to acquire the hi-fi part from them.

*How big is that?*

Oh, it's only 10% of their total.

*Only? Ten% of a half billion dollars is hardly small by audio industry standards. How much of your time do you spend in Germany now?*

At the moment, the major part. I have to untangle the Braun hi-fi portion out of the large parent company. It's all integrated under the so-called matrix system.

*And how many trips back and forth have you made in the last year?*

Fourteen.

*Do you enjoy having one foot in Germany and the other in America?*

Yes, I enjoy that, too. I used to tell

people that I left Germany because I couldn't stand the sauerkraut and the bratwurst, but it's not that bad. And they make good beer.

*But seriously, how long do you hope to keep up this kind of pace? You're 42 now, about to turn 43?*

That's right. That's a bad number. Forty-two isn't bad—it's two 21-year-olds, and that's the way I feel. I can have one guy over there work his tail off and another guy over here work his tail off. Seriously, I think it's going to be a real interesting company. Some of my products can be used over there, and some of their products can be used over here, so both companies together are bigger than the sum of their parts. And that provides my team here—and the German team as well—with new opportunities for innovation that we could not afford if we did not have both markets.


*Since Braun's hi-fi operation is several times the size of ADS, shouldn't they be acquiring you and not the other way around?*

If Braun wanted to be in the hi-fi business and they wanted to expand their business into the United States, that would be the logical thing to do. But they want to make shavers and appliances, and I want to make hi-fi. And I'd like to expand into Europe. I have maybe reached the limits of my distribution and the limits of my product manufacturing capability without adding talent and market. And here I have an opportunity to add a large market—Europe—and to acquire additional talent and manufacturing capability. It seems very logical, since I want to be in the hi-fi business. It's only a matter of how you structure a deal like that.

*You started out as a scientist. Business came second. At this point do you feel you're better at science or business?*

I wonder about that. I may have become a better businessman than a scientist.

*Yet for years you ran all aspects of the company, from A to Z, yourself. You were—and probably are by nature—a line officer rather than a staff officer. Have you finally learned to delegate authority? Though you're still heavily involved in product, you don't seem to be the marketing, sales and advertising managers anymore.*

You see, I'm making headway. 

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1

## AKAI GX-F66RC CASSETTE DECK

### Manufacturer's Specifications

**Frequency Response:** 25 Hz to 16 kHz, to 17 kHz with CrO<sub>2</sub>, to 19 kHz with metal tape.

**Harmonic Distortion:** 0.7%.

**Signal/Noise Ratio:** 60 dB.

**Input Sensitivity:** Mike, 0.25 mV; line, 70 mV; DIN, 2.0 mV.

**Output Level:** Line, 410 mV; head-phone, 1.3 mW at 8 ohms.

**Flutter:** 0.035% wtd. rms; 0.11% wtd. peak.

**Wind Times:** 80 seconds for C-60.

**Dimensions:** 17.3 inches (440 mm) W × 4.6 inches (118 mm) H × 12.2 inches (309 mm) D.

**Weight:** 19 lbs. (8.6 kg).

**Price:** \$575.00.

**Company Address:** 801 West Artesia Blvd., Compton, Cal. 90224.

For literature, circle No. 90



The Akai GX-F66RC is a multi-feature cassette deck which offers auto-reverse record/play, a sophisticated program system, Dolby C noise reduction, and a number of other items. The front panel is an attractive brushed aluminum with easy-to-read black designations. There are quite a few pushbuttons to go with all the functions, but there is relatively little confusion for the user who takes time to read instructions. The cassette-well door opens smoothly with a push of the large "Eject" button, just to the door's left. The timer-start slide switch ("Rec/Off/Play") is below that and above the "Power" switch. Below the cassette-compartment door are large double-arrows: One set at the left to indicate

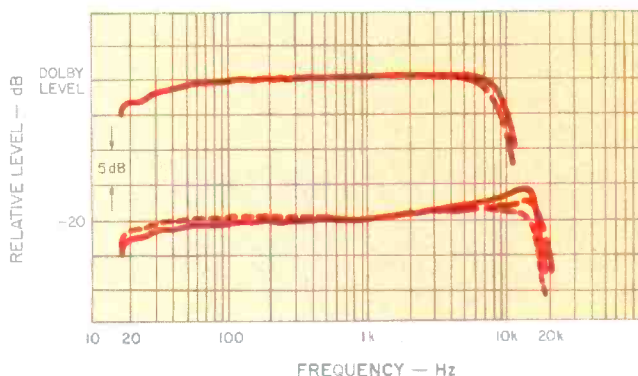
reverse mode, and a set on the right for forward mode. Once the deck is put into record or play in one direction, the corresponding green arrows are brightly illuminated. Even if the deck is stopped or put into fast wind, the arrows stay on, providing an excellent reminder of the planned direction of record/play.

The tape-motion light-touch buttons have very helpful, built-in indicators, with the exception of stop and "Auto Mute." The sophisticated logic adds such niceties as flashing indicators to show what is called for next: Flashing "Play" when in "Pause," and "Rec" when in "Auto Mute." When the latter function is used, there will be an automatic

muting for four seconds, and then the deck goes into "Pause." Longer blank spaces can be obtained by simply holding the button in longer, and "Rec" will flash at one-second intervals, which makes accurate timing quite easy. In the same row with the transport control buttons are two self-indicating button switches which can initiate two interesting and helpful processes. "Intro Scan" sets the deck for fast wind to the beginning of each piece on the tape, one after another, playing just the first ten seconds before fast winding to the next. "Blank Scan" puts the deck into fast wind to the end of what is already recorded. At that point, the deck goes into record mode for four seconds and then into "Pause" in preparation for the next recording. Both of these functions work in either direction, handling all of the interrelated tasks automatically—features that should be very useful to most.

A fairly bright four-digit LED display is used for the tape counter or RPSS (Random Program Search System). The "Memory" and "Reset" switches work in normal fashion. There is also a "Rec Cancel" pushbutton which stops recording, rewinds the deck to counter zero, records a four-second blank space, and goes into pause. It might be noted here that by holding in "Play" and pushing the corresponding return-wind button, the deck will fast wind to counter zero and automatically go into play. Pushing "Program" prepares the deck's logic for receiving instructions for RPSS. There are three program entry modes: "SEQ" for sequential playing of selections regardless of entry order, "Random" for playing selections in any order and "Skip" for entering the selections to be skipped, much faster if most of the pieces are to be played. Up to 20 individual selections, for a program total up to 99 items including repeats, and the program itself can be entered to repeat up to 99 times. The flexibility of the scheme is further enhanced by the fact that RPSS treats the A and B sides of the tape as just one long tape that can be programmed. There is, of course, a ten-key number-entry switch pad, plus "Set," "Clear," "Call" and "Run." The "0" key with "Call" will indicate the number of times a program is to be repeated. As is true with many such systems, a little practice eliminates the confusion of the first attempts. "Stop" is used to return the deck to normal modes.

The "Rev Selector" slide switch, complete with little diagrams and status lights, can be set for forward, forward and reverse to stop, or for continuous cycling (play only). The deck will play or record in either direction regardless of the position of the selector. The level meters to the right are in bar-graph form with yellow for normal levels and red above zero. Adjacent to the meters are the tape-type indicators, actuated by automatic sensing of whatever cassette is inserted. This approach helps to prevent errors with tape selector switches, but the cassettes used must have the necessary sensing holes. Most present cassette shells do have the needed holes, but some off-brands and many older cassettes lack them. Lever-type switches select multiplex filter ("On/Off") and Dolby NR ("Off/B-Type/C-Type"). The dual-concentric record-level pots have good-size knobs of a design helpful to making needed adjustments. The output-level control, on the other hand, has a short, small-diameter knob—a little difficult for stubby fingers to



**Fig. 1—Record-playback responses with Maxell UD tape in forward mode with (solid line) and without Dolby C NR (long dash) and in reverse mode with NR (short dash).**

adjust. There are phone jacks for headphones and two microphones. A single microphone plugged into the "Left" jack provides a mono feed to both channels, a good feature.

The line in/out phono jacks are on the rear panel, as is a DIN-type socket for use with the optional RC-21 remote control. As expected, an inside look revealed a considerable amount of circuitry, with two large horizontal p.c. boards, one above the other, plus two vertical cards of fairly good size and a small one for the power supply. The parts were all identified as were the adjustment pots, etc. The soldering was generally excellent with very little flux residue. Interconnections were made with wirewrap and multipin cables as well as some direct soldering. There were two fuses in clips noted. The transport was somewhat complicated with the two capstan and flywheel assemblies (one for each direction), the two motors, and the two solenoids used. During this check, I noted that the deck was much quieter than most while running in play.

#### Measurements

In general, the playback responses were very good for both equalizations and both directions of play, with the great majority of points within  $\pm 1.5$  dB. The forward responses with 120- $\mu$ S EQ were the exception, with high-end roll-off close to 3 dB at the highest frequencies. Play-level indications were correct on the meters, within the limits of their segment resolution. Play speed was about 0.7% fast, within acceptable limits.

The record/playback responses were surveyed with a number of tapes, including what Akai listed as the reference tapes for the deck. The best results were obtained with Maxell UD, Sony EHF and JVC ME-P, and, in general, the responses were flattest in the reverse direction. In forward, there was considerable treble boost, considered too much with the Type II and IV reference tapes. Figures 1 to 3 are

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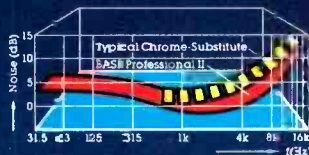
Professional II is like no other tape because it's made like no other tape. While ordinary high bias tapes are made from modi-

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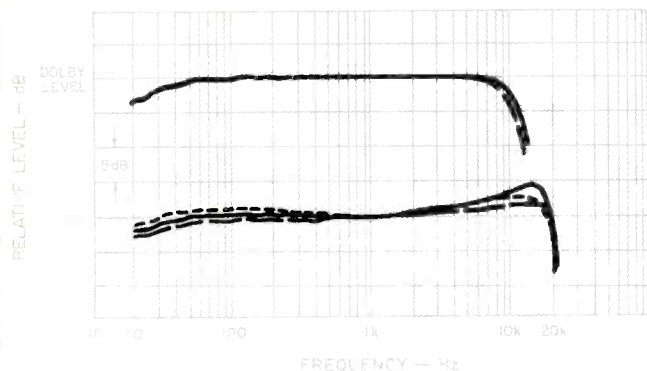
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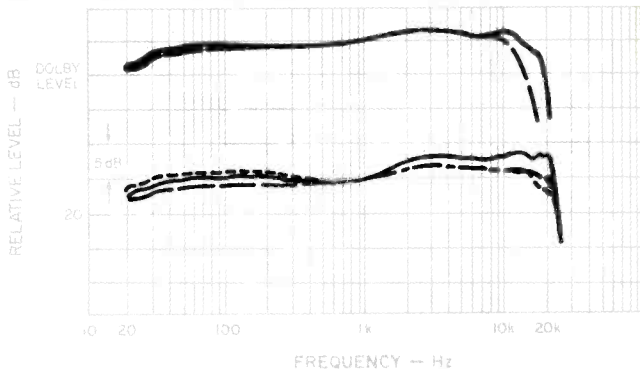
**For the best recordings you'll ever make.**



“The playback responses were very good for both 70- $\mu$ S and 120- $\mu$ S equalizations and both directions of play.”



**Fig. 2—Record-playback responses with Sony EHF tape in forward mode with (solid line) and without Dolby C NR (long dash) and in reverse mode with NR (short dash).**



**Fig. 3—Record-playback responses with JVC ME-P tape in forward mode with (solid line) and without Dolby C NR (long dash) and in reverse mode with NR (short dash).**

the swept-frequency plots for the three tape types with Dolby C NR for both directions and without NR just for forward. In all cases, the extension of high-frequency headroom with Dolby C is quite evident. Two other generalities: The responses with Dolby C NR were flattest in reverse, and in forward the treble boost was 3 dB or more. Table I lists the  $-3$  dB points both with and without Dolby C NR for forward mode. All of these figures are quite good, but a  $+3$  dB limit would have produced much lower high-end limits at  $-20$  dB record level.

The phase error between tracks and the jitter of a 10-kHz test tone was tape dependent; with Sony EHF there was no measurable phase error, and jitter was less than  $\pm 10^\circ$ . The output polarity was the same as the input in record mode, but was reversed in playback. The multiplex filter was down 3 dB at 16.1 kHz and a good 35.4 dB at 19.00 kHz. There was substantially no bias in the output during recording. Separation between channels was 44 dB at 1 kHz, and crosstalk between adjacent tracks of opposite play direction was 75 dB down, both very good figures. Erasure of a 100-Hz tone recorded on the JVC metal tape was 58 dB, quite good.

Figure 4 shows the results of measuring the third harmonic distortion for the three tapes with Dolby C NR from 10 dB below Dolby level to the points where  $HDL_3 = 3\%$ . All of the curves are very linear with some slight curving at the ends. The performance with Maxell UD was particularly good, and it was selected for tests of distortion versus frequency at 10 dB below Dolby level, with and without Dolby C NR. All of the distortion figures appearing in the plots are very good, and much better than most recorders. This is particularly true at the frequency extremes where most decks have rapidly rising distortion. Table II list the signal-to-noise ratios with both IEC A and CCIR/ARM weightings, with and without Dolby C NR, for both Dolby level and  $HDL_3 = 3\%$  references. All of the figures are certainly very good; they

might have been even higher if the high-end frequency responses had been less elevated.

The input sensitivities were 0.2 mV for mike and 83 mV for line, which is on the high side and above the 70-mV specification. Input overload points were at a good 58 mV for mike and at something over 30 V for line. Output clipping ap-

**Table I—Forward-mode record/playback responses ( $-3$  dB limits).**

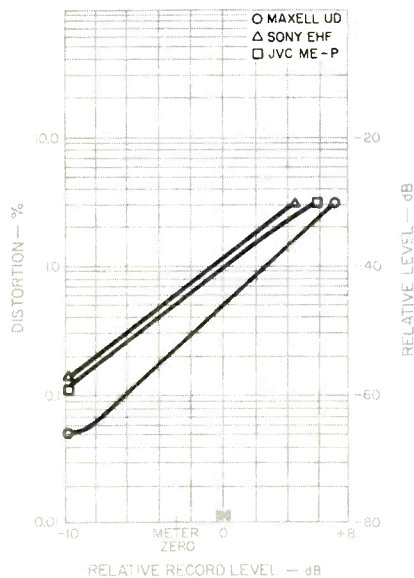
Tape Type	With Dolby C NR				Without Dolby NR			
	Dolby Lvl		$-20$ dB		Dolby Lvl		$-20$ dB	
	Hz	kHz	Hz	kHz	Hz	kHz	Hz	kHz
Maxell UD	24	9.0	17	17.0	24	7.9	17	18.4
Sony EHF	25	10.0	17	19.4	25	9.0	17	19.6
JVC ME-P	25	17.7	17	22.3	27	12.6	17	22.6

**Table II—Signal/noise ratios with IEC A and CCIR/ARM weightings.**

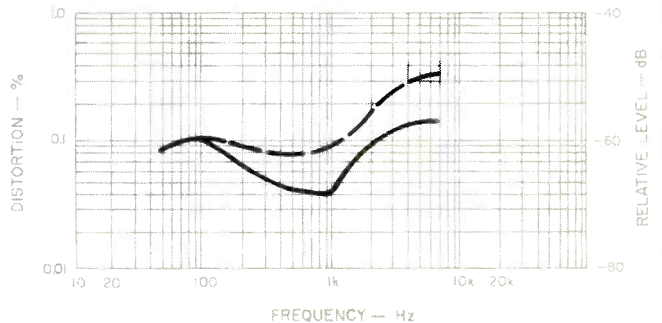
Tape Type	IEC A Wtd. (dBA)				CCIR/ARM (dB)			
	W/Dolby NR		Without NR		W/Dolby NR		Without NR	
	@ DL	HD=3%	@ DL	HD=3%	@ DL	HD=3%	@ DL	HD=3%
Maxell UD	69.0	74.3	55.3	60.6	68.2	73.5	49.7	55.0
Sony EHF	70.4	73.8	55.7	59.1	68.9	72.3	50.3	53.7
JVC ME-P	70.3	74.6	55.0	59.3	67.3	71.6	48.8	53.1

peared at a level equivalent to  $+17.8$  dB relative to meter zero. The line input impedance was 62 kilohms over a good part of the band, falling to 42 kilohms at 10 kHz and an adequate 27 kilohms at 20 kHz. The record-level pots tracked within a dB for 55 dB down from maximum, excellent performance. The line output level was 413 mV unloaded, and fell to 359 mV with a 10-kilohm load, indicative of a 1.8-kilohm source impedance. The headphone output into 8 ohms with a zero meter indication was about 2 mW and

"All of the distortion figures appearing in the plots are very good, much better than for most recorders."



**Fig. 4—**Third-harmonic distortion vs. level of 315 Hz with Dolby C noise reduction.



**Fig. 5—**Third-harmonic distortion vs. frequency with (solid line) and without Dolby C NR (dashed line) at 10 dB below Dolby level with Maxell UD tape.

quite high in level with any of the phones tried. The output-level pot sections tracked within a dB for 35 dB down from maximum, adequate for normal use.

Record-level meter responses were down 3 dB at 15.1 Hz and 28.3 kHz. The dynamic responses were close to those specified for a VU meter (300 mS) with a slightly faster attack (270 mS) and a slower decay (450 mS). The meter's peak-hold consisted of retention of the maximum level at "+1" or above for 1 second. The meter calibrations were very close from "-7" to "+1," but the readings were too high at low levels and also at "+2" and "+3." The three highest steps were a bit erratic with "+4" accurate, but "+6" requiring +7.5 dB and "+8" needing +10.1 for turn-on. Each of the steps had double segments, so the resolution was less than what it appeared to be immediately. As the top-step segments varied in intensity with level, however, there was good gradation in the indication of the exact levels.

The playback speed was quite steady with time as well as with changes in line voltage. With the voltage increased to 130 V, the greatest discrepancy, just 0.1%, appeared. There was some variation in flutter from one cassette to another: Figures of 0.05% wtd. rms and 0.08% wtd. peak were typical, including reverse mode. The wtd. rms figure is a bit above specification, but more importantly, the wtd. peak result was better than specification, indicative of very good performance. The average wind time for a C-60 cassette was 74 seconds. Run-out to stop in wind was about 3 seconds, though in play mode the switch to stop seemed immediate. Change in wind direction or going from wind to play took less than a second.

#### Use and Listening Tests

The wide opening of the cassette compartment door made for easy loading and unloading and gave excellent access for maintenance tasks, even better with the door

cover snapped off. All of the controls and switches worked with complete reliability during the testing. The slide and level switches moved with good snap action, and the level-pot design facilitated balancing channel levels, with one hand at times. The combination of logical arrangement, good labeling, and the many indicators contributed to easy use of the deck's many features. "Blank Search" and "Intro Scan" were particularly helpful at times. The metering was quite easy to use over a range of room light levels, and the one-second holds at +1 and above helped to set levels correctly. The six-language owner's manual has many pages, a total of 72(!), but even in English alone, there are 13 pages of fairly detailed discussion. A number of very good illustrations help to make a good presentation of the various special features.

The timer start worked just fine, with a three-second delay after power turn-on. There were no record, pause or stop clicks even detected—the Akai deck is certainly one of the best in this regard. I noticed that the unit ran quite warm, which was not too surprising with all the circuitry, but it did indicate the need to keep the ventilation holes on top uncovered.

Discs used for checking record/playback performance included Mobile Fidelity releases of Kim Carnes' *Mistaken Identity* and Georg Solti and the London Symphony's *Romantic Russia*. As far as responses were concerned, there was good matching in the results with and without Dolby C NR. Comparisons between playback and the sources indicated a very slight loss in the lowest bass at times and a shift or tilt favoring the higher presence region, less so in reverse mode. There seemed to be an occasional slight hardness, but it might have gone with having record levels a bit on the high side. All in all, the Akai GX-F66RC showed very good to excellent performance in most areas with a number of very useful convenience features.

Howard A. Roberson

# Toshiba's CX receivers give you so much music, there's no room for noise.

Toshiba's new CX receivers can do more for music than you've ever heard.

But to understand just how much, it's necessary to understand two things: record surface noise and dynamic range.

## WHERE DOES RECORD SURFACE NOISE COME FROM?

Not from the music, but from the record itself. Other than dust on the record, the reason you hear noise is that it lies in the same grooves as the music.

In the past, you had to go out of your way to try to silence this problem, with everything from expensive audio equipment to premium audiophile discs.

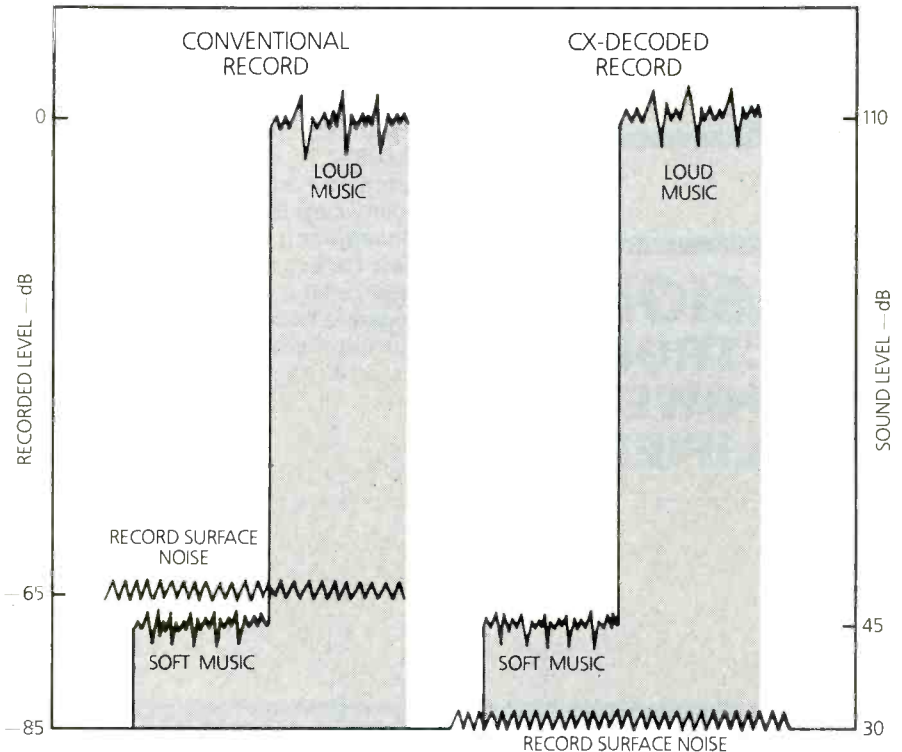
But now you don't have to go any further.

## CX RECORDS ARE WHAT YOU'VE BEEN WAITING TO HEAR.

CX records are the latest development in audio technology. CX is a coding process that actually extends the dynamic range of music, and in the process virtually eliminates record surface noise.

Dynamic range is simply the difference in sound level between the loudest and softest passages of music. The dynamic range of live music is usually around 85 dB. But the same music on an ordinary record only approaches 65 dB.

What CX does, is give you the 20 dB of sound you would otherwise miss. Loud passages are louder, soft passages are softer.



And because there's more room for music, there's less room for noise.

## YOU HAVEN'T HEARD EVERYTHING YET.

You can play a CX record on an ordinary receiver and it will sound ordinary. But we know you won't settle for that.

That's why Toshiba has included a CX decoder circuit in our new receivers, so you can hear the startling difference CX makes.

Close your eyes and you might think you're in a concert hall. That's how close a CX record comes to reproduction of live sound.

And we've given you a lot more than just a CX switch on our new receivers. Our SA-R3 CX Receiver has 40 watts per channel, with a digital-synthesized tuning system and 12 station pre-sets.

You'll get 25 watts per channel from our SA-R2 CX Receiver, along with servo-lock tuning.

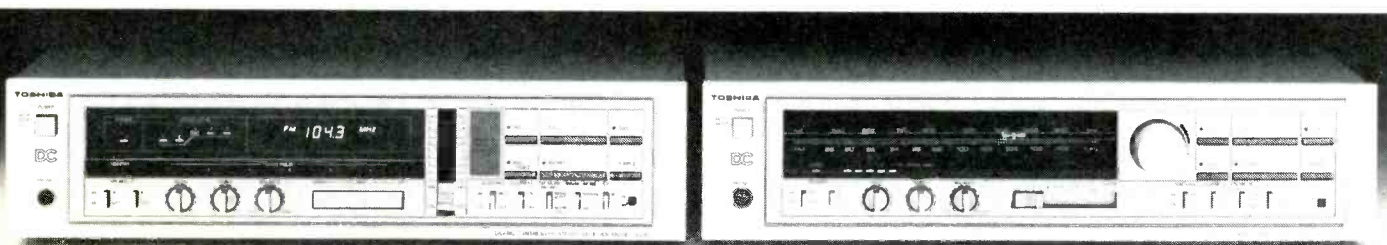
Now all you have to do is listen to our CX receivers for yourself. We think you'll be amazed at what you'll hear.

And what you won't.

CX IS A TRADEMARK OF CBS, INC.

**TOSHIBA** 

Toshiba America, Inc., 82 Totowa Road, Wayne, NJ 07470



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2

## MISSION ELECTRONICS 777 POWER AMPLIFIER

### Manufacturer's Specifications

**Power Output:** 100 watts per channel, continuous, 8 ohms (175 watts, 4 ohms), 20 Hz to 20 kHz.

**Rated THD:** Less than 0.2%, d.c. to 40 kHz.

**IMD:** 0.05%, at 10 watts, 8-ohm load.

**Difference Frequency Distortion:** 0.05%, 10 watts, 8 ohms.

**Damping Factor:** 60.

**Open Loop Bandwidth:** 230 kHz.

**Closed Loop Bandwidth:** 1.15 MHz.

**Slew Rate:** 150 volts/microsecond.

**Rise Time:** 0.32 microsecond.

**Negative Feedback:** 14 dB

**Current Delivery:** 10 amps continuous, 40 amps p-p, instantaneous.

**S/N:** Greater than 100 dB.

**Input Sensitivity:** 0.775 volt for 100 watts output, 8 ohms.

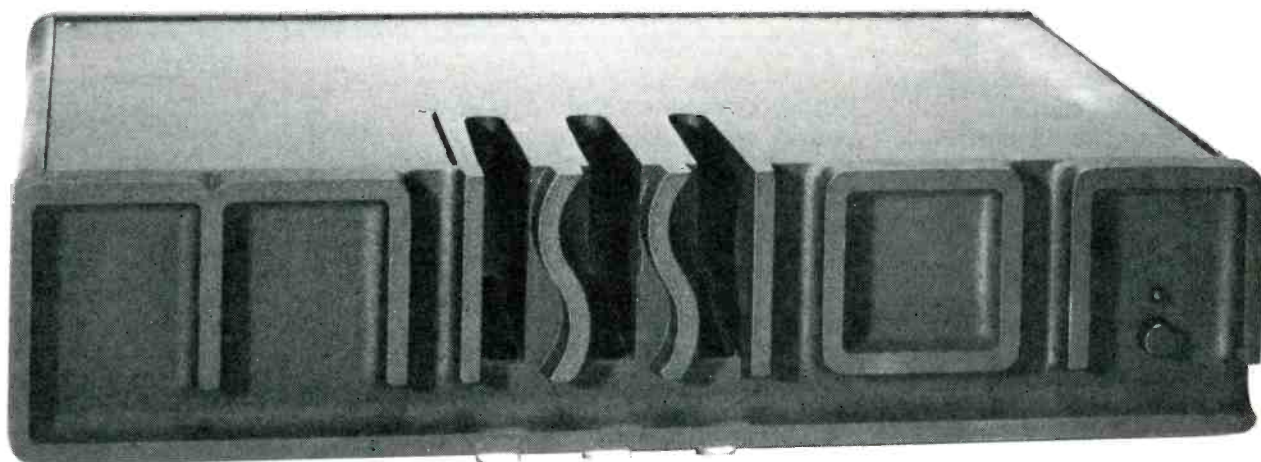
**Dimensions:** 17½ in. (44.45 cm) W × 4¼ in. (10.79 cm) H × 12¾ in. (32.39 cm) D.

**Weight:** 35 lbs. (15.75 kg).

**Price:** \$1,200.00.

**Company Address:** 310 Carlingview Dr., Rexdale, Ont., Canada M9W 5G1.

For literature, circle No. 91



Some months ago when I tested a Mission Electronics 776 preamplifier, I expressed some regret at not having been able to check out their matching amplifier, Model 777, at the same time. Now that situation has been rectified, and because the people at Mission feel, as I do, that these two

products really belong together, they were nice enough to lend me a 776 preamp again so that I might drive the 777 amplifier from that very excellent matching component. You may recall that the heavy cast-aluminum front panel and case of the 776 preamp was fashioned so that the front

panel bears the company's logo. The same novel design has been used on the 777 amplifier, but this time it serves a practical purpose, with the entire casting acting as a giant heat sink.

The 777 is totally modular in construction, but the number of connectors has been minimized for ease of servicing and for wiring reliability. Two identical mono amplifiers are used, each of which is powered by a separate transformer and power-supply module. All active components used in the 777 are discrete. Small-signal, low-power transistors are low-noise, high-gain and high-bandwidth types. The output devices are high voltage H-FETs, having bandwidths which are greater than those of the driving stages. All resistors used in the amplifier section proper are metal film, 1% tolerance, low-noise types; decoupling capacitors are polyester. Heavy-duty connectors are used to bring d.c. voltages to the amplifier modules, and gold-plated connectors are employed for input signal connections.

### Controls and Connections

The front panel of the Mission 777 has no controls other than a small pushbutton on/off switch at the extreme right of the panel, above which is a small green LED serving as a power-on indicator. The detachable line cord at the rear of the unit is arranged such that only when it is removed can the line fuse be replaced. The fuse housing also contains a small, universal "voltage card" which is employed to select the correct voltage for the country in which the amp is to be used. This arrangement, intended largely for safety, is similar to that on some of my better test equipment. Input jacks are located at the center of the rear panel and, flanking them on either side, are five-way heavy-duty binding posts on standard 3/4-inch centers and individual fuse posts containing 3.5-ampere loudspeaker line fuses.

Below the input jacks I found a small switch labelled "Soft Clip." During the tests, I tried in vain to determine just what this switch does but could detect no difference in the clipping action of the amplifier (which was pretty soft to begin with) when this switch was activated. As the old saying goes, "When all else fails, read the instructions!" Sure enough, I learned that Mission had decided to eliminate this feature for, as they put it, "... reports from the field and recommendations made by many reviewers indicate that the soft clip feature incorporated in the amplifier is redundant." Although they have removed the circuit, the disabled switch is still there to fill the mounting holes originally intended for it.

### Circuit Highlights

The 777 amplifier module is a symmetrical Class-A amplifier except for the output devices which operate in Class-AB mode. Symmetry is achieved through cascading stages of the amplifier in alternate PNP/NPN complementary transistors, while drawing symmetrical currents from positive and negative voltage supplies. The amplifier is d.c.-coupled throughout, using the same amount of feedback for both the program signal and d.c. Direct current bias stability is achieved by the application of high *local* feedback loops. Basically, two stages of voltage amplification are used, and these are separated by a unity-gain buffer stage.

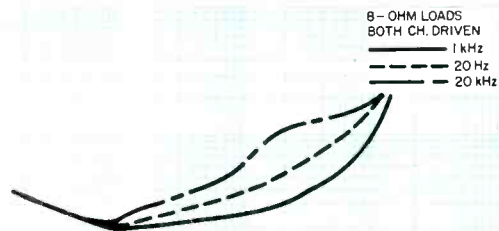


Fig. 1—Power output vs. harmonic distortion.

Overall feedback in the amplifier is only 14 dB, but this is enough to provide THD figures below 0.2% from d.c. to beyond audibility and a closed-loop bandwidth of 1.15 MHz. Protection is provided for both the amplifier itself and connected speakers through an output fuse which is incorporated *within* the feedback loop to reduce its effects on damping factor, which remains above 60 measured at the output terminals.

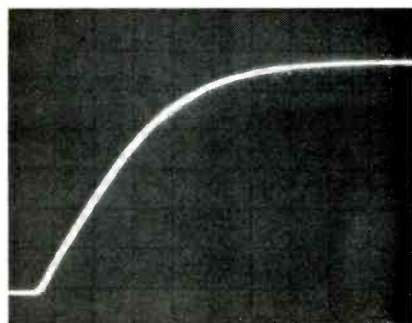
### Measurements

The 777 was able to deliver 130 watts of continuous power per channel at mid-band frequencies for its rated distortion of 0.2% into 8-ohm resistive loads. With a 4-ohm load, the amplifier delivered around 220 watts per channel at mid-frequencies, decreasing to the rated 175 watts per channel at the 20 Hz and 20 kHz test frequencies. In order to make the measurements under the 4-ohm load conditions, it was necessary to bypass the speaker fuses which would not normally be called upon to deliver such high continuous currents.

To check the stability of the amplifier under conditions of unusual loading, I connected a 2- $\mu$ F capacitor across the 8-ohm load in each channel. Under these difficult conditions, maximum power before visible clipping decreased by approximately 1 dB to 103 watts per channel, still above the manufacturer's rated power for a purely resistive load. Figure 1 shows power output level versus distortion for test frequencies of 1 kHz, 20 Hz and 20 kHz. Considering the low amount of feedback employed in this amplifier circuit, I was surprised and gratified to find that the damping factor was still quite high, 57 measured at a frequency of 50 Hz according to the new Standard. Twin-tone (CCIF) IM measured an almost negligible 0.025%, while IHF-IM twin-tone measurements added up to an equivalent sum figure of 0.2% at rated output of 100 watts per channel into 8 ohms.

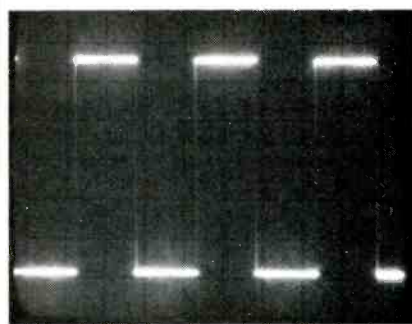
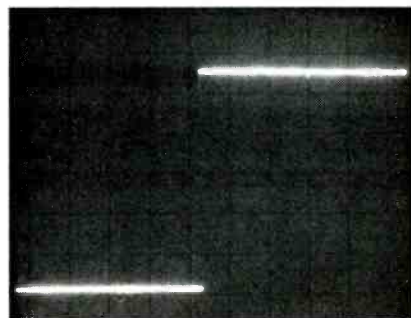
Figure 2 shows the large-signal rise-time, which I measured as 0.6 microsecond. IHF slew factor was greater than 5. Figure 3 illustrates square-wave response for a 100-Hz input signal driving the amplifier nearly to full rated output. A

"The 777 is easy to listen to, with no harshness at all, and bass is unmuddied at all levels."



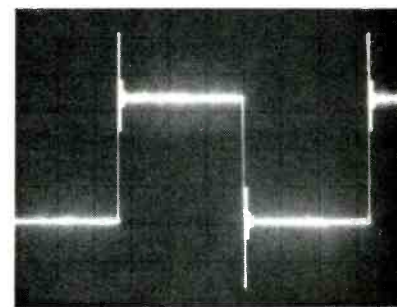
**Fig. 2—**  
Large-signal rise-time measured 0.6 microsecond.

**Fig. 3—**  
Square-wave response, 100-Hz input signal.



**Fig. 4—**  
Square-wave response, 1-kHz input signal.

**Fig. 5—**  
Square-wave response to a 1-kHz input signal when Mission 777 amp is loaded with 8 ohms in parallel with 2- $\mu$ F reactance.



1-kHz square-wave response at the same output level was just about as perfect, as shown in Fig. 4.

Signal-to-noise ratio, referred to 1-watt output, measured 85 dB (A-weighted) which, translated back to a rated output level reference, is 5 dB better than claimed by Mission, or 105 dB. Input sensitivity for 1-watt output was 0.1 volt exactly, which translates to exactly 1.0 volt for rated (100 watts) output. This is slightly higher than specified by the manufacturer but certainly not beyond the output capability of the matching 776 preamplifier or any other high-quality preamp/control unit with which the 777 is likely to be used.

Frequency response extended from essentially d.c. to 80 kHz for a roll-off of 1.0 dB and all the way to 300 kHz for the half-power ( $-3$  dB) cut-off point. Talk about wideband design!

Dynamic headroom, not specified by Mission, measured a reasonably high 1.8 dB, indicating that under conditions of musical programming having short, steep transients, the amplifier could deliver bursts of instantaneous power equaling approximately 150 watts per channel into an 8-ohm load!

When the amplifier was subjected to the highly reactive load mentioned earlier (2  $\mu$ F across 8 ohms), a 1-kHz square wave (applied to the input so as to produce an output just short of rated level) caused the usual amount of overshoot (see Fig. 5) and a rapidly decaying ringing effect but no trace of overall long-term instability.

#### Use and Listening Tests

I listened extensively to the Mission 777/776 preamplifier/

amplifier combination using reference speakers of widely differing load characteristics as well as a pair of Stax SR-X electrostatic phones which enabled me to hear "through" to the amplifier itself without being distracted or influenced by room acoustics. My impression is that the 777 is an easy amplifier to listen to. There is no harshness at all, neither in the midrange nor in the extreme treble range, and bass is impressively extended but seems tight and unmuddied at all listening levels with a variety of program material. Here is another amplifier that seems to be able to deliver more than its power ratings would suggest when it is tending to its real business of reproducing music signals rather than test tones. Only the least sensitive (most inefficient) speakers, positioned in larger-than-average, acoustically-damped listening rooms, would cause this amplifier to strain or clip at reasonable listening levels. At that, if you were to drive the amp to occasional clipping, the brittle or "hard" clipping attributed to solid-state amplifiers with high orders of overall feedback would be notably absent with the 777.

I suspect that given a chance, the 777 could easily become one of those amplifiers favored by the dedicated group of audiophiles who seek accuracy in sound regardless of cost. What impresses me, however, is that its cost, relative to that of equally favored high-end amps, is really quite reasonable. To the true music lover, that may not prove to be a disadvantage either, though of course there will always be those who say, "It can't be all that good, it doesn't cost enough!" At the risk of offending the anti-punsters, may I conclude by saying "Mission accomplished!"—they really did!

*Leonard Feldman*



**NOW YOU CAN HAVE DIGITAL RECORDING WHERE YOU WANT IT MOST: AT HOME.**

There are moments when a musician is so inspired he stops making music and starts making magic. And, as most artists agree, these peak periods of supreme inspiration don't always occur in the clinical conditions of the recording studio.

Which explains why Sony, the inventor of digital audio processing, has just created the world's smallest, lightest and most compact digital audio processor — the PCM-F1.

Already touted by every major audio magazine, the PCM-F1 leaves one awestruck by its vital statistics.\* Its level of performance surpasses that of even the most sophisticated analog recording studio. Its unique 3-way power supply allows you to use it anytime, anyplace.

And because Sony consciously designed it without a built-in VCR, it can be used with any VCR — 1/2 or 3/4 inch.

But perhaps its greatest feature is its price.

Obviously, we can go on and on about the brilliance of this new machine, but by now we figure you've heard enough about it and you're ready to go to your Sony dealer and hear it for yourself.



**SONY** The one and only.

\*Features and Specifications: Wow and flutter — unmeasurable; dynamic range — greater than 90dB; distortion — less than 0.005%; frequency response — 10-20,000 Hz, ± 0.5 dB. Weight — 9 lbs., height — 3 3/4"; depth — 12"; width — 8 1/2". 14- and 16-bit quantization. © 1982 Sony Corp. of America. Sony is a registered trademark of the Sony Corp.

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# FOREVER IS A LONG TIME



## Presenting High Bias II and the Ultimate Tape Guarantee.

Memorex presents High Bias II, a tape so extraordinary, we're going to guarantee it forever.

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Extraordinarily flat frequency response at zero dB recording levels, combined with remarkably low noise levels, means music is captured live. Then Permapass<sup>™</sup>, our unique oxide-bonding process, locks each oxide particle—each musical detail—onto the tape. So music stays live. Not just the 1st play. Or the 1000th. But forever.

### We'll guarantee the cassette.

We've engineered every facet of our transport mechanism to protect the tape. Our waved-wafer improves tape-wind. Silicone-treated rollers insure precise alignment and smooth, safe tape movement. To protect the tape and mechanism, we've surrounded them with a remarkable cassette housing made rigid and strong by a mold design unique to Memorex.

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If you ever become dissatisfied with Memorex High Bias II, for any reason, simply mail the tape back and we'll replace it free.

**YOU'LL FOREVER WONDER,**

**IS IT LIVE,  
OR IS IT  
MEMOREX.**

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3

## SHURE V15 TYPE V PHONO CARTRIDGE

### Manufacturer's Specifications

**Tracking Force, at Stylus Tip:** Optimum, 10 mN (1.0 gram); maximum, 12.5 mN (1.25 grams).

**Tracking Force, Total Tonearm Setting with Dynamic Stabilizer:** Optimum, 15 mN (1.5 grams); maximum, 17.5 mN (1.75 grams).

**Force Exerted by Dynamic Stabilizer:** 5 mN (0.5 gram).

**Tip Geometry:** Hyperelliptical, 5 × 38 microns (0.2 × 1.5 mils), long contact area.

**Trackability at 10 mN (1 gram)**

**Tracking Force:** At 400 Hz, 30 cm/S; at 1 kHz, 46 cm/S; at 5 kHz,

80 cm/S; at 10 kHz, 60 cm/S; all figures typical in cm/S peak velocity.

**Total Trackability Index (TTI):** 91.7, minimum.

**Vertical Tonearm Resonance:** Less than 5 dB rise at 14 Hz in SME Series III arm (without SME damper).

**Channel Balance:** Within 1.5 dB

**Channel Separation:** At 1 kHz, 25 dB or greater; at 10 kHz, 18 dB or greater.

**Output Voltage:** 3.2 mV rms at 1 kHz at 5 cm/S peak velocity, typical.

**Frequency Response:** 10 Hz to 28 kHz.

**Recommended Load:** 47 kilohms in parallel with 250 pF (including tonearm wiring, connecting cables, and

preamplifier input). Capacitive loading from 100 to 400 pF will cause negligible change from the recommended 250-pF loading.

**Resistance:** 950 ohms d.c., typical.

**Inductance:** 330 mH at 1 kHz, typical.

**Weight:** 6.6 grams.

**Replacement Styli:** V15V-VN5HE, nude hyperelliptical tip, 5 × 38 microns (0.2 × 1.5 mils); V15V-G-VN5G, nude spherical tip, 0.6 mil.

**Optional 78 rpm Stylus:** VN578E, bi-radial (elliptical) tip, 13 × 63 microns (0.5 × 2.5 mils).

**Price:** \$250.00.

**Company Address:** 222 Hartrey Ave., Evanston, Ill. 60204.

For literature, circle No. 92



After reviewing Shure's specifications, I was highly impressed by the claim of even greater trackability by the V15 Type V over that of its predecessor, the V15 Type IV. With such high-frequency trackability as 80 cm/S peak velocity at 5 kHz and 60 cm/S peak velocity at 10 kHz, there positively is no commercial record currently available that the V15 Type V could not track. I feel, however, that in the not too distant future, some record company will probably attempt to produce a recording that will cause the Type V to mistrack.

To achieve such tracking ability, there had to be a major reduction in effective tip mass, which automatically meant that its cantilever had to be redesigned for an even lower effective mass than the Type IV's. Shure accomplished this by using beryllium, which has the highest stiffness-to-mass ratio of any metal, for the ultra-thin walled cantilever. Specially developing the process, Shure forms the "Microwall/Be" cantilever out of beryllium foil, and claims for it the lowest effective mass of any stylus shank. The effective stylus assembly mass of the Type V is 0.175 mg as op-

posed to the Type IV's 0.290 mg. The mechanical resonance frequency has been raised to 33 kHz, which is well beyond the audio range.

The hyperelliptical nude diamond tip configuration, with a 50% reduction in tip mass, has a cylindrical stem that allows for precise orientation of the contact surfaces. Bonding cement is carefully controlled to prevent excessive build-up. Although the entire diamond is polished, the areas in contact with the record groove are additionally polished using Shure's "Māsar" technique to further reduce surface noise and to retard record wear.

The Type V, like its predecessor, continues to use the moving-magnet generator but with a slightly longer magnet due to the increased length of the cantilever. The magnetic circuit utilizes laminated pole pieces to eliminate the sag in the mid-frequencies, thus providing an overall flatter frequency response. The V15 Type V features high output levels with fewer turns of wire, resulting in a lower output impedance. As a consequence, the frequency response is less sensitive to capacitive and resistive loading.

“Shure’s mounting jig, the Duo-Point Alignment Gauge, minimizes lateral tracking angle errors to less than one degree.”

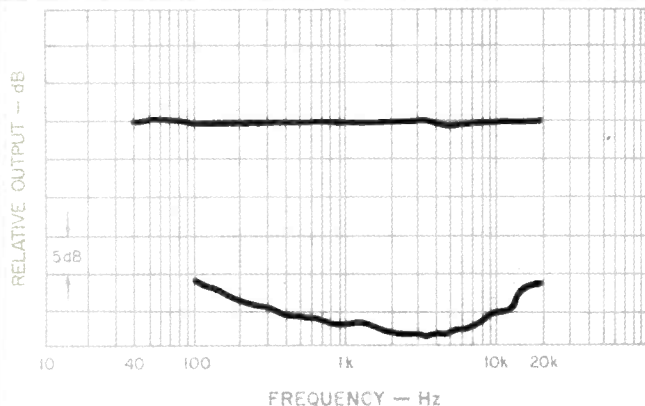


Fig. 1—Frequency response using the

Columbia STR-170 test record.

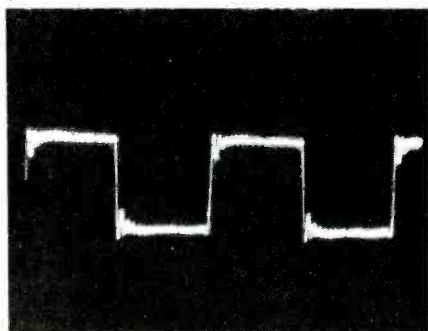


Fig. 2—Response to a 1-kHz square wave.

To eliminate resonances that might color or distort the signal, the Type V cartridge body is formed by an encapsulation molding technique that holds the internal components rigidly in place. The side-guard stylus protection system, first developed by Shure, helps prevent accidental stylus damage. This often results from careless handling of the tonearm or stylus, such as when the cartridge accidentally slides across the record or is lowered against the edge of the record or turntable platter. Should this happen, the entire stylus shank and tip withdraws into the stylus housing before it can be bent or broken.

Another carry-over from the V15 Type IV to the Type V is the much misunderstood Dynamic Stabilizer and Destatizer. It is not a brush, per se, despite the fact that its more than 10,000 carbon fibers also manage to sweep away microscopic dust particles. Actually, its primary purpose is to act as a miniature shock absorber (stabilizing or damping both the vertical and horizontal extraneous motions of the tonearm). By maintaining a constant cartridge-to-record distance and uniform tracking force, it eliminates such warp-related problems as groove skipping, cartridge bottoming, signal wow, and even amplifier and speaker overload. The viscous-damped Dynamic Stabilizer attenuates the arm-cartridge system resonance effect which causes large increases in subaudible output and possible mistracking. In addition, the Dynamic Stabilizer protects the stylus and record from damage if the arm is accidentally dropped onto the record, by providing additional vertical damping.

There are over 10,000 tiny (each 0.3 mil in diameter), electrically conductive carbon fibers or bristles in the Dynamic Stabilizer. When the record is rotating, the fibers immediately rearrange themselves into V-shaped groups, engaging the groove and remaining so as long as the record is playing. This action (interfiber friction of the bristles) with the groove makes possible the lateral damping. These electrically conductive fibers simultaneously neutralize or discharge the upper or playing surface static electricity, thus eliminating the effects of a charged record during playback. However, it must be understood that the static charge on the underside of the record is not accessible to the carbon fibers and remains when the record is removed from the turntable.

No record in existence ever has all of the microscopic dust particles removed from its grooves, even after being cleaned by a record-cleaning machine. So it's good that the Dynamic Stabilizer also manages to provide a "bonus" function—sweeping away the remaining microscopic dust particles from the record groove bottom near the point of playback. Since the carbon fibers do pick up dust particles, it is necessary to clean the fibers regularly with the brush provided for this purpose. In no way, however, are the carbon fibers to be considered as a replacement for the usual record-cleaning brush or techniques that should be applied to the record surface just prior to playing.

The optimum tracking force for the Type V's 5 × 38 micron contact stylus is 1.0 gram. The turntable's tracking force should be set to 1.5 grams to compensate for the Dynamic Stabilizer when it is used. The maximum tracking force permitted is 1.25 grams, plus 0.5 gram for the Dynamic Stabilizer.

The proper mounting and alignment of a phono cartridge on the headshell is a frustrating chore, to say the least, but it must be done and with great accuracy. To overcome this frustration, Shure has devised a mounting jig, officially called the Duo-Point Alignment Gauge. Its primary purpose is to assist in aligning the Type V so that it is tangent to the record grooves at the two precise points (2.6 and 4.76 inches) so as to minimize distortion caused by lateral tracking angle error. This procedure is far more accurate than the traditional overhang adjustment. Since there is only one visual alignment to make, the possibility of error is reduced to less than 1°. The cartridge body itself rests in a closely fitted "nest," providing both a precision work station for mounting to the headshell and a holder that facilitates cartridge body alignments on the gauge. The Shure Leveling-Alignment Stylus fits into the cartridge in place of the stylus to enable the cartridge body to be rotated and/or shimmed so that its horizontal plane is precisely aligned in relation to the record surface. This minimizes crosstalk while providing maximum channel separation.

Finally, each V15 Type V phono cartridge is supplied with its own computer printout of important parameters such as output level, channel balance, separation at 1 and 10 kHz, phase, and the frequency response above 1 kHz.

To make it easier for audiophiles to compare the overall quality of one phono cartridge with another, Shure has introduced a new test record (available free to purchasers of the V15 Type V), the Audio Obstacle Course—TTR-117.

**“The 1-kHz square-wave response is the flattest I have ever seen, with very little or no overshoot.”**

With this test record, it is a simple matter to determine the Total Trackability Index (TTI) of any cartridge as a single numerical figure. Trackability is defined as the ability of a cartridge to maintain contact with record-groove walls in the presence of high-amplitude, high-velocity, and high-acceleration audio signals. The TTR-117 contains three test tones, representing low, medium, and high musical frequencies combined and weighted to create a single trackability test signal. At graduated velocity levels, the signal is representative of actual recorded music. By following directions on the record jacket, it is possible to determine the TTI for any phono cartridge. In addition to the TTI, the TTR-117 test record provides for testing arm-cartridge resonance, level, channel balance, and skating compensation. The skating compensation band provides an excellent way to accurately set the anti-skating adjustment of practically any tonearm one might use.

#### Measurements

The Shure V15 Type V phono cartridge was mounted in a Technics EPA-A501H interchangeable arm unit used with the Technics EPA-500 tonearm mounted on a Technics SP-10 Mk II turntable. The cartridge was oriented in the headshell and tonearm with the Shure Duo-Point Alignment Gauge and Leveling Alignment Stylus. The cartridge alignment was then checked with the Dennesen Geometric Soundtracktor and the two gave identical results. The vertical stylus alignment was made with the Shure Leveling Alignment Stylus.

Laboratory tests were conducted at an ambient temperature of 72° F (22.22° C) and a relative humidity of 65% ±3%. The tracking force for all reported tests was 1.0 gram, with an anti-skating force of 1.6 grams. The load resistance was 47 kilohms, and load capacitance was 262 pF. All reported measurements were made without using the Dynamic Stabilizer except when measuring the arm-cartridge resonance, where the measurements were made both with and without the damping device. By using this technique, I was able to measure the actual phono cartridge parameters. The listening tests were also done with and without the Dynamic Stabilizer. As is my practice, measurements are made on both channels, but only the left channel is reported unless there is a significant difference between the two channels, in which case both channels are reported for a given measurement.

The following test records were used in making the reported measurements: Columbia STR-170, STR-100, STR-112; Shure TTR-103, TTR-109, TTR-110, TTR-115, TTR-117; Deutsches HiFi No. 2; Nippon Columbia Audio Technical Record (PCM) XL-7004; B & K QR-2010, and Ortofon 0002, A5906A-1, and A5906B-1.

Frequency response, using the Columbia STR-170 test record (Fig. 1), was +0.75, -0.5 dB from 40 Hz to 20 kHz, and +0, -0.5 dB from 1 kHz to 20 kHz. Separation was 28.5 dB at 1 kHz, 29.25 dB at 4 kHz, 25.25 dB at 10 kHz, 27.25 dB at 12 kHz, 23.75 dB at 15 kHz, and 21.75 dB at 20 kHz. From these data it is quite evident that the V15 Type V has an excellent frequency response and a very good high-frequency separation. I believe this is the flattest cartridge frequency response I have ever measured.

The 1-kHz square-wave response, Fig. 2, is the flattest I have ever seen, with very little or no overshoot followed by very low-level ringing that was probably cut into the record at the time it was made. This square-wave response was produced without the use of the Dynamic Stabilizer. The arm-cartridge low-frequency resonance was almost impossible to measure with the EPA-A501H arm unit. It was necessary to disable the arm's anti-resonance unit and, also, not use the Dynamic Stabilizer. Following this procedure, two lateral low-frequency resonance points were identified—one at 8 Hz with a 1 dB rise and the second at 12 Hz with a 4.5 dB rise. Vertical resonance is at 7 Hz with a 4.5 dB rise. Neither the lateral nor the vertical arm-cartridge low-frequency resonance was measurable when the arm's anti-resonant unit and the Dynamic Stabilizer were used. The high-frequency resonant point is at 37 kHz.

Using the Dynamic Sound Devices DMA-1 Dynamic Mass Analyzer, the arm-cartridge dynamic mass was measured as 10.25 grams, and the dynamic vertical compliance as  $30 \times 10^{-6}$  cm/dyne at the vertical resonant frequency of 7 Hz. Both the anti-resonant unit on the arm and the Dynamic Stabilizer were defeated for this test.

The harmonic distortion components of the 1-kHz, 3.54 cm/S rms 45° velocity signal from the Columbia STR-100 are: 1.8% second harmonic and 0.5% third harmonic, with less than 0.2% higher order terms.

The vertical stylus angle measured 24.5° using the Vertical Tracking Angle Meter (Inclination Meter), Model 3002, developed by the CBS Technology Center (227 High Ridge Rd., Stamford, Conn. 06905). Other measured data are:

Wt., 6.76 g; d.c. res., 884 ohms; ind., 384.5 mH; opt. tracking force, 1.0 g without and 1.5 g with the Dynamic Stabilizer; opt. anti-skating force, 1.6 g; output, left 0.93, right 0.99 mV/cm/S; IM distortion (4:1): +9 dB lateral, 200/4000 Hz, left: 1.2%, right: 3.1%; +6 dB vertical, 200/4000 Hz, left: 1.5%, right: 2.9%; crosstalk (using Ortofon A5906B-1) left: -30 dB, right: -26.4 dB; channel balance, 0.5 dB; trackability: high freq. (10.8 kHz, pulsed), 30 cm/S, mid-freq. (1000 and 1500 Hz, lat. cut), 31.5 cm/S, low freq. (400 and 4000 Hz, lat. cut), 30 cm/S; Deutsches HiFi No. 2, 300-Hz test band was tracked cleanly to 86 microns (0.0086 cm) lateral at 16.2 cm/S at +9 dB and 43.1 microns (0.00431 cm) vertical at 8.12 cm/S at +3.64 dB. I checked this parameter with two other Type Vs and obtained the same results with this test record as well as with other manufacturers' similar test records.

The Shure V15 Type V phono cartridge played all the test bands cleanly on both the Shure Obstacle Course—Era III and the Era IV musical test records, at 1.0 gram, without mistracking. The newest Shure test record, the Audio Obstacle Course—117, presented no problem to the Type V as it played the six trackability test bands without mistracking. Accordingly, the Total Trackability Index for the V15 Type V measured 103. I doubt that very many cartridges will be able to accomplish this feat.

#### Use and Listening Tests

When listening to records I find the need for absolute stylus cleanliness imperative, regardless of who made the cartridge, for no stylus is immune to its natural enemy—dust

**“The Shure V15 Type V towers over all previous Shure cartridges and probably has no peer among current moving-magnet cartridges.”**

particles! It is a well-known fact that even the cleanest of record grooves contain microscopic dust particles that have a way of collecting on the stylus. Therefore, it is most important to clean the stylus before each play to prevent stylus dust particle build-up that eventually will produce sound distortion.

The following equipment was utilized in the listening evaluation of the Shure V15 Type V phono cartridge: Technics SP-10 Mk II turntable, Technics EPA-500 tonearm fitted with the Technics EPA-A501H interchangeable arm unit, Crown IC-150 preamplifier, Audire DM-700 power amplifier, Crown DC300A power amplifier, Hafler 500 power amplifier, dbx Model 224 Type II noise-reduction system, Benchmark ARU ambience recovery system, Phase Linear 220 CX decoder, a pair of stacked Duntech DL-15B speakers in each channel, a pair of Boston A40 speakers, a pair of Cerwin-Vega 211R speakers, a pair of Janis W-1 subwoofers with their Interphase 1A units, and the Audio-Technica AT666EX vacuum disc stabilizer. Monster Cable was used for the Duntech speakers, and the turntable was equipped with the Hiraoka Disk-SE22 turntable mat except when the vacuum disc stabilizer was used.

As usual, I performed many hours of listening tests both before and after measurement. In fact, this report has been delayed because of the many listening tests I wished to perform with the V15 Type V. Besides the ordinary stereo listening, I also listened to many dbx-encoded records for a better aural evaluation since there was no surface noise to compete with the music as was true with the classical Columbia CX-encoded records. For pleasure listening, the Benchmark ambience recovery system setup was used, utilizing three amplifiers and speakers on each channel.

Like all record owners, I have many warped records that are difficult, if not impossible, to play cleanly with practically any cartridge. Although the Dynamic Stabilizer is an effi-

cient device, it too has limitations when confronted with some of the warpage present on many commercial discs. I was not surprised to find that some of the very bad warps could not be played cleanly with the Type V, even when using the Dynamic Stabilizer. However, the Type V was able to play these badly warped records cleanly when the Audio-Technica vacuum disc stabilizer was placed on the turntable in place of the mat and a vacuum used to flatten out the records, thus rigidly coupling the record to the platter. (*Editor's Note: A review of the AT stabilizer will probably appear in the December issue.—E.P.*)

The V15 Type V was able to cleanly reproduce *The Sheffield Drum Record* (Lab 14) and, using the Dynamic Stabilizer, all the high-velocity cannon fire present on the Tchaikovsky 1812 recording (Telarc DG-10041) in a truly awesome manner. While listening to various recordings and, in particular, the Respighi *Feste Romane* and *The Pines of Rome* (Mobile Fidelity MFSL 1-507) and the Boito *Prologue to Mefistofele* and *Verdi Te Deum* (Telarc DG-10045), I noted an excellent sonic clarity, transparency of sound, transient response, and stereo imaging, as well as the lack of detectable coloration, particularly when reproducing the high recorded velocities present on most current direct-to-disc recordings. The bass was sonically well defined and tight. All voices were reproduced extremely well, and applause definition was excellent. In general, the cartridge acquitted itself superbly, and the sound is truly silky-smooth.

After listening to the Shure V15 Type V over a five-month period I must conclude that it towers over all previous Shure cartridges and probably has no peer among moving-magnet cartridges currently available. In fact, those enamored with the vaunted moving-coil cartridges and their mystique would find it profitable and ear-opening to audition this remarkable cartridge.

B. V. Pisha

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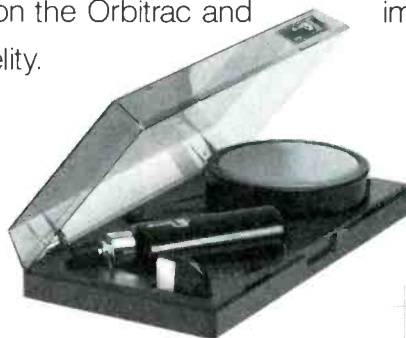
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4

**CAMBRIDGE  
PHYSICS  
MODEL 310  
LOUD-  
SPEAKER**

**Manufacturer's Specifications**

**Enclosure Type:** Accoustic suspension.

**Drivers:** 10-in. cone woofer, 4½-in. cone midrange, 1-in. dome tweeter.

**Frequency Response:** 30 Hz to 20 kHz, ± 1.5 dB.

**Sensitivity:** 84 dB for 1 watt at 1 meter.

**Crossover Frequencies:** 520 Hz and 4 kHz.

**Impedance:** 8 ohms, nominal; 6 ohms, minimum.

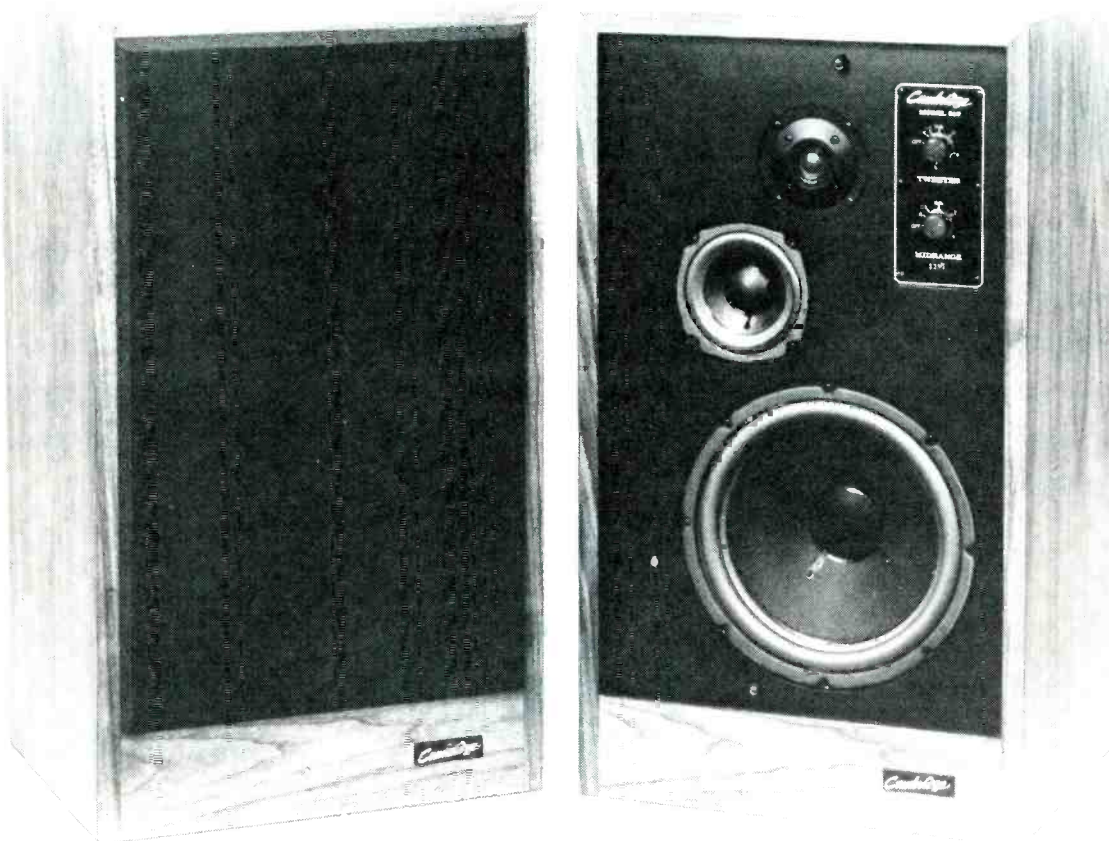
**Dimensions:** 15¼ in. (387 mm) × 26¾ in. (670 mm) × 13 in. (330 mm).

**Weight:** 50 lbs. (22.7 kg).

**Price:** \$449.00.

**Company Address:** 26 Fox Rd., Waltham, Mass. 02154.

For literature, circle No. 93



The Cambridge Physics 310 is a three-way loudspeaker system. The bass spectrum is handled by a 10-in. woofer mounted in a sealed enclosure, a 4½-in. cone driver handles the midrange frequencies, and a 1-in. dome tweeter carries the frequencies upward from 4 kHz.

The solidly built, oiled-walnut enclosure weighs in at nearly 50 lbs. (23 kg). Although the 310 is said by Cambridge Physics to be suitable for bookshelf placement, the system's mass seems a bit large for such application unless one has a very sturdy bookshelf. In the event that this system is mounted on a flat surface above a small child's head height, I recommend mechanically restraining the enclosures from sliding; since all sides are smooth, a firm tug on the speaker wire could bring them down on an inquisitive toddler.

The black cloth-covered grille pulls off to reveal midrange and tweeter level controls. These are scaled in decibels relative to a preferred "flat" setting and operate in a manner similar to a volume control on a preamplifier, with full counterclockwise rotation corresponding to off or no acoustic output from the driver.

Amplifier connections are made to what Cambridge Physics calls "poke-home" terminals mounted in a recessed cavity on the rear of the enclosure. Pushing down a terminal tab opens a clamp so that the wire may be poked into a hole on the rear of the terminal. Releasing the tab closes the clamp, which firmly holds the wire and provides good electrical contact. The opening is adequate for properly dressed 16-gauge wire, but barely. Larger wire sizes or poorly dressed multiple-strand wire, even of 18 gauge, can prove troublesome. The terminals are clearly identified as to polarity, and no difficulty should be encountered in hookup.

After opening the packing box and placing the 310s on the floor, I recommend sitting down and reading the excellent owner's manual which Cambridge Physics supplies with each speaker. The manual takes you step by step through proper setup and is written in a clear manner which does not require a Ph.D. in physics to understand.

### Measurements

Impedance for the Cambridge is plotted in Fig. 1. Tweeter and midrange controls were both set to the reference level of 0 dB for this measurement. The complex impedance plot for these same settings is presented in Fig. 2. Bass resonance occurs at 36 Hz, and the worst-case reactive load occurs around 45 Hz with a 30° phase shift. Any amplifier capable of safely driving a 4-ohm resistance to full level should be able to power the Cambridge without difficulty. Because of the substantial variation in impedance over the frequency range, from a minimum of 5.3 ohms to 14.8 ohms, the Cambridge should be connected to the power amplifier through low-impedance cable.

The one-meter anechoic frequency response is plotted in Figs. 3 and 4. Midrange and tweeter levels were both set to 0 dB for these measurements, while the measuring mike was located directly on the speaker's center axis. The sound pressure level, Fig. 3, is essentially uniform from a low-frequency cutoff of 27 Hz up to 5 kHz, where it quickly rises to a higher level, then remains steady up to 20 kHz. The level of the tweeter is approximately 6 decibels hotter

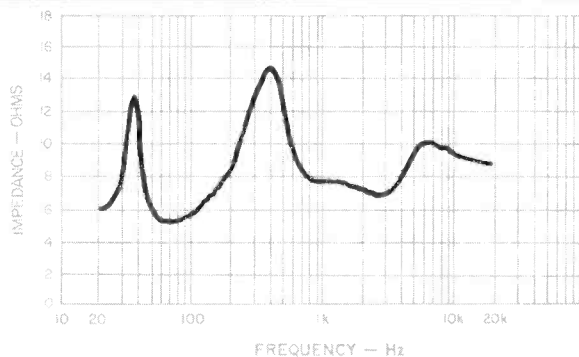


Fig. 1—Impedance.

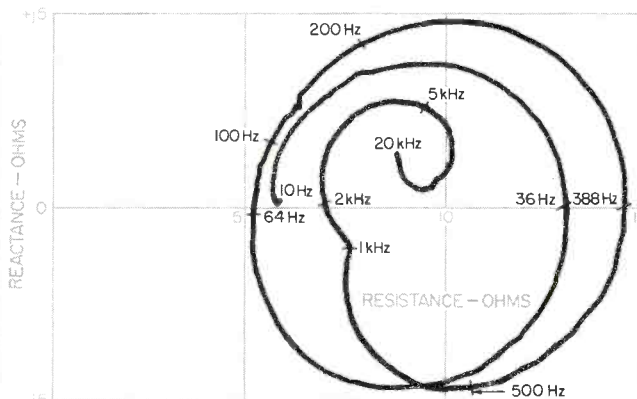


Fig. 2—Complex impedance.

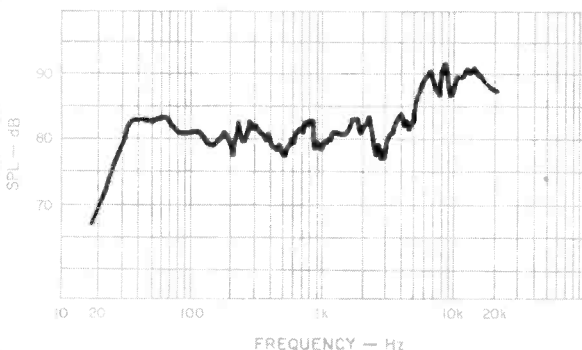
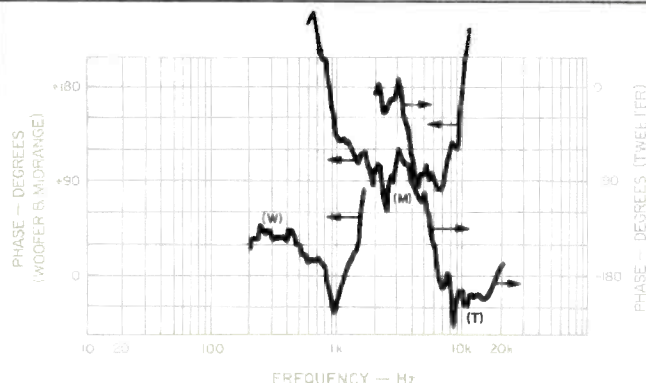
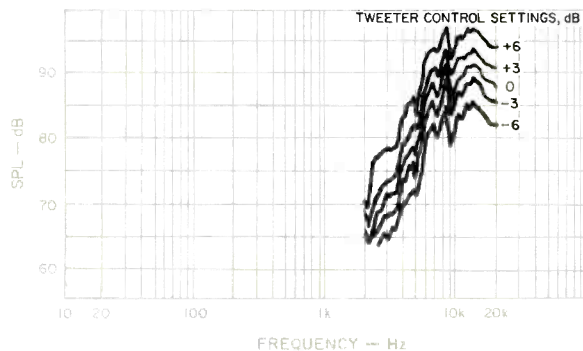


Fig. 3—One-meter on-axis sound pressure amplitude for a constant-voltage drive corresponding to 1 average watt into an 8-ohm resistor.

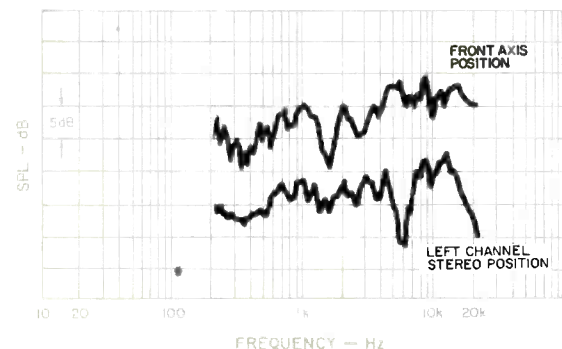
“With settings flat, the 310’s response is uniform from 27 Hz to 5 kHz, where it rises to a steady plateau.”



**Fig. 4—One-meter on-axis phase response corrected for air-path delay of (W) woofer, 3.7493 mS; (M) mid-range, 3.0531 mS, and (T) tweeter, 2.9326 mS.**



**Fig. 5—One-meter on-axis anechoic sound pressure level for five tweeter control settings, with midrange turned off.**



**Fig. 6—Three-meter room test.**

than the midrange and bass level. This conclusion is verified in the measurement of Fig. 5, in which the midrange control is turned completely off and the axial sound pressure level is measured at each of five major settings on the tweeter level control. In fairness to Cambridge, the user manual recommends that a setting of “0” on the control scales results in a “flat” frequency response when the speakers are properly located in a room whose reverberation time is close to optimum. Presumably, the flatness of response to which they refer is that of total sound power reaching the listener’s ear. I would personally recommend that the tweeter level be reduced to the  $-6$  dB control position for best spectral balance of direct sound if the listening position is aligned with the loudspeaker’s main axis.

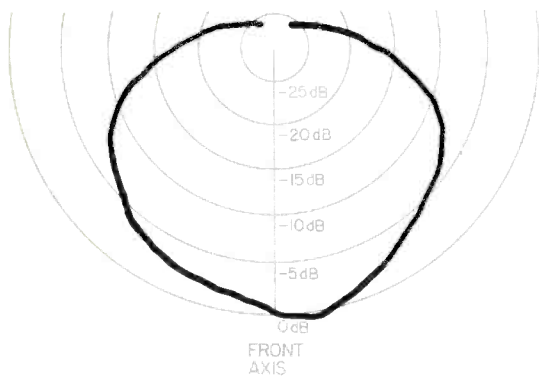
The phase response, Fig. 4, is corrected for three arrival times when the microphone is positioned one meter on axis. The tweeter sound arrives at a mean average time of 2.933 milliseconds with a polarity such that a positive pulse applied to the red terminal of the loudspeaker results in a sound pressure decrease. The midrange sound arrives at 3.053 milliseconds and has an average phase of plus  $90^\circ$  relative to the applied voltage. The woofer energy below 1 kHz has a sound pressure which is in phase with the applied voltage and arrives at 3.749 milliseconds. Although each of the three drivers is of minimum phase type in individual sound pressure performance, the combined response of the system is nonminimum phase.

The three-meter room response for the Cambridge is shown in Fig. 6. The first 11 milliseconds of sound reaching the listening position is separated from all subsequent reverberation and weighted to prevent abrupt transitions at the beginning and end of this time window. The frequency spectrum, corresponding to this early room sound, is displayed in Fig. 6. The choice of 11 milliseconds is based on psychoacoustic data relating to pitch perception of short duration transients. The measuring microphone is placed one meter above a carpeted floor and three meters from the front of the loudspeaker enclosure. In this particular measurement, the Cambridge was raised 13 cm (5 inches) above the floor and positioned 13 cm in front of a hard surface wall. A standard 2.5-meter floor-to-ceiling height was used and no object or furniture was allowed to reflect sound energy within the 11-mS window of first sound reaching the microphone. Significant floor scatter is evident below 800 Hz when the microphone is placed directly in front of the loudspeaker, and the response rises above 5 kHz, as in the anechoic measurement.

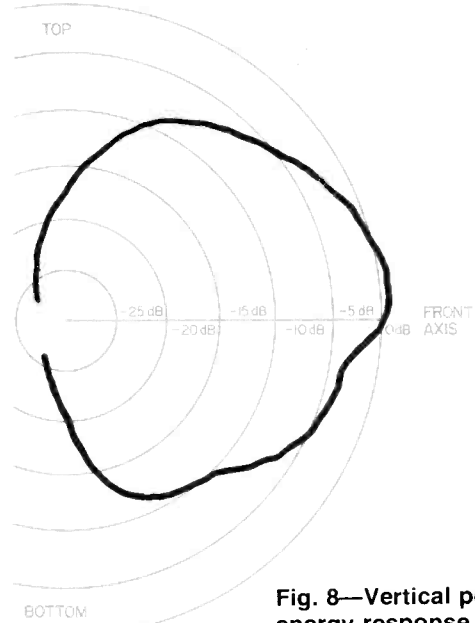
A  $30^\circ$  off-axis measurement, simulating the use of this speaker as the left channel of a stereo pair, produces the lower curve in Fig. 6. (The two curves are displaced by 10 dB for clarity of presentation.) A significant response dip occurs in the 5- to 6-kHz range for this position, and is due to the drivers’ placement on the front panel of the Cambridge. Floor scatter has been significantly reduced in the stereo placement, and the average response is more uniform than when seated directly in front of the speaker. These measurements indicate that some shifting of stereo image will occur with change in frequency content and seating configuration. The implication is that the speakers



“Measurements indicate that orchestral tutti will be properly held in their spatial and temporal stereo positions.”



**Fig. 7—Horizontal polar energy response.**



**Fig. 8—Vertical polar energy response.**

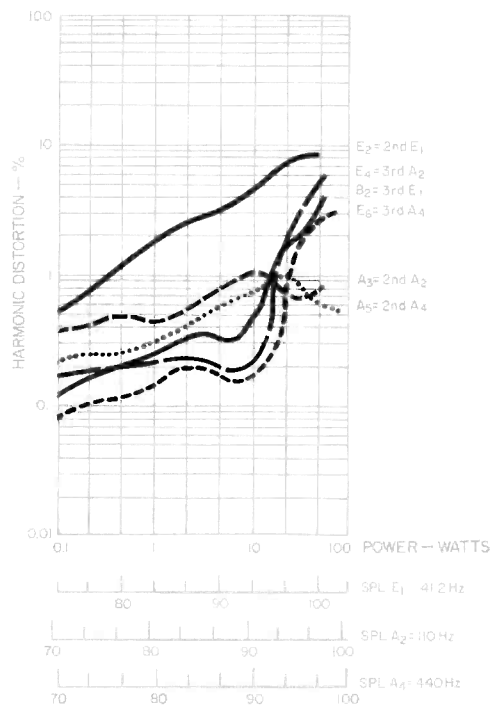
should be rotated toward the listening area for best stereo imaging and the tweeter level control should be pulled to its  $-6$  dB position. Also, the response can benefit by raising the speaker much higher than the five inches recommended by Cambridge.

Horizontal dispersion of sound is shown in the horizontal polar energy response measurement of Fig. 7, while the vertical dispersion is shown in Fig. 8. There is a small left-right asymmetry due to physical location of drivers on the front of the enclosure, but the spread of sound overall is quite good for a full  $60^\circ$  of listening angle. The vertical response shown indicates that the main wavefront of sound is launched slightly upward toward the normal listening position when the Cambridge is mounted near the floor. Because of this upward response, the speaker should not be placed immediately under overhanging shelves or near similar objects which could reflect early sound back toward the listening position.

Harmonic distortion for the musical tones  $E_1$  (41.2 Hz),  $A_2$  (110 Hz) and  $A_4$  (440 Hz) is shown in Fig. 9. All components remain quite low up to an average power of 30 watts. Distortion is principally due to second-harmonic components at low level, rising toward dominance of third harmonic at highest levels.

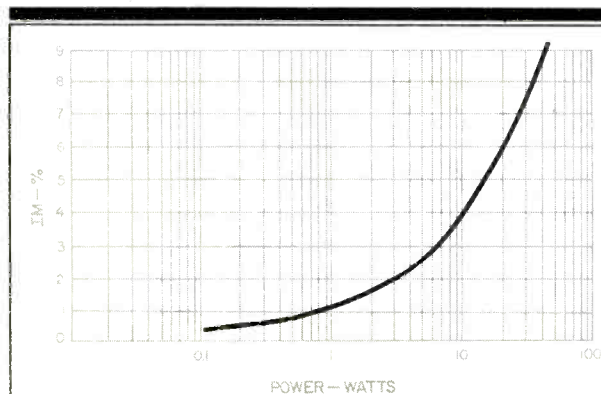
Intermodulation distortion on  $A_4$  (440 Hz) caused by  $E_1$  (41.2 Hz) when both are mixed one-to-one, is shown in Fig. 10. At low power levels the modulation on 440 Hz is principally amplitude modulation caused by the 41.2 Hz. At 10 average watts, there is approximately  $8^\circ$  peak-to-peak phase modulation accompanying the amplitude modulation, and at 25 average watts the phase modulation has increased by a slight amount to about  $15^\circ$  peak-to-peak. There is no average advancement or retardation of the arrival time of 440 Hz due to this modulation, so the intermodulation is primarily spectral coloration rather than being time shift.

The Cambridge handles massed musical components quite well. In my Crescendo Test, in which a sine wave is mixed with broadband noise of 20 dB higher power level, a tone of 440 Hz suffered less than 0.1 dB modification up to combined levels of 400 watts peak instantaneous power. A

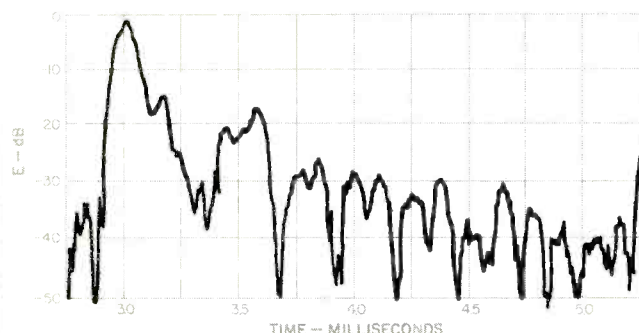


**Fig. 9—Harmonic distortion for the tones  $E_1$  (41.2 Hz),  $A_2$  (110 Hz), and  $A_4$  (440 Hz).**

“These speakers can handle tremendous orchestral peaks without apparent strain. And the bass response is particularly good.”



**Fig. 10—IM distortion on A<sub>4</sub> (440 Hz) caused by E<sub>1</sub> (41.2 Hz) mixed one-to-one.**



**Fig. 11—One-meter on-axis energy-time response.**

middle C tone of 262 Hz was suppressed 0.5 dB at 50 peak watts and was down 1 dB at 400 watts peak, while a tone of 110 Hz remained within 0.2 dB of its proper value up to 400 watts. This shows that inner musical tones will not get lost or wander around the stereo stage during orchestral peaks.

Similarly, the Acoustic-Transfer Linearity of the Cambridge was quite uniform up to high power levels. In this test, the ratio of sound pressure level to applied voltage is used as a measure of the degree to which sound is compressed or expanded with changes in drive levels. A perfect loudspeaker will have a constant ratio of sound pressure level to applied voltage over the full power range. The Cambridge has less than 0.1 dB deviation from perfection up to 100 average watts for tones of 440 Hz and 262 Hz. A tone of 110 Hz is within 0.1 dB up to 10 average watts, then drops uniformly above this level and is down 0.5 dB at 100 watts. The handling of 60 Hz is similar to that of 110 Hz but drops to 1 dB at 100 average watts drive. Of course, all of these measurements are made for momentary transients, simulating percussive tones which the loudspeaker will be called upon to reproduce. Steady-state measurements at such high power levels would soon fry the cone, and the unnatural thermal changes thus induced would not be indicative of musical performance.

Taken in total, the harmonic, IM, Crescendo, and Acous-

tic-Transfer measurements indicate that orchestral tutti will be properly preserved in spatial and temporal stereo position. Some low-bass muddiness will begin to appear at very high sound levels, and instruments will tend to go bright and “blasty” if ultimate power handling is quickly approached. However, there should be no changes in single-instrument timbre due to changes in power levels below 10 average watts drive.

The one-meter axial energy-time curve for the Cambridge is shown in Fig. 11. The first peak is due to direct sound from the tweeter and is spectrally centered near 20 kHz, while the secondary peaks near 3.5 milliseconds are caused by enclosure edge diffractions centered around 7 kHz. Midrange energy arrivals near 3.1 milliseconds smoothly follow the early tweeter sounds. Because of the 6-decibel stronger response of the tweeter, relative to midrange and woofer levels, the tweeter carries most of the total energy for broad-band percussive sounds. In the case of the uniform-energy test signal used to generate this curve, the tweeter handles 80% of the total energy, the midrange handles 17.5%, and the rest is carried by the woofer. With the exception of the secondary diffraction peak, which could cause acoustic problems in the 2 to 3 kHz frequency range, the general shape of the energy arrivals indicates a good on-axis transient response.

#### Use and Listening Tests

Listening was conducted with the speakers raised five inches off the floor, as recommended by Cambridge. My first impression of the 310 overall was of a very bright top end and a solid bass, with some noticeable but acceptable midrange coloration. After experimentation, I decided that the best response, to my ears, was obtained with the speakers angled toward the listening area and the grille assembly removed. Top-end brightness was controlled by pulling down the response with preamplifier equalization, rather than reducing the Cambridge tweeter level. On some program material, piano reproduction in particular, I sensed a slight hole in the octave around middle C, which artificially colored the response to make it sound a bit more bass-heavy than I would prefer. However, musical articulation with this instrument is quite good.

Stereo imaging is also quite good; though not spectacularly so. Lateralization is excellent, and the sense of depth is good, but did seem, to my ears, to produce a somewhat shortened illusion of depth.

These speakers can handle tremendous orchestral peaks without apparent strain; the bass response is particularly good. I tried listening with and without sub-bass units and felt that the Cambridge did not need low-bass help on anything but the most esoteric demonstration program material. Brass, horns, and strings are all accurately reproduced, though piano and vocals suffer in relative terms from middle- and low-register timbral problems.

On balance, the sound of the Cambridge 310 is fairly accurate, and I found that I could listen to these speakers for long periods of time without aural fatigue—which is a pretty good test for speakers you’re considering living with. This may not be the best speaker in the world, but it’s pretty good for the price.

*Richard C. Heyser*



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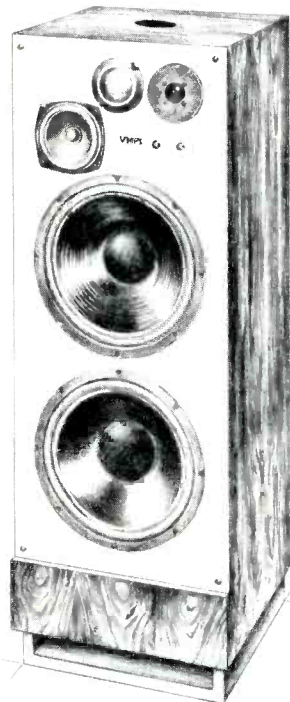
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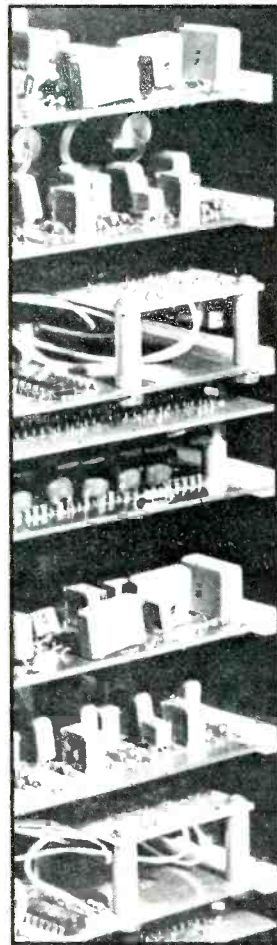
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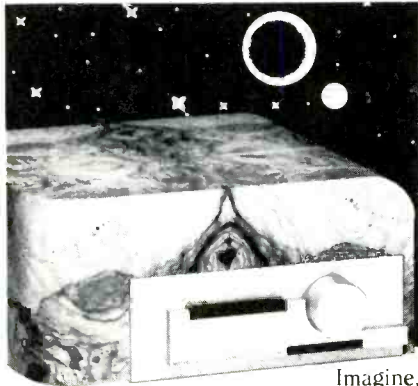
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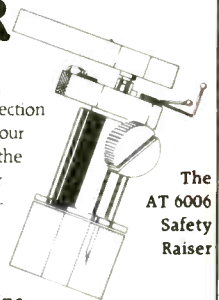
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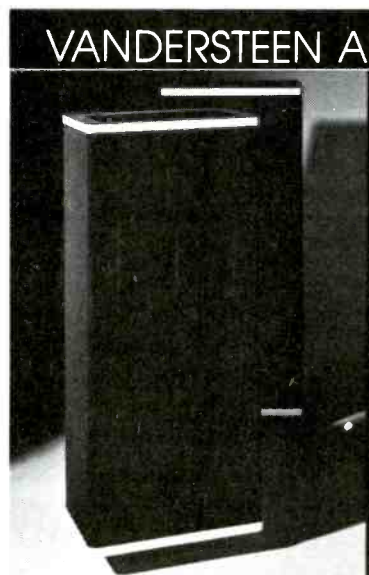
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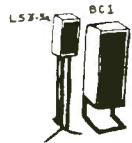
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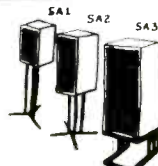
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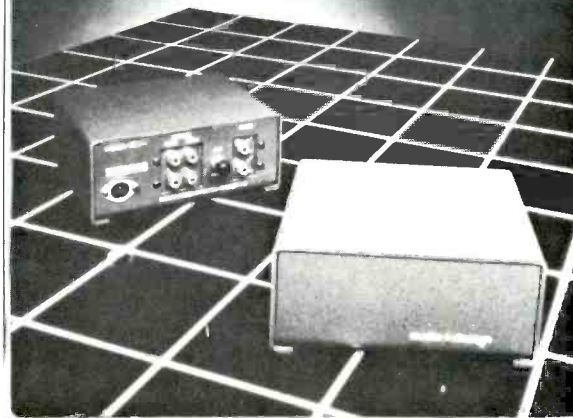
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# AD INDEX

Firm (Reader Service No.)	Page
ADS (1)	2
Advert (16)	33
Alisop (2)	67
American Int'l Typewriter (3)	96
Audiophile System (4)	92
Audio Source (43)	25
Audio-Technica (5)	28
BASF (6)	35
Bryston Manufacturing (7)	8
Carver Corp. (8)	22
dbx (10)	18
Denon (11)	Cover III
Design Acoustics (34)	66
Discwasher	Cover IV
Dynavector (12)	24
Goodyear	94
Hitachi (13)	29
Illbruck (14)	73
IMF Electronics (15)	89
Jack Daniels	27
J&R Music World (17)	96
JVC	51
KEF (18)	19
Kyocera (9)	7
McIntosh (19)	29
Maxell (20)	23
Memorex (21)	62
Meridian (22)	93
MicroFidelity (23)	21
Mitsubishi (24)	Cover II & I
Onkyo (25)	9
Ortofon (26)	15
Phase Linear (27)	12
Pioneer (28)	54
Quad (29)	5
Revox (31)	15
R. J. Reynolds	11
Sansui (30)	3
Shure Bros. (32, 33)	8, 13
Signet (35)	91
Sony (36)	61
TDK (37, 38)	4, 18
Telarc (39)	14
Toshiba (40)	57
Yamaha	49

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## LOUDSPEAKERS

## TOME FOOLERY

*The Complete Handbook of Videocassette Recorders—2nd Edition* by Harry Kybett. TAB Book No. 1211, 1981, hardbound, \$14.95; paperbound, \$9.95.

Many of us video hobbyists have been waiting years for a definitive layman's guide. This isn't it. Despite its title, Kybett's book appears to consist of obsolete data, erroneous information and subjects ill-chosen for discussion, exacerbated by photographs reproduced like newspaper wirephotos.

The two most serious errors are the outdated information and the author's addressing topics of no interest to the layman and precious little to the technician. As to obsolescence, I found no currently available consumer equipment: The book fails to note the existence of the 6-hour VHS format, and only grudgingly notes the longer-playing Beta II and Beta III formats. The Philips videocassette system is discussed briefly, but again with outdated and erroneous information (and with the company name consistently spelled "Phillips").

The instructional sections fare little better. Kybett leaps from chapters covering the simplest operations—essentially reworked instruction manuals—directly into detailed circuit-by-

circuit looks at specific recorders—apparently, reworked service manuals.

Topics one could reasonably assume would interest videophiles or interested laymen are absent. There is nothing on signal processors like stabilizers and enhancers, only the bare mention of camera hook-up, practically no discussion of camera handling or lighting techniques (critically important), and no coverage of Kopyguard and other anti-copy provisions which frequently affect playback performance. A skimpy, one-page index rounds out the general incompleteness of the work. *Gary Stock*

*How to Get the Most Out of Your Audio Recording and Playback System* by Christopher Robin. Reston Publishing, 1979, 128 pp., \$5.95.

Immediately, the title may confuse the reader, as it did me, since the book is primarily concerned with reproduction, rather than recording. In any case, the first chapter is entitled "Basic Causes of Poor Sound Reproduction." I would agree with its basic tenet that speaker and room characteristics are the most likely major factors but there was much to disagree with in the specific text, including its tying "loudness" to the level-vs-dis-

tance law. Using a 2% figure for speaker efficiency, the author draws conclusions unwarranted for many acoustic suspension systems.

The next two chapters cover stereo and quadraphonic reproduction. There is a fair amount of text on speaker placement, but there is no discussion of pointing on vertical and horizontal axes or the influence of the dispersion properties of the loudspeakers themselves. There are a number of errors in discussing the characteristics of reverberation and of white and pink noise, quite misleading to the neophyte. The chapter on selecting speakers adds further confusion by classifying any sealed enclosure as an "infinite" baffle design. It also states that folded horns have "impaired low-frequency response." (I wonder if Paul Klipsch realizes this.) The chapter on making recordings has a fair amount to say on recording pianos from 10 feet away *only*, with no comment on lid up or down. The chapter on microphones has its own set of errors, including two references to the "short gun" mike!

"How to Get the Best Sound in Your Car" has a higher percentage of help per error. The glossary is a poor one, with mediocre definitions, at best. There is no index. Not recommended.

*Howard A. Roberson*

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EDWARD TATNALL CANBY

## WELL-SEASONED OZAWA



Music Director Seiji Ozawa leads the Boston Symphony Orchestra.

**Vivaldi: The Four Seasons.** Boston Symphony Orchestra, Ozawa; Joseph Silverstein violin.

**Telarc DG 10070**, digital, \$17.98.

There was a time, a few decades back, when the Boston Symphony would indeed play this sort of Baroque music amplified in the scoring to fit a very large string orchestra with, more often than not, added colors unheard of in Vivaldi's time. No longer—and a good thing. All that sort of amplification could ever do for the music on records (as opposed to the live concert hall) was to render it hideously muddy and thick. And not a bit louder.

It's amusing, then, to find that this particular "Boston Symphony Orchestra" consists of some eight violins, three violas, one cello and one string bass plus harpsichord! And one soloist, the excellent Joseph Silverstein, violinist. Was Telarc being economical? Of course! A neat little package and it doesn't require Symphony Hall, either, but was done in a chapel at nearby Wellesley College. Yet it just

happens that this is the ideal and entirely correct ensemble for the music, in the flesh (*not* in Symphony Hall) and, especially, on records. So everybody wins, especially you and me. The only question is—why call it "The Boston Symphony?" Sales, no doubt. But also, perhaps, legal complexities? Who knows? Or cares.

I feel a personal distress that Telarc, when it went into digital with Soundstream and Audio-Technica, dropped its analog line of recordings with a soundless thud. One of those was my own record, on which I worked very hard for several years in the preparation. Such is fate for analog tape! Perhaps it is good for a record critic to feel this personally, so it hurts. However, I continue to believe that Telarc's digital recordings are both technically superb and, more often than not, musically excellent as well. It seems to me that a responsible critic must, in this fashion, be of several minds and persons, according to function. And so I am.

There are, in fact, too many routine,

badly styled so-so performances of this music on the audiophile scene, but this is not one of them. I would put it immediately in the top class, taut, beautifully exact, and shaped to perfection by Ozawa, who has a remarkable feel for Western musical styles, well ahead of most Western conductors. And Joseph Silverstein is an ideal soloist who plays a fabulously lean, tight solo part in an impeccable style, too, almost without vibrato (as the music should be) and, no matter how fast, always precisely on pitch.

I'd recommend, as the proper comparison to this recording, the unusual one by Trevor Pinnock's "original" instruments, strings built to the older Baroque pattern before the great updating of instruments that occurred in the early 19th century—Strads and all. It's on Vanguard.

**The Revelli Years, Vol. One.** Univ. of Michigan Symphony Band, Revelli.  
**Golden Crest Lab. Series CRS 4202**, six discs, \$59.88.

Sound: B- to B+      Recording: B  
Surfaces: A-

Revelli? There are worlds within worlds in the music scene, and who on the outside would know of Revelli, except for a few million symphonic band enthusiasts, here and there from the U.S.S.R. to Podunk, U.S.A., who already know his music with this band in its live form! The marvel of recording, once again, is that it brings this special world to the rest of us so easily and comfortably—even if we've never heard of the celebrated band leader. I hadn't. Why should I? But I enjoyed every bit, as far as I got. (Time really didn't allow me to play all 12 mighty LP sides before writing these words.)

First, no question about it, Revelli deserves his special rep. This basically collegiate band is not only incredibly accurate and professional in the playing, over the many years here covered, but under this conductor it plays with remarkable musicality and understanding—which is rare in band programming of such breadth and width, ranging over all sorts of territory from Sousa to Wagner and Strauss and on to contemporary. The acid test for a symphonic band is here surmounted beautifully: The massed clarinets really

sound and play like the strings they represent in the classical works.

Second, we have here a splendid illustration of the present continuity in respect to basic good tape recording over many past years, plus our present ability to update the signals for current disc release. These tapes, all made "live" at various concerts, range over a period from 1958 through 1971. And yet they have been so admirably equalized out (in terms of levels only) that no changes are evident in sound quality from one item to the next, and in fact no dates are given in the programmed material on the discs. You will find the actual dates on the back page of the accompanying booklet. The only consistent difference I myself could hear was slightly increased distortion in the louder passages on the earlier tapes, the newer ones being cleaner in that respect.

We can now reduce at least 20 years of our past recordings to a standard of quite high excellence in

stereo and we may go back well before that if the originals were state-of-the-art at the time. In this day of rapid changes, I find this a happy thought.

**Schoenberg: Quintet for Winds, Op. 26.** Oberlin Woodwind Quintet. **Gasparo GS-204CX**, \$8.98. (Also digital, non-CX \$15.00.)

There is much more to this excellent chamber music recording than merely a fine performance of a Schoenberg masterpiece, one of the more easily accessible ones, and very well recorded, at that. This is the first classical CX encoded record I've heard. And it isn't even from CBS.

Am I perverse? I have the CX decoder but I deliberately decided to check out CBS's story. Don't need a decoder! (It says so in Schwann, under Gasparo.) As most of us know, there has been a large flap, especially among recording engineers, as to the sound of CX records played minus de-

coder. I think I am beginning to see how all this works. It's a curious snafu of aesthetic and engineering standards, applied in different milieux, from different viewpoints, and not very sensibly.

We are often limited in our permissible language. CBS can't possibly say what I will here say (my own thoughts, of course)—namely, that especially (but not entirely!) in pop music, most people do not listen for distortions and mostly don't give a hoot. If you've heard a typical "hi fi" being maltreated by some casually jovial, well-intended listener, you *should* understand that the relatively minor distortions apparent in a CX pop record, played as most people play the same, are not going to matter much. If they do? Well, then, go get a decoder.

I think this was the CBS intention and probably with good and canny insight into The Market. But, oddly, no recording engineer can get more up-tight about audio quality than a top

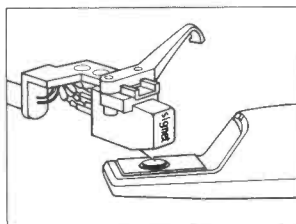
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“Oddly, no recording engineer can get more uptight about audio quality than a top pop man!”

pop man! Good! Should be that way. Just keep things in perspective, gents, is all I suggest. I have yet to hear a word from the audio fraternity about CX *with* decoding, though I've heard from the recording exec end.

So—I put this very classical disc on my table like any other and went casu-

ally about my business, listening without special care. It's another record, isn't it? Honestly, I expected some pretty awful sounds, after all the comment. Imagine my growing surprise. No such thing. In five minutes, thinking Schoenberg, I had more or less forgotten CX. This disc *is* listenable, the mu-

sic *does* get through, with surprisingly little trouble—if you don't sit down and strain every ear for traces of sinful distortion.

It seems to me, in the CX context, that this is a far more important point than any comment I might have as to the same disc decoded properly. I know pretty much how it will sound, in relation to the dbx decoding and even (on tape) the two Dolby playbacks. Not too much ground for high-power controversy here! CX does less than dbx, but it does a lot, and the technical problems are not *that* different. Keep this on a generalized plane of perspective, remember.

Nevertheless, CBS has been moved to issue its own CX discs in alternative standard versions and the two sorts, like the two versions of this Gasparo disc, will be available in some unannounced ratio—but not at a price differential. (If this isn't double inventory, then I can't count, but maybe it isn't.) If your audio ear is acute as well as tender, by all means get (a) the “plain” version of any CBS or other CX release or (b) the CX version *AND* a *proper* decoder. Nobody but a casual listener will ever play CX without decoder, nor has to! The only trouble is, there are millions of casual listeners. Yes, plenty of thousands in the classical field too.

Just in case you think I'm playing along, let me state that I still think the ideal way is to do the thing—code/decode—*right*, in engineering terms, as well as it can be done, state-of-the-art. And then figure a way to sell the discs and the decoders. That is the dbx approach. Basically a more limited, more hi-fi-oriented procedure. Whereas CX, necessarily, is for the millions, including the millions of record dealers. Room for both? Yes! If there's room for big companies *AND* smaller companies. Right?

(*Editor's Note:* Our contacts in the CX camp tell us that they prefer to call their release program a “mixed” system in that the albums, whether CX encoded or not, will be placed in a single bin at retail. The release list, now numbering 78 titles not including the Gasparo albums, includes many more classical selections, with many of them on the Masterworks label! Approximately 250 titles are expected by the end of the year.—E.P.)

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## TV BRIGHTENS UP

If imitation is the sincerest form of flattery, as the old saying goes, then Sony should feel quite pleased. As pointed out in my "VideoScenes" column last month, many manufacturers at the SCES introduced component TV systems designed to compete with the pioneering Sony Profeel. Needless to say, for most of these new component TV systems, I have been given only the most limited information on their facilities and features. However, I have been using a 25-inch Sony Profeel system for some months and must say I am mightily impressed by its performance.

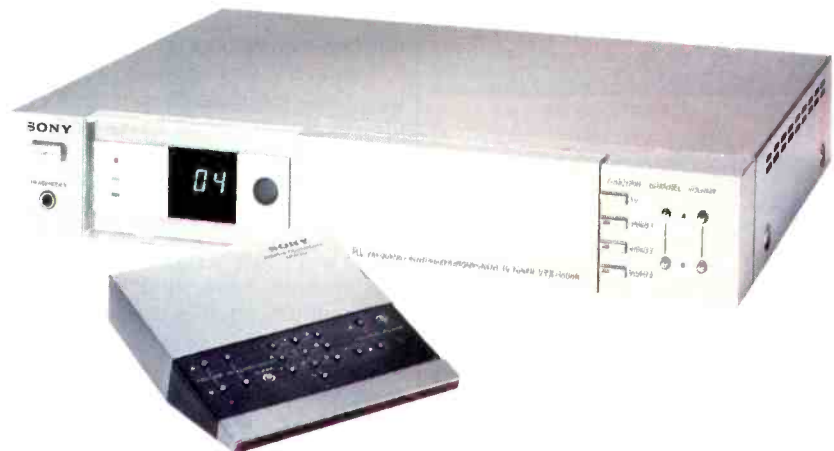
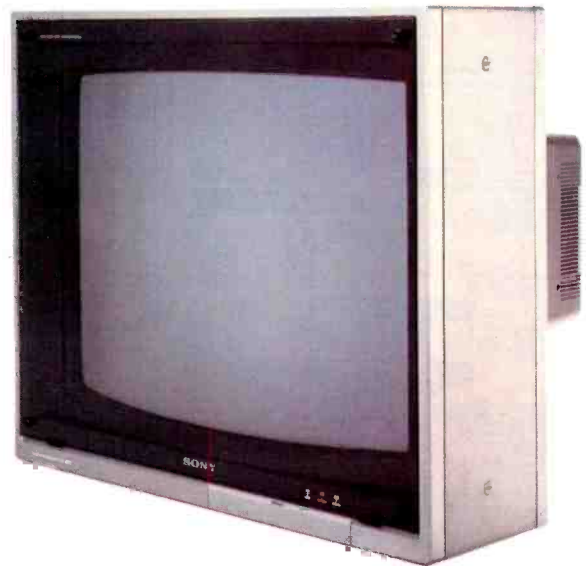
The Sony Profeel component TV system was introduced last year in 19- and 25-inch versions. Now there is a 12-inch system available and, for Texas oil barons, a special 30-inch Profeel in a custom cabinet that sells for a mere \$10,000! I have the KX-2501 25-inch TV monitor and the VTX-1000R component TV tuner with infrared remote control.

The KX-2501 is furnished in a gray colored cabinet measuring 26 in. W × 22 in. H × 19 in. D. Weighing in at a hefty 121 pounds, the unit comes with two built-in lifting handles. The associated VTX-1000R tuner is supplied in a matching gray shade. There are two 10-watt amplifiers built into the monitor, but no loudspeakers (which must be external units placed several feet from the monitor to avoid magnetic distortion of the picture). However, two special Sony loudspeakers, which are properly shielded, may be attached on each side of the monitor.

The TV monitor is very advanced in its design, with inputs for such special services as multiplex letter information broadcasts (teletext or videotex), and connections for stereo-TV adaptors, even though neither service is fully operational in this country. The picture tube is covered by a lightly smoked glass cover for anti-glare and higher contrast. However, this glass is easily removable for those who feel the picture is better without it.

The TV monitor utilizes some standard Sony circuits but has many unique circuits designed to enhance picture quality as well. The 25-inch TV tube uses the by-now-familiar Trinitron one-gun, three-beam electronic focusing system with a single large electronic

*The Sony Profeel component TV system includes a monitor, a tuner, and an infrared remote control.*



lens. This, of course, avoids convergence problems. The aperture-grille color selection system helps to reduce moiré patterns, and a cylindrical screen means less distortion from angled viewing. There are refinements, like a peak-current equalizer for better picture stability and a velocity-modulation scanning system for better sharpness and resolution. What Sony calls their Colorpure Filter is really a comb filter for improving fine detail without color spill or color noise. It all adds up to a TV picture that is limited only by the quality of signal fed into it. The old computer adage GIGO—"garbage in/garbage out"—really applies here. Given a good signal from broadcasts, videocassettes or videodiscs, or a direct feed from a video camera, the

picture quality is outstanding for its sharpness and resolution, with good contrast, good light-to-dark area brightness ratios, very clean pure white and video black, and vivid well-saturated colors.

There are a few automatic control systems on this monitor, such as the picture buttons which adjust contrast, color intensity and brightness simultaneously in the proper ratio. But thank goodness there are many individual controls that permit a wide range of adjustments to suit individual tastes. Oh, I know the standard picture balance is good, but I want the option of color correction if I think it is indicated.

The KX-2501 has far more jacks, switches and controls than the standard TV set. There are audio and video

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"With the Sony Profeel, resolution and sharpness are so good that individual strands of hair stand out in startling detail."

input jacks, control input jacks and input level controls. There are all the usual picture controls and a very special RGB (red, green, blue) 32-pin input that allows character generators and microcomputers or any equipment having digital RGB outputs to be connected to the TV monitor.

If desired, the monitor can be mounted on a wall. Various stands and tables or equipment cabinets also can be used. Fortunately, I had an attractive three-legged base from a cocktail table which accepted the KX-2501 quite nicely.

The KG-2501 has no tuner but if you own a Beta or VHS videocassette recorder, the tuner in these units can function quite well with the monitor. Ah, but there is a little kicker lurking here. You may think that the VTX-1000R tuner might be redundant if you already own a VCR. However, unless you do acquire the VTX-1000R, you will have to forego the pleasures of remote control, since the infrared sensor is located on the front panel of the VTX-1000R. Sorry about that!

The VTX-1000R is an extremely versatile unit. The tuner has easy channel selection with a PLL frequency synthesizer, and presets are available. There are multiple audio and video inputs and outputs on the rear panel, and VCRs, videodisc player, video games, projection TV can all be hooked in and selected by front-panel pushbuttons. There is an input level control for video, even a control in/out jack for future use with external control units, and a multiplex in/out jack for future multichannel sound. There are 75-ohm antenna terminals for VHF and CATV and 300-ohm antenna terminals for UHF. A headphone jack accepts low- or high-impedance headphones and has a volume control. However, neither the volume control nor the mute facility can be operated from the remote control. Various signal lights indicate different functions; a red light blinks to acknowledge remote control commands, and a large, illuminated numerical display denotes channel selection.

The companion remote control furnished with the VTX-1000R has more functions than is customary. Most of its 19 controls (such as power, volume, picture, channel scan and random-access tuning) are duplicated on the

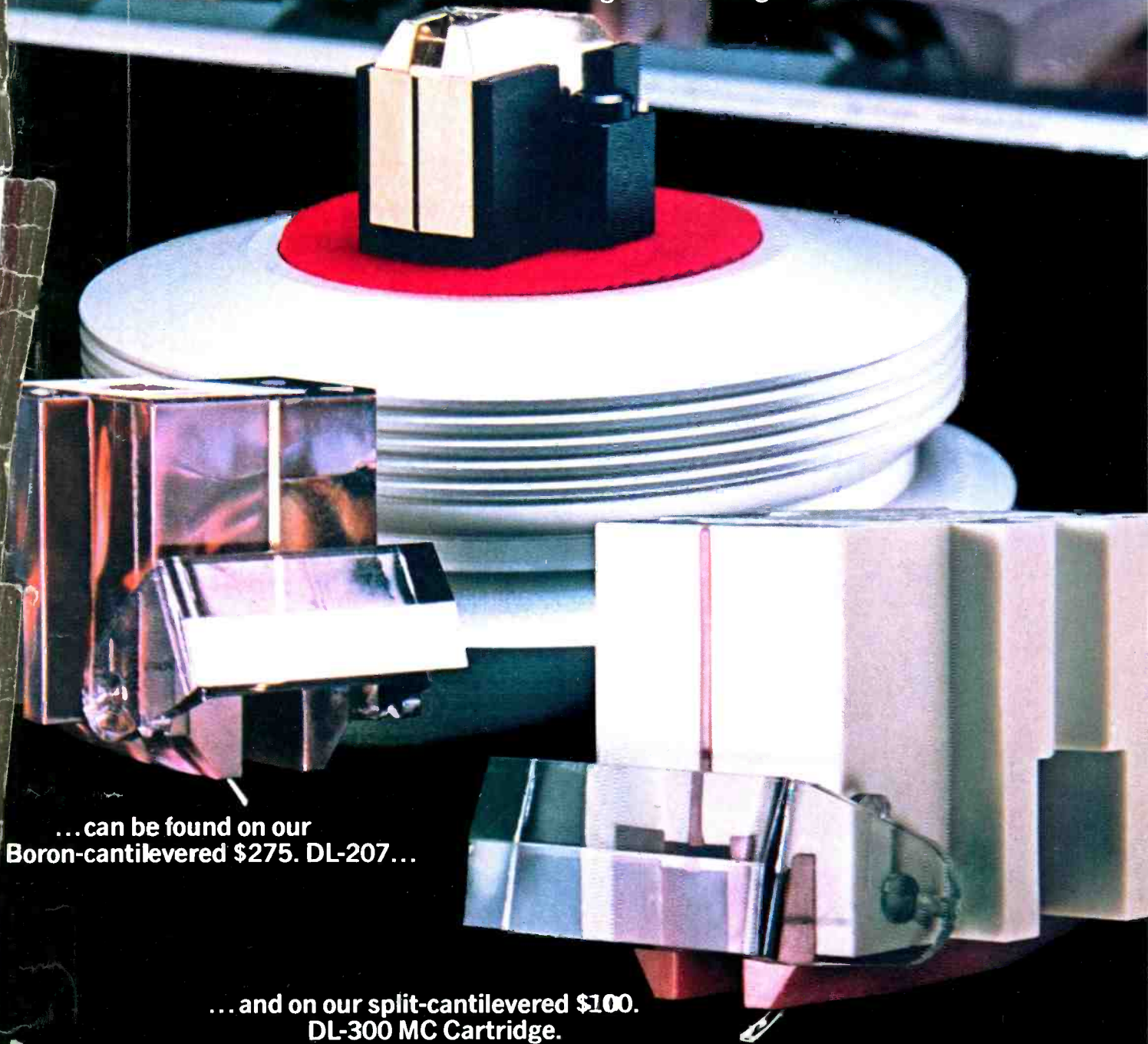
panel of the tuner; muting and clear, however, are exclusive to the remote control. The infrared transmitter is usable up to 23 feet. Channels can be selected one by one, or a key can be kept depressed to rapidly scan the channels. Similarly, volume may be adjusted in increments or continuously. The direct access channel-selection system can be set up for UHF coverage. One unusual control is the contrast control. Not generally found on remote control units, it increases or decreases contrast either by increments or continuously.

I am a bit surprised that a system as sophisticated as the Profeel does not offer remote control of hue, intensity and brightness. (Years ago I had an RCA TV set with this facility; it worked via signals from a tuning-fork oscillator driving individual servo motors on the control pots. I will admit the motors eventually broke down and were the devil to fix.) I've heard strong rumors that future versions of the Profeel will have remote control of color balance controls.

There you have it—the Sony Profeel is certainly the finest TV system I've ever used. Some shows with obviously color-temperature-controlled lighting are just amazing in picture quality. The brightness and brilliance of the colors are superb, and the resolution and sharpness are so good that individual strands of hair stand out in startling detail. One must not forget the vastly improved TV sound either. I am using a KEF 104 speaker on each side of the monitor and some of the live music is of fine quality. There is also a distinct improvement in the quality and intelligibility of dialog. At \$1,900 for the monitor and component TV tuner (and that is with no loudspeakers), the Profeel isn't cheap. But in my mind the Profeel is currently at the pinnacle of video performance. The system has a multiplicity of controls and facilities, but in spite of this, the Profeel is not difficult to operate. There is no question that component TV is not for everyone; those who want TV sets in Queen Anne consoles will certainly reject it. On the other hand—show them one of their favorite afternoon (or evening) soap operas (which happen to have great quality pictures) on the Profeel and they may have a change of heart!

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The perhaps ultimately low effective tip mass of Denon's most expensive cartridge establishes new standards for cartridge tracing and minimal record wear (the recommended stylus force is a mere 0.8g). Yet the basic design configuration of the DL-1000 is common to many Denon cartridges.

For example, an amorphous deposition Boron cantilever with the highest rigidity/weight ratio known) is also used on Denon's new DL-207, as is Denon's original dual damping mechanism, which effectively cancels resonances in the two critical portions of the musical bandwidth.

More amazing, perhaps, is the fact that Denon's *least* expensive cartridge, the DL-300, benefits from much of the technology that has made Denon Moving Coil Cartridges the world's reference standard for years. Like the DL-1000, it features a cross-coil armature (for better stereo separation and imaging), a poleless magnetic structure (for vastly reduced weight), and a single-point cantilever suspension system (for maximum compliance and strength).

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