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AUDIO • VIDEO • TEST REPORTS • MUSIC

OCTOBER 1988

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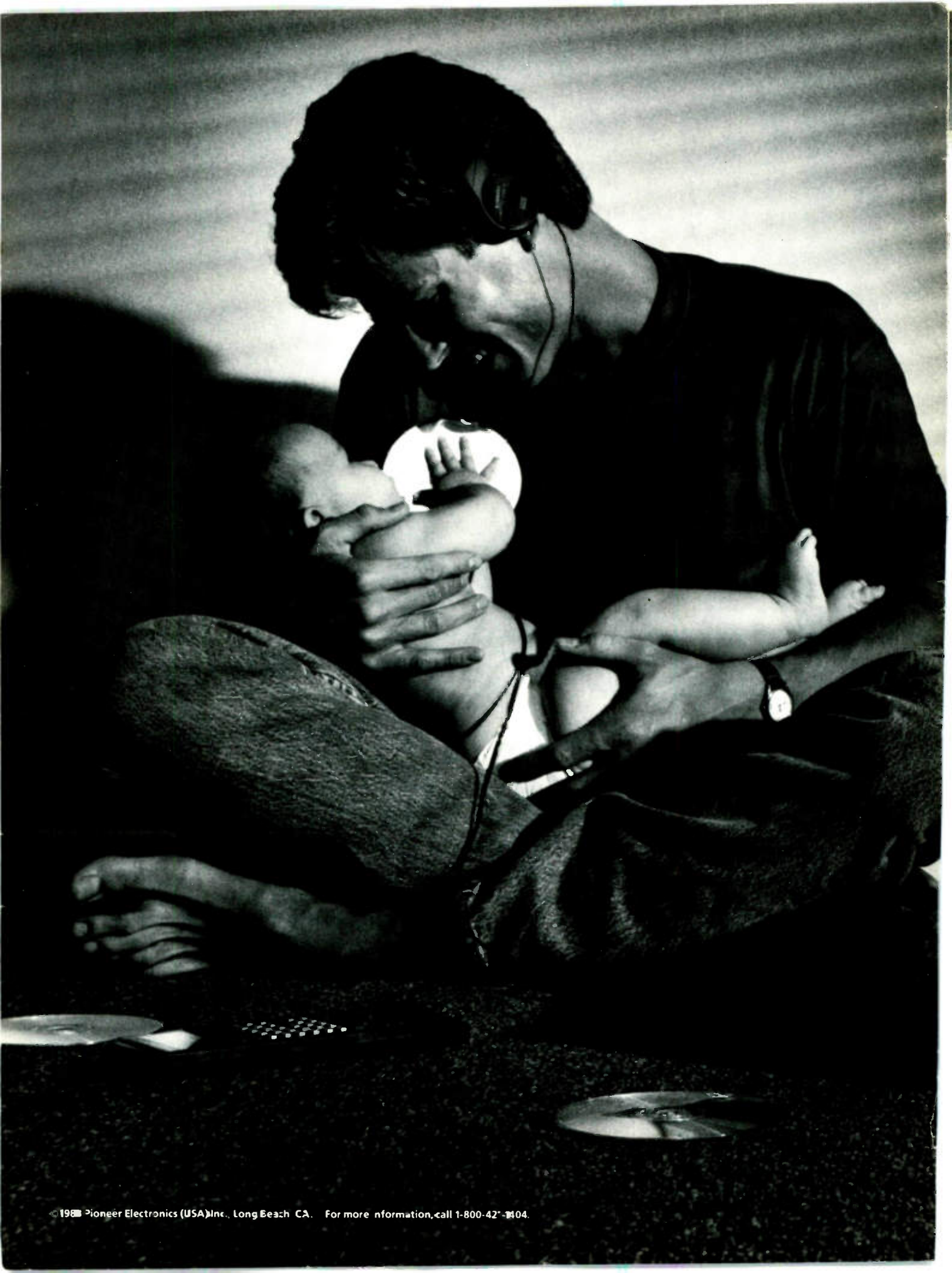

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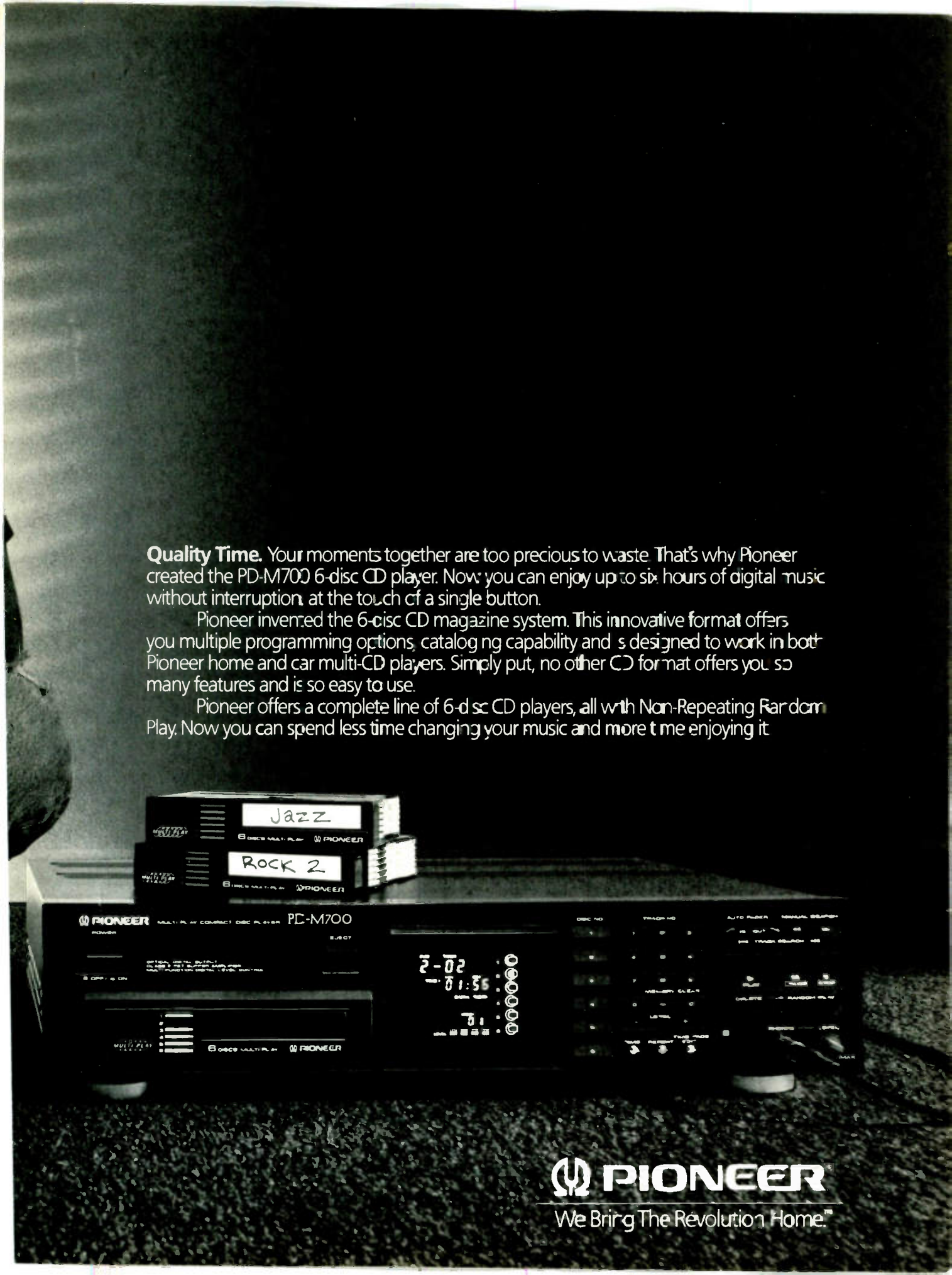

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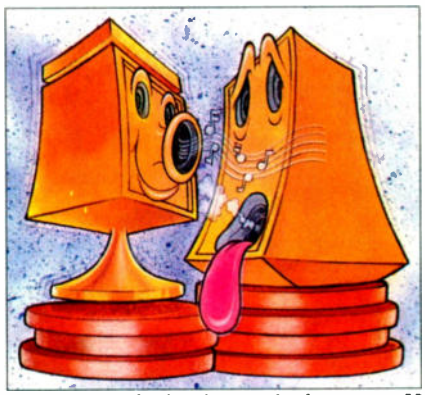
OCTOBER 1988 VOL. 38 NO. 10

ULTRA V
Interview: Carver Corporation; Product News (Follows page 48)

Tested: Yamaha CD player, five more 29



Separating audio fact from audio fancy 52

The heyday of RCA opera returns on CD 68

TEST REPORTS

AUDIO & VIDEO

MUSIC

On the cover: From the top, Cambridge Audio's CD-2 Compact Disc player, Sony's CDP-507ESD Compact Disc player, and Yamaha's CDX-1110U Compact Disc player.

Cover design: Joanne Goodfellow
Cover photo: David A. Wagner

COLUMNS

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FrontLines

A Second Look At CD-V

By Michael Riggs

A year ago this month, I set down my thoughts on the prospects for CD-Video, or CD-V for short. I was not very optimistic. If you don't already know, CD-Video is the omnibus name Philips/Polygram is pushing for optically recorded music videos of all kinds and sizes—from concerts and operas on 12-inch Laserdiscs to CD-size (5-inch) discs holding as much as 20 minutes of audio plus a five-minute video clip. The characteristics common to all CD-Vs are three: They are read by a laser, they feature musically oriented video programs, and the video soundtracks are digital.

Beyond that, the situation is pretty snarled. For example, all 12-inch CD-Vs can be played on all Laserdisc players, though some old models may reproduce only the analog soundtrack (recorded along with the digital version for just this reason). But early players can't handle 8-inch Laserdiscs (or CD-Vs) or regular Compact Discs, and only a few very recent machines know what to do with a 5-inch CD-V. And though a regular CD player will play back the audio-only portion of a 5-inch CD-V, few are available that will recognize the video track.

For the last year, none of this has been of much interest, because you couldn't buy CD-Vs anyway. The 5-inch version turned out to be harder to produce than had been expected, which delayed the launch of the format well past its original announcement. But now, at last, CD-V is here, and perhaps, despite the confusion that is sure to ensue, its future is a little more promising than I had at first thought.

One reason is that Polygram is putting greater emphasis on 12-inch classical releases than it had initially—which is where I think the biggest audience lies. The player population is much larger there, and the big CD-Vs can build on the growing (if slowly) success of Pioneer's mostly movie-oriented Laserdiscs. Polygram now recognizes that it will take time to develop a strong base of players capable of handling the 5-inch CD-Vs. Whether the company understands *how* long and hard that process may be remains unclear, however.

Polygram is acting as though it considers CD-V the "next big thing," even though players that will handle all versions of CD-V are large and relatively expensive. And for manufacturers to build 5-inch CD-V capability into standard-size CD players, they have to see a market. How many people want to pay seven to ten dollars for half-a-CD's worth of music plus a short video? Is that lone video such a strong attraction that someone would choose a CD-V over a less expensive 3-inch CD containing perhaps as much music or a standard CD costing a few dollars more but delivering twice to three times the playing time?

The other question mark is how CD-G (CD-Graphics) fits in. CD-G is a system for putting lower-resolution, still-frame images on a television screen while the music is playing. These can be anything from cover art to song lyrics, and because they fit into subcode space already allocated in the original Compact Disc standard, they do not reduce playing time. On the other hand, they do require special circuitry in the player and a video output. Since CD-V players also need video outputs, it seems only natural that CD-G capability be included too.

Yet, I see no sign of a move in that direction. Warner New Media is busy developing CD-G, and the first commercial CD-G disc is supposed to be available now, while Polygram is saying that it sees CD-G as something to come in, further down the road, after CD-V is established. We may well see separate CD-G and CD-V players (if we see either) before there are machines that can do it all. That's silly, but I don't get the feeling that anyone is really in charge of CD development anymore—which is too bad for all of us.

The brightest spot in this mess is CD-3, which as I said last year is a genuinely good idea that has a good future ahead of it. The first 3-inch releases are out, and more are in the wings. If you'd like to see what our music critics think of the initial offerings in this new format, turn to this month's Backbeat. □

L E T T E R S

NO NOISE ON "ABBEY ROAD"?

Mr. Ranada mentions in his August "Bits & Pieces" column that Sonic Solutions processed the Beatles *Abbey Road* CD with its No Noise system. Is this the one EMI released, CDP 46446? If it is, I sure don't hear much of an improvement. There is a lot of hiss on this disc. I know that the master tapes are probably very noisy, as a friend of mine has a copy of the collector's-grade vinyl LP that he bought in Japan, and it too is quite hissy. Or is there another release of *Abbey Road* that has been processed with No Noise? If so, I would be very interested in knowing; I was disappointed that EMI's digital remastering didn't get rid of the hiss.

Alex Hrapunov
Goldvein, Va.

Digital remastering can't of itself remove noise that already is present in the original recording; it can only prevent further sonic degradation. Our understanding is that the No Noise process was used on some tracks but not all. Presumably, those tracks were in unusually bad shape. Remember, too, that we don't know how aggressively the system was applied. It could well be that EMI preferred to use the bare minimum of processing necessary to eliminate just the worst noise and not run the risk of altering the desired signal in any way. In any event, there is only one official EMI release of the Abbey Road *Compact Disc.—Ed.*

TAPE SQUEAL

Robert Long's recent column on tape squeal ["Tape Tracks," July] prompts me to write about my own experiences. In the mid-1970s, I began buying prerecorded open-reel tapes from Ampex, Barclay-Crocker, and the Reel Society. After about five years, the Ampex double-length tapes began to squeal. Now *all* my Ampex tapes squeal, while the others continue to play without problem.

The squealing occurs when the tape vi-

JOE WIESENFELDER

High Fidelity's 1988 ASME interns Michael Mettler and Michelle Beaulieu

Good help is hard to find? You really couldn't prove it by us. For the past four summers, HIGH FIDELITY has taken on two journalists-in-training through the American Society of Magazine Editors' (ASME) Magazine Internship Program. This year, ASME selected 63 college students from across the country to be placed as interns at 56 different magazines.

Our interns were Michelle Beaulieu from Simmons College in Boston, Massachusetts, and Michael K. Mettler from Drake University in Des Moines, Iowa. Michelle, from Presque Isle, Maine, is pursuing a dual concentration in English and communications, while Michael, from Homewood, Illinois, is majoring in magazine journalism and minoring in English. The two seniors are now back at school after a nine-week stint on the job. Their main responsibility was to oversee the production of our magazine TEST REPORTS, which will appear on newsstands this month. Supervisor for the pair was our Group Assistant Managing Editor Margaret Schmucker, who was a 1986 ASME intern here.

"The internship program was not only a great opportunity to participate in magazine publishing; it was a chance to live in New York among journalism students from all over the country," said Michelle. "I made some good contacts, but—more important—I made some good friends." She was the editor of last spring's Senior Job Booklet at Simmons and is a journalism teaching assistant this fall.

"The best thing about being at HIGH FIDELITY was that we were responsible for the production work behind an entire magazine," Michael told us. "We felt much closer to the project because it was pretty much our own baby." Michael, whose interest in music is reflected in a CD collection numbering into the hundreds, is now editor of *DM Magazine*, the metropolitan magazine of Des Moines, and he also serves as copy editor and columnist for Drake's student newspaper, *The Times-Delphic*. Michael plans to return to New York next May, after his graduation: "This is where the heart of the magazine business is, and I couldn't imagine being content elsewhere."

WHAT MAKES ONE AUDIO BRAND SOUND BETTER.

CD PLAYERS have always been susceptible to errors in converting digital data to analog audio. In fact, academic researchers recently declared that error in converting the Most Significant Bit is a primary cause of audible problems. Every Denon Compact Disc Player since 1983 has corrected this problem with the Super Linear Converter.

Now, with the new "Delta" conversion circuit, Denon's DCD-3520 and DCD-1520 represent the closest approach yet to true 16-bit linearity. Denon's 20-bit 8x oversampling digital filter joined to a pair of true 20-bit Super Linear Converters quite simply elevate digital playback to a new level of musicality.

DCD-1520

But then, Denon built the world's first professional digital audio recorder back in 1972. And we've recorded digital master tapes of unsurpassed musical accuracy.

It's simply easier to make digital audio sound more like music when you know what music sounds like.

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▶THE FACT IS, YOU SHOULD LISTEN TO NEC.

Fact: Over 1400 movies on videotape and laser disc have been encoded with Dolby® Surround Sound.

Fact: Compact discs have established a new level of audio realism.

Fact: TV broadcasts in rich, full-bodied stereo have become the rule, rather than the exception.

With all the amazing new audio source material that's available these days, it's understandable that you'd want to rush right out and get the equipment you need to enjoy it.

But the fact is, much of the equipment that promises to turn the act of listening into a big thrill, can actually turn out to be a big disappointment.

Which is why, when it comes to the subject of Surround Sound, you really should listen to NEC.

▶NEC HAS MORE EXPERIENCE WITH SURROUND SOUND THAN ANYONE ELSE.

And that's not the only thing that gives us an edge. You see, NEC Corporation is the leading maker of semiconductors. Since the technology of Surround Sound is largely dependent on microprocessors, we're in a unique position to create the exact circuitry necessary to give you the most lifelike sound.

For example, only NEC offers digital delay circuitry throughout its entire Surround Sound line.

Many of our components have adjustable digital delay, which lets you fine-tune delay time, in millisecond increments, to suit the acoustics of your room.

And all our Surround Sound components feature genuine Dolby circuitry, so you can take full advantage of the Dolby Surround Sound information encoded on so many tapes and discs.

What's more, our high-end components offer a level of Surround Sound that is unsurpassed by anyone in the industry.

It's called Dolby Pro-Logic Surround.

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For sheer audio realism, it rivals anything you've ever heard in any movie theater.

Pro-Logic circuitry is remarkable for its ability to deliver far better channel separation than conventional systems can: from 26 to 40dB, as compared to only about 3dB.

What's more, Pro-Logic has an active center channel—a separate, additional sound track—which conventional systems lack.

This center channel dramatically heightens realism.

Sound seems to emerge, not from any given speaker, but rather from the precise point in space that it should.

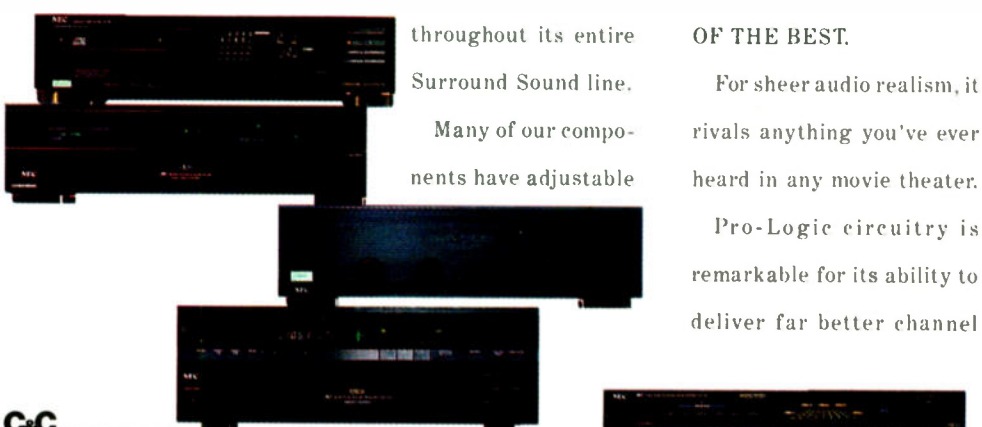
It also *moves* to follow the action of whatever's making the sound, whether it's a bee buzzing slowly across the screen, or an F-16 blasting over your head.

▶YOU'VE GOT TO HEAR IT TO BELIEVE IT.

The feeling you get from NEC Surround Sound is impossible to describe in words. Which is why you should ask an NEC dealer for a demonstration.

It'll help reinforce one very important fact:

Certain things in life simply cannot be compromised.



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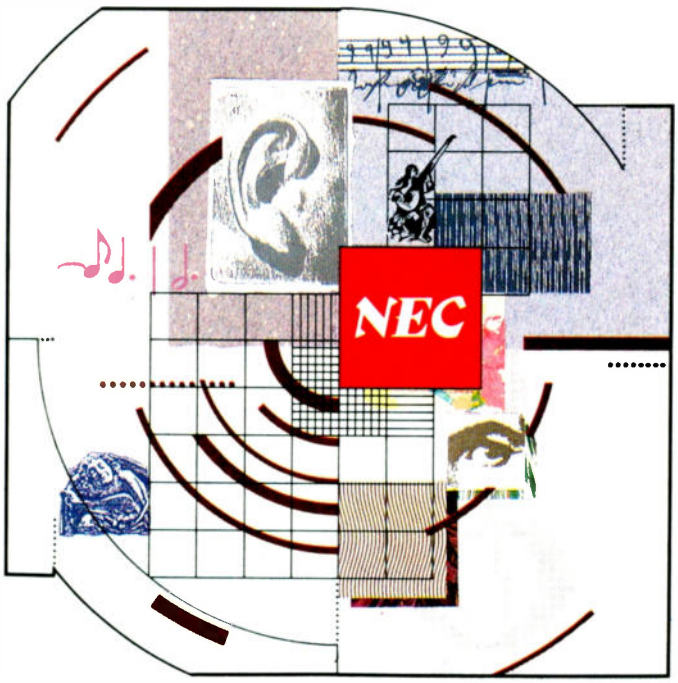

A Renaissance

in Sound

AVX-910

COMPREHENSIVE AUDIO/VIDEO SWITCHER

Provides great system flexibility by allowing switching capability between a large number of audio and video inputs and outputs. It also provides output monitoring and record modes for both audio and video. Its advanced circuitry features Digital Video Noise Reduction. To ensure absolute signal integrity, the AVX-910 is built with independent circuits for both audio and video signals plus an independent power supply for each of these signals. In addition, it provides you with S/VHS inputs/outputs.

PLD-910

DOLBY PRO-LOGIC SURROUND SOUND DECODER

The PLD-910, digitally, provides logic steering of all the audio signals. Its capabilities include Dolby Pro-Logic Surround and Creation Surround. A L/R independent dual variable 16-bit digital delay circuit ranges from 1 to 94 msec in 0.1 msec steps. Independent power supplies and independent circuit boards are employed for both digital and analog circuits assuring you of signal integrity.

Renaissance Series

AVX-910
COMPREHENSIVE AUDIO/ VIDEO SWITCHER

No. of Terminals	Inputs	Outputs
Audio/Video	5*	3*
Audio—Only	5	1
A/V Monitor Output	—	1**
A/V Record Output	—	1**
Audio Level/Impedance		
Maximum Input	10Vrms/47k ohms	
Maximum Output	10Vrms/1k ohms	
Video Level/Impedance		
Inputs/Outputs	1Vp-p/75 ohms	
S-Inputs/Outputs	1Vp-p/75 ohms (luminance) 0.28Vp-p/75 ohms (chroma)	
Frequency Response	5Hz—100Hz +0, —3dB	
Power Source	120VAC, 60Hz	
Dimensions (W x H x D)	43.0 x 8.0 x 34.0 cm 16-15/16 x 3-5/32 x 13-3/8 inches	
Weight	7.2kg (15-7/8 lbs.)	

*For each of 2 video inputs and outputs, there is also a S-terminal.
**In addition, 1 S-terminal.

PLD-910
DOLBY PRO-LOGIC SURROUND SOUND DECODER

Signal-to-Noise Ratio	90dB (Out 2/Dolby) 100dB (Out 1/Stereo)
Total Harmonic Distortion	0.005% (Out 1/Stereo)
In/Output Level/Impedance	
Input	150mV/47k ohms
Out 1	1V/1k ohms
Out 2 (A,B)	1V/1k ohms
Center	1V/1k ohms
Mono	1V/1k ohms
Surround Decoder	Dolby Pro-Logic surround/ "Creation" surround
Digitol Delay Circuit	
No. of Channels	2 (left/right independent)
Quantization	16 bits linear
Sampling Frequency	44.1kHz
Frequency Response	10Hz—20kHz±1dB
Dynamic Range	90dB (Out 2/"Creation" surround/delay on)
Delay Time	1—94msec. (0.1msec. steps) 15—30msec. (Dolby Surround)
Power Source	120VAC, 60Hz
Dimensions (W x H x D)	43.0 x 8.0 x 34.0 cm 16-15/16 x 3-5/32 x 13-3/8 inches
Weight	7.9kg (17-13/32 lbs.)

AVD-700
AUDIO/VIDEO SWITCHER/ SURROUND SOUND DECODER

No. of Terminals	Inputs	Outputs
Audio/Video	5	3
Audio—Only	5	1
Mono-Output	—	2
DECODER SECTION		
ANALOG STAGE (By-Poss mode)		
Signal-to-Noise Ratio	100dB	
Total Harmonic Distortion	0.005%	
Frequency Response	10Hz—100kHz (+0, —3dB)	
DIGITAL STAGE		
Dynamic Range	90dB	
Total Harmonic. Distortion	0.02%	
Frequency Response	10Hz—20kHz (+0.5, —1dB)	
Delay Time	1mSec—92mSec (1mSec Step)	
GENERAL		
Power Requirement	120V AC, 60Hz	
Power Consumption	33W	
Dimensions (W x H x D)	430 x 80 x 340 mm 16-15/16 x 3-5/32 x 13-25/64 inches	
Weight	7.3kg (16.1 lbs.)	
Accessories	Instruction Booklet Wireless Remote Control Unit	

PLA-610
A/V SURROUND SOUND PRO-LOGIC AMPLIFIER

AMPLIFIER SECTION		
Rated Output	30W + 30W	
Total Harmonic Distortion Rate	0.03%	
Frequency Responses (by-pass mode)	10Hz—40Khz (—2dB)	
SN Ratio (Main in)	100dB	
No. of Terminals	Inputs	Outputs
Audio/Video	4	2
Audio—Only	2	1
Center Channel	—	1
Mono (Subwoofer)	—	1
Delay Time	15, 20, 25, 30mSEC	
Dimensions (W x H x D)	16-15/16 x 3-5/32 x 13-3/8 inches	

M-50
MONAURAL AMPLIFIER

Rated Output Power	50W (8 ohms) 100W (4 ohms)
Dynamic Power	240W (2 ohms), (Direct Input)
Frequency Response	5Hz—300kHz
Total Harmonic Distortion (at Rated Output Power)	0.004% at 8 ohms (20Hz—20kHz) 0.006% at 4 ohms (20Hz—20kHz)
Signal-to-Noise Ratio 115dB or more (Direct Input)	
Input Sensitivity/Impedance	
"Filtered 0.15"	150mV/47k ohms
"Filtered 1.0"	1.0V/47k ohms
"Direct"	1.0V/20k ohms
High Filter	150/500/7k/15k/30kHz (—3dB with 6dB/oct.)
Low Filter	18/35/70/150/500Hz (—3dB with 6dB/ocl.)
Power Requirement	120VAC, 60Hz
Power Consumption	120W
Dimensions (W x H x D)	8-17/64 or 8-9/32 x 4-23/32 x 14-31/32 inches (210 x 120 x 380 mm)
Weight	8.2kg (18 lbs.)

NOTE: Design and specifications are subject to change without notice.

DOLBY SURROUND™ DOLBY SURROUND™ PRO · LOGIC

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NEC

PLA-610

A/V SURROUND SOUND PRO-LOGIC AMPLIFIER

This very sophisticated amplifier works with all four surround sound effects: Dolby Pro-Logic, Hall, Matrix and Concert. It has a combination of 10 input/output terminals ranging from audio/video inputs/outputs to center channel and monaural (subwoofer) outputs. Its many sophisticated features include a variable 16-bit digital delay circuit. The power amplifier is rated at 30 watts x 2 (8 ohms). It stores three memory presets for Surround Sound, volume level and delay time.

AVD-700

AUDIO/VIDEO SWITCHER/SURROUND SOUND DECODER

This component offers the user great flexibility in the selection and creation of sound modes. It accommodates Dolby, Hall, Matrix and Creation with a Surround Sound memory control. A variable 16-bit digital delay circuit functions from 1 to 92 msec in 1.0 msec increments. Its left and right channels are provided with independent digital delay adjustments. For great flexibility in operation, it offers a wide array of audio and video in/output terminals.

As we move towards the 21st Century, the integration of Computers and Communications (C&C) will increasingly enhance the quality of life, increase productivity and nurture creativity through the human touch, as people are freed from the tedium of mundane tasks. NEC is dedicated to the future of C&C and digital technology...

NEC has its heritage in communications since our founding in 1899 as a manufacturer of telephone sets and switching equipment. We have grown and expanded for almost a century, always on the leading edge of the most advanced technologies. Thus, we have a comprehensive perception of the potential of the entire spectrum of computing and communications devices.

Our experience and long-term commitment to C&C and digital technology has resulted in the development of what we believe to be the finest audio system components available. We have skillfully integrated the best of computer and communications technology, employing digitalization, to create our new Renaissance Series of Integrated System Components.

The Renaissance Series is a marvel of "multi-dimensional" sound reproduction. It establishes a new level of sensory experience that you could never before enjoy in your own home. Keep your eyes and ears on us in the future for additional innovative and outstanding developments in the field of audio components.

M-50
MONAURAL AMPLIFIER

The M-50 amplifier features three selectable inputs. It can be used directly with a compact disk player, a preamp and directly with another audio component such as an AM/FM tuner. Its high current drive capability ranges from 50 to 240 Watts. Five selectable crossover frequencies for both high and low cut filters provide a 6dB octave slope for use with Bi-amp and Tri-amp systems. A direct-coupled DC servo features a low-noise FET input.

A RENAISSANCE IN SOUND

Sound has been vital on Earth since our planet acquired its atmosphere and produced the first vibrations that reached a receiving ear. Somewhere, sometime, way back then sound was born. What was that first sound? If only we could have been there to record its birth millions of years ago!

Think of all those glorious sounds gone unrecorded. The roar of Tyrannosaurus. The clashing of endless armies over the centuries. Cries and laughter and all the music and singing over the ages. Gone forever!

Not entirely. All these sounds and sights have been recreated in endless films, video cassettes and laser disks. Even the future exists in sight and sound, in science fiction adventures such as the Star Wars Trilogy. But...until now, sound reproduction in your home was more like a painting. Regardless of its beauty, it was two-dimensional. It lacked the visceral feeling of multi-dimensional reality and controllable power.

As man and his arts enjoyed a Renaissance in the 14th Century, so does man and his sounds, and sights, enjoy one in this decade. NEC offers you a true Renaissance in total sensory experience through our Renaissance Series of integrated system components.

You will hear sound reproduction in your home as you could never possibly experience it prior to this significant advance.

You will be surrounded by sound as you have experienced it in a theater, where Dolby® Surround Sound has become the industry standard. Through its commitment to leading edge technology, NEC brings this advanced and technically sophisticated system to the comfort and convenience of your home. Stereo Hi-Fi video cassettes and laser disks are encoded with the Dolby multi-channel sound information you cannot experience without this system. In fact, the Renaissance Series enables you to enjoy true Dolby Surround Sound from any stereo television broadcast encoded with Dolby Surround Sound.

With the Renaissance Series, video will take on a new life and sensory power through this system which allows you total mastery of sound emanating from all directions. The NEC Renaissance Series is so sophisticated it will simulate the multi-dimensional effect even from non-Dolby sources. The NEC System is designed for the discerning and demanding listener.

The system also accommodates your own creative preferences. You can create your own state-of-the-art multi-dimensional matrix of sound. In effect, you can engineer sound to take maximum advantage of the acoustic qualities of your home "Media Room." You simply cannot duplicate NEC Renaissance sound quality and characteristics by adding speakers to a traditional sound system.

NEC Renaissance Sound can re-create every subtle nuance of a dramatic live experience and combined with video, create the total sensory effect as vivid as being in a million dollar theater. In this case, hearing is believing.

NEC's circuitry and architecture in the Renaissance Series demonstrates its dedication to producing superior products for the most demanding and knowledgeable users.

Listen!

L E T T E R S

brates as it passes over the erase head, and it happens on both my tape decks, so the equipment is not to blame. Cleaning the erase head fixes matters, but only for about five minutes. My theory as to the cause of the vibration is that the tape used by Ampex was defective in some way. The lubrication that is a normal part of tape formulation apparently has dried out prematurely. The only long-term solution I have found is that on one of my decks I can misthread the tape so that it does not contact the erase head. If anyone knows a better approach, I would appreciate hearing about it.

Richard C. McDonald
Lakeland, Fla.

See this month's "Tape Tracks."—Ed.

PROTECTING YOUR HEARING

As you say in your editorial ["Front Lines," July], overamplification does exist, and it is becoming more and more widespread. Musicals that used to rely on the singing capabilities of the actors may now be performed with body mikes on all but the most minor characters. Not only does the voice quality become poorer, but the sense of space from a singer at the back of the stage is lost.

I recently attended the New York City Opera version of *Madama Butterfly* at SPAC (the Saratoga Performing Arts Center). They didn't use body mikes, but they had several boundary-type microphones strung along the edge of the stage. As the singers moved to the front of the stage, where they needed less amplification, they had *more*. The voice quality became harsh and pointed, and the sound level was actually too high. To make matters worse, all voices were localized about 40 feet above the center of the stage. Great singing but bad sound.

High sound levels certainly can cause hearing damage, but there is some evidence that the harm is less if the listener is not tense: more danger for the uptight worker than for the happy music listener. There is some probability that the greater damage is the result of the reduced blood flow that tightened muscles can cause, even in the head.

A mild criticism of the sound-level table in the feature "Unsound Sound" [July] and the related text is that the distances associated with each of the levels are not given: Smaller distances mean higher levels and greater damage. It has been common to call 85 to 90 dBA the threshold for ear damage. The OSHA (Occupational Safety and Health Administration) criterion, however, is based on the industrial acceptance of a considerable threshold shift over a 25-year work period. As I have pointed out to many people, the unnoticed threshold shift during youth gets added to that from the aging process: Now you are fifty and can't hear soft conversations or music. Too late! Dr. Karl Kryter has cautioned that all sounds louder than 70 dBA may contribute to raising the hearing threshold.

My own experience is that a lot of people listen to music at maximum levels of as much as 100 dBA or more. The problem is greatest with pop and rock, because the music stays at a high level from beginning to end. A typical classical piece has a great range of levels, allowing the ear to rest at least momentarily, even if the highest levels match those for rock. Because high levels fatigue the hearing mechanism, pop and rock performers tend to keep increasing the volume to maintain the same sensation for themselves. Unfortunately, the probability of hearing damage is increasing at least as fast. Musicians are gradually becoming aware of the problem, but they still judge sound level by ear. I also observe that the listeners (their customers) want the sound very loud.

Howard A. Roberson
Berkshire Sound Laboratory
Pittsfield, Mass.

Thank you for your editorial and special section on hearing preservation in the July issue. The material is interesting and very valuable.

For the dB figures given on page 45 and elsewhere is it correct to assume that the measurements are of rms values and are averaged over some period of time? Since the peak-to-average ratio will vary with the type of music and the dynamic range of the medium, how will this affect the choice of safe listening levels? For example, classical music, especially from a Compact Disc, typically has a high peak-to-average ratio, so an average level of 80 dBA at the ear will include much larger crests. I have been working on a high-quality headphone amplifier and, given the sensitivity specifications of typical phones, would like to be able to calculate the maximum power levels that would be useful and safe.

Julian L. Kurtz
Livingston Manor, N.Y.

Your assumption that the figures represent averages is correct. In most cases, the average level is more important than the amplitude of brief peaks.—Ed. □

All letters should be addressed to The Editor, HIGH FIDELITY, 825 Seventh Ave., New York, N.Y. 10019. Letters are subject to editing for brevity and clarity.

"If I Had It To Do All O
This Is Hc

"The technology for a new generation of loudspeaker systems was already here," says Henry Kloss. I was just the first one to put it together right."

"Right," in this case, meaning a stereo system that allows the integration of speakers into a room in a way that's never before been possible.

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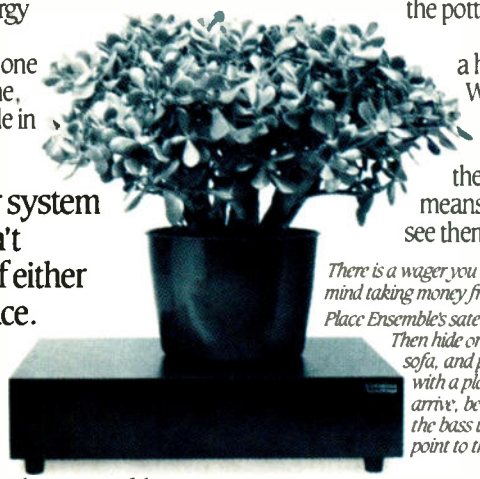

The first speaker system that doesn't cheat you out of either bass or space.

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The frequencies completely ignored in the so-called "mini-speakers" now in vogue...

Ensemble provides them. With two dedicated, acoustic-suspension loudspeakers whose jobs are solely to reproduce the bottom two octaves of musical significance.

It is by design, not afterthought, that Ensemble comes with two, not one, bass units.

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They are a compact 12" ×21" ×4.5". Yet they generate the low-frequency energy that would ordinarily require either a pair of very large conventional loudspeakers, or adding on a massive "subwoofer." Moreover, using two separate easily placed bass units dramatically reduces the creation of standing waves—the bane of pure hi-fi reproduction.

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There is a wager you can make, if you don't mind taking money from house guests. Place Ensemble's satellites where they're visible. Then hide one of the bass units under the sofa, and put the other on the floor with a plant on it. When your friends arrive, bet them to point out where the bass is coming from. They'll point to the satellites. Every time.

As for the other 8 octaves of music.

The rest of the sound spectrum, from a nominal crossover of 140 Hz, is reproduced by a stereo pair of two-way satellite units. Each incorporates a low-frequency driver, crossing over at 2,700 Hz to a direct-radiator tweeter that goes beyond audibility.

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This is more difficult than it may sound.

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ver Again...And I Do... w I'd Do It."

Henry Kloss. Member of the Audio Hall of Fame. The creator of Acoustic Research in the 1950's, KLH in the 1960's, and Advent in the 1970's—the dominant speakers of their decades—now brings you Ensemble: the best-sounding speaker system of this era.

on a small number of sales, but from selling a lot of systems to a lot of people. You, perhaps, among them.

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Cloning Tube Sound

Tubephiles will lust after Carver's new cost-no-object Silver Seven vacuum-tube power amp ($17,500 per stereo pair). So they could be just a little peeved that the practical Mr. Carver has also produced what he says is its sonic duplicate in the $799, solid-state M-4.0t stereo power amp. According to Carver, a particular amp's sound is described by its "transfer function," the exact mathematical relationship between output signal and input signal. The Silver Seven's transfer function has been designed into the M-4.0t.

Both amps are rated at 375 watts (25.7 dBW) per channel into 8 ohms, from 20 Hz to 20 kHz, with no more than 0.5 percent THD. The M-4.0t employs Carver's Magnetic Field design, which results in a lightweight (23-pound) unit that draws current only as needed—therefore generating little heat and obviating the need for heavy heat sinks. Bridged for mono, the 4.0t has a rated clipping power of 1,000 watts (30 dBW). Another new Magnetic Field power amp, the $549 M-0.5t, is rated at 140 watts (21.5 dBW) per channel but does not feature bridged operation or the Silver Seven's transfer function.

Carver's top AM/FM receiver is the new 6250 ($899), rated at 125 watts (21 dBW) per channel and including the company's highly regarded Asymmetrical Charge-Coupled FM tuner section, which works to reduce background noise and the audible effects of multipath interference. The unit also features Carver Sonic Holography, a process that widens and deepens the stereo soundstage, and a generous array of inputs including two for video sound. A wireless remote operates most receiver functions as well as those of Carver CD players. *Carver Corp., P.O. Box 1237, Lynnwood, Wash. 98046.*

3-D TV Sound

With the advent of MTS (stereo) TV, manufacturers began paying closer attention to the audio sections of their sets. Perhaps the best example of this is the Zenith/Bose connection. Now Toshiba is making its move by incorporating Carver Sonic Holography in four of its high-end large-screen stereo TV sets. So far, two direct-view models—the 27-inch CX-2788 ($1,800) and the 30-inch CX-3088 ($2,800), both with subwoofers—and two rear-projection sets—the 46-inch TP-4688 ($3,500) and 52-inch TP-5288 (price not yet available)—incorporate the spatial-expansion circuitry. Sonic Holography works by canceling interaural crosstalk, so that your right ear hears sounds almost exclusively from the right channel, and vice versa for your left ear. The effect widens the stereo soundstage and tends to add some depth as well (on stereo material, of course). *Toshiba America, 82 Totowa Rd., Wayne, N.J. 07470.*

Flexible Power

As a power amp for a surround-sound system, the NEC AVA-505 ($449) is hard to beat. It operates in a three- or five-channel mode, accommodating surround-sound processors both with and without a built-in stereo amp. For example, the AVA-505 can provide 30 watts (14.8 dBW) per channel to front and back speaker pairs and 60 watts (17.8 dBW) to the center speaker in a full-fledged Dolby Surround

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Arthur Fiedler & The Boston Pops—Capriccio Italien-Capriccio Espagnol (Orinda) 364257

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C U R R E N T S

setup. Alternatively, the front and back amps can be bridged to provide 60 watts to each of the three front channels, while your processor or another stereo amp powers the back channels. Volume knobs on the 505's front panel enable you to balance levels in either mode. *NEC Home Electronics, 1255 Michael Dr., Wood Dale, Ill. 60191.*

Sony GV-8 Video Walkman

Personal Video

That's Sony's blanket term for a new generation of portable video products, exemplified by the GV-8 Video Walkman. The GV-8 contains an 8mm VCR, a VHF/UHF TV tuner with a telescoping antenna, a three-inch color LCD screen, and a built-in speaker. Other features include an external antenna connector, audio and video input and output connections, a one-event program timer, and a sleep timer that shuts off the set after one hour. The unit can be run from either DC, supplied nickel-cadmium rechargeable batteries, or alkaline batteries in an optional external case. The GV-8 weighs less than three pounds and measures just 5 by 8 inches across and 2½ inches thick. It's incredible, and you pay for it: $1,300.

The striking quality of the GV-8's color LCD will probably change your mind about the viability of such devices. It's available without the VCR in the 2.7-inch FDL-330S ($650), a cube-shaped set whose tuner "pack" can be removed to make the monitor small and light enough to mount on a camcorder. An audio-video input and an earphone jack are included, and the unit runs on DC or batteries. *Sony Corp., Sony Dr., Park Ridge, N.J. 07656.*

A/V Centerpiece

Yamaha's AVX-100U ($699) is a "master control" center for audio-video surround-sound systems. It contains two separate stereo amps—65 watts (18.1 dBW) for the front channels and 14 watts (11.5 dBW) for the back—plus a digital-delay surround-sound processor featuring Dolby Surround and seven other effects. The back channel amps can be bridged to supply 28 watts (14.5 dBW) to a center channel. As befits a master controller, the AVX-100U contains a slew of audio and video connections (including an S-video input), an elaborate independent recording-out selector, and a comprehensive remote that operates other Yamaha "RS" audio and video components. The unit's operating modes can be displayed on a TV monitor, and a titling feature enables you to superimpose three 24-character lines on a video recording. *Yamaha Electronics Corp., 6660 Orangethorpe Ave., Buena Park, Calif. 90620.*

Autosound Fashions

Last month's "Autophile" mentioned Clarion's new Audia 6000 car CD changer ($1,649), a 12-disc model with a stalk-mounted control head that can be removed for safekeeping and to program CD sequences at home. A similarly eye-catching design is used for the 720EQ seven-band electronic equalizer ($500), which features a surround-sound processor with a three-preset digital delay line. As many as five EQ curves can be memorized and the spectrum analyzer display has eight different modes to aid in making EQ adjustments. A three-position subwoofer crossover is included.

Clarion says its 5510RP autoreverse cassette/receiver ($390) was designed by a young female Japanese engineer. That may explain its unusual and refreshing styling, which Clarion thinks will appeal predominantly to young women. The unit comes in white or charcoal and contains a two- or four-way high-power amp. We welcome new styling trends for car audio, and don't see any reason why a man wouldn't appreciate the Clarion's look. ("Hey, sweetheart, I got this radio for *you*.") *Clarion Corp., 5500 Rosecrans Ave., Lawndale, Calif. 90260.*

Sweet 18

The prices of 18-bit CD players are dropping, as evidenced in two new models from Onkyo. The DX-5500 ($600) and the DX-7500 ($700) each feature dual 18-bit digital-to-analog converters (DACs), the former model employing a four-times oversampling digital filter and the latter's filter operating at eight times the standard rate. Both units incorporate "Opto-Drive," wherein an LED controls a phototransistor that is said to generate a highly

(Continued on page 96)

Answers to Readers' Questions

By Larry Klein

Specialized Speakers

My local audio dealer told me that different types of speakers should be used for rock and classical music. Is there any truth in his position?

Martin Gaylord
Milwaukee, Wis.

It is true that a speaker that does a fine job of reproducing chamber music may not be suitable for rock, but only because it lacks the efficiency and acoustic-output capabilities (in the bass or overall) to attain the desired loudness levels. If rock or other electronics-based music causes distortion because your amplifier runs out of power attempting to drive your low-efficiency speakers, or because your speakers overload since they have inadequate power-handling capacity, then other speakers with greater efficiency or power-handling ability would, of course, do a better job. However, the desirability of good performance in all the other traditional audio criteria—frequency range and smoothness, minimal distortion, and so forth—continue to be valid.

Most people who suggest different speakers for different music really haven't thought out the matter. If you want high-fidelity performance—meaning that the output of the speaker mimics, as faithfully as possible, the signal fed into it—then there can be so such things as rock or classical speakers, only good and bad ones. And a high-quality speaker should be able to reproduce signals accurately no matter what kind of music is involved. For example, if the recording has been engineered so that its bass has extra "sock" and its strings added "bite," the speakers should deliver those qualities—neither more nor less. And the only way a speaker can do that is when it doesn't have *designed-in* "sock" or "bite." In other words, a speaker that is able to deliver loud rock with true fidelity should do just as good a job when reproducing string quartets.

Power Needs

I recently installed one of Radio Shack's inexpensive audio power meters in my system and I'm perplexed by its readings. According to the meter, my amplifier is never called upon to deliver more than 20 watts per channel, even when played at very loud levels. Are my large bass-reflex speakers that efficient, or is the meter in error? Although I don't hear any distortion on peaks, I worry whether my 65-watt amplifier is adequate.

Daniel Pomeroy
Covington, Ky.

Using a very accurate power-indicating meter with medium- to low-efficiency speaker systems, I found that I averaged perhaps 2 watts on background-level music, 20 watts on loud peaks, and 200 watts on momentary very loud peaks. Other speakers I have used required about 10 dB less power (translating to 0.2, 2, and 20 watts, respectively) to acheive the same loundess levels. Therefore, it is quite possible that a 65-watt amplifier is more than adequate for your large bass-reflex (vented) speaker systems, and that it never actually is called on to deliver its full output capacity.

When dealing with conventional cone speaker systems, it is helpful to keep in mind that there are design trade-offs involving enclosure size, efficiency, and low-bass response. The larger the system, the more efficient it is likely to be. Given equivalent-size systems, the more efficient units are likely to have less very low bass response than the less sensitive ones. In short, it is indeed difficult to achieve low bass from an efficient small box without some kind of electronic assistance.

Ear Training

I've been told that home equalizers are useful devices for "ear training." Can you give me more information?

Max Segal
San Diego, Calif.

Aside from their many corrective virtues—described in my November 1987 article "The Joys of Equalization"—equalizers *are* wonderful training tools. Time spent with an equalizer may convince you that most of the elusive sonic properties, positive and negative, discussed endlessly among audiophiles are simply minor frequency-response variations that the ear translates into colorations and other sonic artifacts.

If you gently manipulate the equalizer's controls while listening for the effect on the music, you'll find bands that increase or decrease harshness, hollowness, airiness, muddiness, resolution, and so forth. For example, the transparency, "air," inner detail, and clarity provided by some moving-coil cartridges and a few amplifiers can be duplicated in other equipment by a slight boost of the two upper-octave sliders of a ten-band equalizer.

Some readers will be disillusioned to learn that the special sonic qualities of some very expensive audio products result from nothing more than minor response anomalies; but that's life. Although equalizer-derived ear training may temporarily turn you into a cynic, ultimately it could make you into a more critical listener, one who is better able to appreciate genuine sonic advances when they do appear. Besides, your friends will be impressed when, on first hearing, you confidently proclaim that a new speaker's response is down by 3 dB at 80 Hz and that it has a 4-dB peak in the 3-to-8 kHz region.

We regret that the volume of mail is too great for us to answer all questions.

Keeping VHS and VHS Hi-Fi On-Track

By David Ranada

While on a recent tour of Mitsubishi's VCR-manufacturing facilities in Kyoto, Japan, I was introduced to the technology behind a simple but fascinating new VHS-deck feature that automates one of the few remaining signal-quality adjustments left on a VCR: the tracking control. Except for 8mm units and some of the newest Mitsubishi VHS models, until recently all home VCRs had tracking controls. The controls' function—keeping the video heads aligned with the recorded video tracks—is best explained by analogy. The one used in Mitsubishi's American sales-training literature is so appealingly vivid that it bears quotation in full:

Suppose [a] bottling plant's conveyor belt is set up for 100 bottles per minute. Also, the machine to cap the bottles is set up for 100 bottles per minute. If the machines are synchronized, or "in phase," then as the bottles pass, the capping machine will precisely cap each bottle. If not, then the capping machine will miss each bottle as it passes. This will happen even though each machine is working at exactly the right speed. One might imagine synchronizing the machines by briefly slowing or speeding up the conveyor belt until the capper is aligned with the bottles. This is precisely how a tracking control works.

In this analogy, the bottles represent the videotape passing by, and the capping machine stands for the VCR's rotating head-drum assembly (that silver cylinder you can see by pushing open your VCR's cassette door). For greater accuracy, the Mitsubishi paper should mention that the capper speed might also be varied to achieve perfect synchrony.

Likewise, a tracking control is used to center the sweeping video heads *precisely* (to within a few micrometers) over the recorded tracks on the tape by adjusting the tape and head-drum speeds or phases. Such accuracy is required in order to obtain the best carrier-to-noise (C/N) ratio from the video and FM-audio signals, if any, on the tape. Improvements in C/N ratio translate into increased video and FM-audio signal-to-noise ratios. And that, in turn, leads to the traditional recommendation for how to adjust tracking: Turn the control (or push the tracking buttons) so that the amount of noise (snow or graininess) is minimized. The point of proper adjustment is most easily seen with a non-moving image; on rented movies, I use that FBI warning at the beginning.

A tracking control is most important when playing a tape recorded on a VCR different from the one used for playing it. Since a tracking control compensates for very slight geometrical mismatches between the recorder and your playback deck, it has no effect during recording and, ideally, need not be adjusted when playing tapes made on your own machine.

But Mitsubishi's Twin Digital Tracking system will do this automatically, anyway—with a couple of twists. First, it continually optimizes tracking throughout a tape, so that a tape recorded on more than one machine always receives the proper compensation. Second, it seeks the best balance between optimum video tracking and optimum VHS Hi-Fi tracking, for the two are often different (if there is no Hi-Fi soundtrack, the circuit adjusts for best video tracking only). Apparently the disparity between the optimum video and FM-audio tracking points stems from the different head configurations used in various VHS and VHS Hi-Fi units. At times, one may not be able to perfectly adjust video tracking without slightly degrading the audio, or vice versa. That's why Mitsubishi decks bearing the Twin Digital Tracking feature also have a defeat button and a manual tracking control. These would most likely be used when audio playback needs to be at its best, since the Hi-Fi tracks seem to be more obviously degraded as tracking goes off-center.

Mitsubishi is not the only company to have come up with an automated tracking-control adjustment. At last June's International Conference on Consumer Electronics, an engineering convention in Chicago, two engineers from the West German consumer-electronics research and development laboratories of International Thomson (parent now of GE's and RCA's consumer electronics divisions) delivered a paper on an "Alignment Free Digital Videorecorder-servo Concept." In it, they describe a system very similar to Mitsubishi's maximum-envelope-detection scheme for controlling head/tape tracking. They also state the *true* reason for computerizing the process: lower manufacturing costs. "The problem was how to reduce production costs and get a higher precision for the necessary adjustments," the Thomson paper explained. The system, like Mitsubishi's, regulates the head-drum and capstan motor's speeds and phases via a microcomputer acting through digital-to-analog converters. "The advantage of a digitally regulated system is that there are no loop adjustments necessary."

As I recall the layout of the Mitsubishi VCR assembly lines (I wasn't allowed to photograph them), very little of the work there was actually performed by people. Assembly of the mechanically complex tape transport was done by a line of machines, as was the insertion of the multitude of electronic parts into the circuit boards. The only portions of the process done by humans was a little assembly and the final electrical and mechanical adjustments. So, as with digital filters in CD players (see "The Overselling of Oversampling," p. 61), digital technology, while perceived as a performance booster, is often introduced for strictly economic reasons. It can lower parts and production costs while possibly increasing audio and video performance—thereby justifying the higher price charged for the newfangled feature. Twin Digital Tracking is such a good idea, however, that I hope Mitsubishi makes it a part of all of its VCRs. □

JVC

Super Digifine Hi-Fi Components

JVC's line of new-generation digital-ready audio components
is opening a new age in super-high fidelity.

The JVC Super Digifine Series — More accurate digital sound and more digital applications.

As super-fidelity digital becomes more and more established in the audio market, we find ourselves entering a new phase of the digital revolution — one in which the quality of sound is determined by much more than just the program source.

At JVC our leading-edge expertise in digital technology has helped us to develop newer, more diverse applications in which digital techniques have enhanced sound reproduction. We call the components that embody these new radical digital applications "Super Digifine." They are the successors to our original "Digifine" series of components that ushered in the first phase of the digital age.

Our "Super Digifine" series includes components from amplifiers to speaker systems, and even features a revolutionary digital acoustics processor designed to recreate a live performance ambience at home.

Enter the new age of digital with JVC.

SX-911WD
3-Way Speaker System

XP-A1000BK
Digital Acoustics Processor

AX-Z911BK
Digital Pure-A Integrated Amplifier

SUPER DIGITAL

JVC's line of new-generation digital-ready audio components is opening a new age in super-high fidelity.

XL-Z555BK
Compact Disc Player

TD-V711BK
Discrete 3-Head
Cassette Deck

RX-1001VBK
Programmable
Remote/Computer-Controlled
Receiver

Digital Applications for Higher Sense of Power and Presence

AX-Z911BK Amplifier — Digital Pure-A for pure and powerful sound

JVC's innovative Digital Pure-A Circuit provides both true class-A operation and a high power of 100 watts*, thanks to the newly developed digital "signal prediction" circuit. As you may know, class-A amps have long been the serious audiophile's dream because, unlike common class-B amps, they don't allow output transistors to switch on and off, hence pure, low-distortion sound is possible. But because of their high cost, they have been out of reach of most music lovers until now.

* Per channel, min. RMS, both channels driven into 8 ohms, from 20Hz to 20kHz with no more than 0.003% total harmonic distortion

High-power class-A operation — that's Digital Pure-A

The new Digital Pure-A Circuit is a class-A amplifier combining pure sound, high power, high efficiency, and compact size. It takes advantage of the fact that digital signals can be stored in memory temporarily, without degrading phase response or frequency response.

During operation, our made-for-digital circuit takes digital signals direct from the output (optical or coaxial) of a CD player, and splits them into two: the main and the "prediction" signals. The main signal is sent to a time base processor where it's stored in memory for about 150msec. before it goes to the D/A converter. The other, the prediction signal, is sent to a prediction circuit where the level of the upcoming main signal is measured, and a prediction output signal is generated by analyzing the level of the D/A-converted main signal and the amplifier's output signal. Based on this prediction, the power-supply voltage control circuit adjusts the voltage supplied to the power amp.

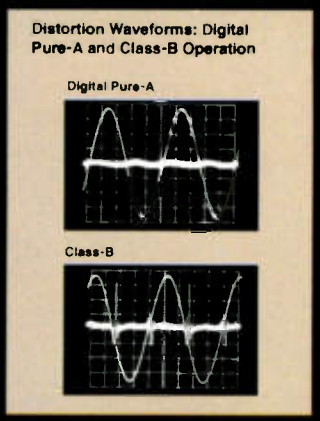
Programmable power supply for high efficiency

Most of the time, our Digital Pure-A Circuit provides the power amp with low power-supply voltage. But when the "predicted" power output exceeds the threshold of 20 watts, the circuit increases the power-supply voltage to provide higher power — no less than 100 watts.

Switching the power-supply voltage occurs approximately 120msec. *before* the temporarily stored main signal is read out of memory. In this way, signal prediction gives the power supply time enough for it to switch from low to high before the musical signal reaches the power amplifier.

Thus the power amplifier operates in low-distortion class-A most of the time, but without creating excessive heat. The result: both delicate and dynamic sounds are reproduced with clarity and an extra sense of power.

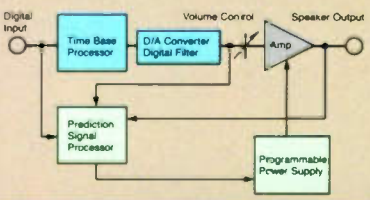
Distortion Waveforms: Digital Pure-A and Class-B Operation



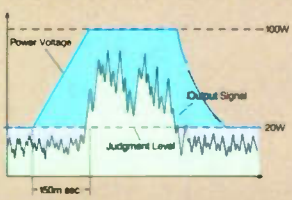
Customized for digital reproduction

The AX-Z911BK is custom designed for superb digital reproduction. It's complete with a D/A converter featuring a 4X oversampling digital filter. There are terminals for direct connection of digital equipment: an optical input, a coaxial input and an in/output for DAT. A "D/A CONVERTER DIRECT" circuit directly connects the D/A converter to the power amp. And the digital and analog circuitry are completely separated to reduce digital noise.

Digital Pure-A Circuit



Conceptual Operation of Digital Pure-A Circuit



If the level of the output signal is predicted to go beyond the judgment level 150 msec. *later*, the power voltage is automatically increased to a high level to prevent the signal from clipping.

AX-Z911BK Digital Pure-A Integrated Amplifier

- 100 watts per channel, min. RMS, both channels driven into 8 ohms, from 20Hz to 20kHz with no more than 0.003% total harmonic distortion
- Digital Pure-A Circuit for class-A operation to provide low-distortion digital sound (For digital signal)
- Dynamic Super-A with Gm Driver for better in-use performance (For analog signal)
- "D/A CONVERTER DIRECT" for direct D/A converter-to-amp connection
- Built-in D/A converter with quadruple oversampling digital filter
- 3 digital connections: one for optical, one for electrical (coaxial) and an in/output for DAT
- Separate layout for digital and analog circuits for reduced interference
- Circuit layout for shortest signal path to ensure "pure" signal transmission
- High-gain phono equalizer for MM/MC cartridges
- Low-noise motor driven volume control
- Bass response control
- Gold-plated terminals
- "Dimensional" multi-function display
- Wireless remote control

XP-A1000BK Digital Acoustics Processor — life-like ambience

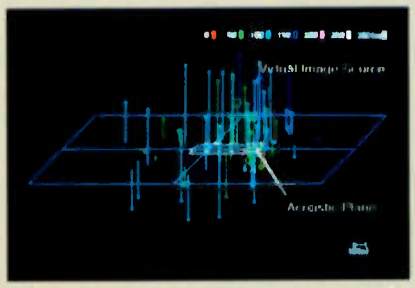
No matter how faithfully your stereo system reproduces music, there is one thing missing from the sound it plays back: that sensation of "being there." The acoustics of a hall produce certain reverberations that just can't be realistically reproduced with a standard stereo system. The new JVC Digital Acoustics Processor gives you a digital way to simulate the acoustics of a live performance, recreating a realistic "sound field" right in your own listening room. It's a revolutionary engineering concept that gives you all the pleasure of live music.

The sound field — what makes the sound come alive

A sound field is simply the ambient characteristics of a live music environment. When a sound is generated it disperses in all directions. First you hear the direct sound from the source. That's followed by the early reflections — a group of sounds that are reflected by the walls and ceiling. Finally, you hear reverberations from random directions over a relatively extended period. Each live music space has its own individual sound field, or pattern of reflections and reverberations. And it's basically this pattern that gives you a clue to the size of a space.

JVC's Digital Acoustics Processor

Our Digital Acoustics Processor simulates the sound field where live music is performed, by accurately replicating directions and levels of reflections and reverberations in the digital way. To make it possible, JVC even developed the computerized way to measure live music environments: the "symmetrical 6-point sound field analysis method." The processor contains a ROM (Read-Only Memory) where the vast amount of data from actual measurements is stored. A newly-developed digital acoustics processing LSI synthesizes the early reflections with proper direction, timing and reverberation, according to data stored in the ROM. Digital processing is performed in 16-bit quantization at sampling rate of 48kHz, combining a 4X oversampling D/A converter and a 64X oversampling A/D converter. The entire process operates channel by channel, to ensure accurate recreation of sound fields.



Symmetrical 6-Point Sound Field Analysis Pattern
In order to develop the XP-A1000BK, we first had to develop a computer-aided acoustics measuring system to analyze a variety of sound fields. In this analysis, the center of each circle represents the location of a "virtual image source" relative to the direct sound source, and the size its intensity.

Symmetrical 6-Point Sound Field Measurement Device

Custom-Designed "Digital Acoustics Processing" LSI

Accurate sound field pattern generation in any environment

Each recording site has its own sound field, and so does your listening room. To accurately reproduce a desired sound field in your room for a particular type of recording, therefore, ambience of the listening room must be "neutralized" when a program is played back. Otherwise, there may be excessive reflections and reverberations, which can totally ruin the sense of realism. Our Digital Acoustics Processor lets you adjust not only the parameters for the source program (size, liveness, etc.) but also those for the listening room and the recording site. As a result, our processor can recreate the ambience of any musical environment in any listening room and from any kind of musical program — a feat no other similar processor can duplicate.

20 memory-resident and 20 user-programmable sound field patterns

Our Digital Acoustics Processor has 20 programmed sound field patterns in memory — patterns for concert hall, recital hall, church, jazz club, stadium, and so forth — so that you can choose the one that best suits the type of music you select. Moreover, you can create and store in memory twenty of your own sound field patterns, the patterns that are customized to the acoustic conditions of your listening room and to your listening habits.

XP-A1000BK Digital Acoustics Processor

- Newly-developed LSI for digital signal processing
- Digital processing using 16-bit quantization and 48kHz sampling
- 4X oversampling D/A converter and 64X oversampling A/D converter
- 20 programmed sound field patterns in ROM and 20 user-programmable sound field patterns
- Adjustable acoustic parameters: Sound field size, liveness, frequency response, etc.
- Accurate compensation for ambience of listening room and source program
- Direct digital inputs and outputs: optical and coaxial
- 4/6-channel system configuration selectable
- 6-ganged motor-driven remote-controlled volume control
- Programmable fluorescent display

20 Preset Sound Field Patterns

NO.	PROGRAM NAME	TYPE	NO.	PROGRAM NAME	TYPE
1	SYMPHONY HALL 1	SHOEBOX TYPE	11	LIVE CLUB 1	JAZZ CLUB
2	SYMPHONY HALL 2	SHOEBOX TYPE	12	LIVE CLUB 2	DISCOTHEQUE
3	SYMPHONY HALL 3	SHOEBOX TYPE	13	PAVILION	LIVE CONCERT
4	SYMPHONY HALL 4	VINEYARD TYPE	14	GYMNASIUM	HARD-FLOORED HALL
5	SYMPHONY HALL 5	VINEYARD TYPE	15	STADIUM	OUTDOOR LIVE CONCERT
6	SYMPHONY HALL 6	VINEYARD TYPE	16	MOVIE THEATER 1	SMALL SPACE
7	RECITAL HALL	SMALL MUSICAL SPACE	17	MOVIE THEATER 2	MEDIUM-SIZED SPACE
8	OPERA HOUSE	WITH TIERED SEATING	18	MOVIE THEATER 3	LARGE SPACE
9	CATHEDRAL	GOTHIC STYLE	19	MOVIE THEATER 4	EXTRA LARGE SPACE
10	CHURCH	HIGH-CEILINGED SPACE	20	MOVIE THEATER 5	STANDARD

Adjustable Parameters

	PARAMETER	ADJUSTABLE RANGE		PARAMETER	ADJUSTABLE RANGE
1	ROOM SIZE	0.5—2	7	REAR DELAY	15—30 ms
2	LIVENESS	0.5—2	8	SPREAD/POINT	SPREAD/POINT
3	LOW PASS FILTER	1—16kHz, THRU	9	LISTENING ROOM REVERB	0.2—0.6 ms
4	REVERB LEVEL	0—2	10	LISTENING ROOM SIZE	10m² or less, 10—16m², 16m² or more
5	HIGH-FREQUENCY REVERB	0.1—1			
6	OFFSET DELAY	0—200 ms	11	SOURCE REVERB	0—5 sec

XL-Z555BK CD Player — high-tech features for better digital sound

Some people seem to think that today's CD players have reached the limits of digital technology after all, they say, digital is digital — so there's no difference in sound quality between players. We've found, however, that there *is* a difference between models, and it is intimately related with the digital and analog technologies built into the players. With our advanced engineering in audio behind, JVC has come up with a series of technologies to provide even better digital sound. And the XL-Z555BK is proof.

New high-precision 3-beam laser pickup design
Our newly designed pickup combines high sensitivity, precision, stability and immunity to resonance and vibration.

New High-Precision 3-Beam Laser Pickup

Stability and resistance to vibration and resonance are improved thanks to a new suspended actuator. The pickup is also compact and lightweight, improving tracking accuracy and reducing "servo noise."

4X oversampling digital filter
Our 4X oversampling digital filter uses a sampling frequency that's four times higher than normal (176.4kHz instead of 44.1kHz). Used in combination with a gentle-attenuation quality analog filter, it reduces noise and phase distortion to give you clear, well-defined digital sound.

"New Y Servo System" for superior tracking ability
Our new servo system uses two special tracking beams — one leading and one trailing the main beam. The difference between the two signals is compensated for, and they are compared so as to cancel each other out. The result: The pickup remains locked on the correct track, even when the disc is dirty or scratched.

Disc/track indication and multi-disc editing
Two special features make the XL-Z555BK easier to use. You can give a name up to 10 characters long to a disc or a track, and store as many as 512 of them in memory for display on playback. And you can program up to 48 tracks chosen from six different discs so you can easily transfer them to tape.

XL-Z555BK Compact Disc Player

- Quadruple oversampling digital filter for smooth, precise response
- Twin high-speed D/A converters for precise imaging
- JVC high-precision 3-beam laser pickup
- New Y Servo System for superior tracking ability
- JVC "Opticalink" system for low digital noise
- Digital outputs: one optical and one coaxial
- Double-floating Independent Suspension System
- Disc/track title indication to name tracks and discs
- Remote control with volume control and numeric keypad
- Ready to play 3-inch (8cm) "CD singles"
- Random access programming of up to 32 tracks
- Auto/multi-disc editing key for cassette recording
- Random play, intro-scan, 5-way repeat, index play

RX-1001VBK Receiver — exquisite ease of use with computer control

The JVC RX-1001VBK is a supreme example of how computers make your life easier. From remote operation to graphic equalizer, a computer takes charge to provide you with the exceptional operating versatility and flexibility that simply defy your imagination.

"Programmable" A/V remote control
Our "programmable" A/V remote control means that you can operate not only the receiver itself but also other JVC audio components *and* video components from a single remote. What's more, it has capacities to learn more functions of any audio and video component, whatever its make. And the RX-1001VBK's remote even comes equipped with a touch-panel LCD (Liquid Crystal Display) that serves as a multi-page menu and convenient touch panel.

To Program, Place Our Remote End-to-End with Other Remote.

JVC's Digital Acoustics Processor
The receiver features the Digital Acoustics Processor, the kind found in our XP-A1000BK. The realistic sound field it creates puts you where music is performed live — right in your own home. Conveniently, five types of sound fields (SYMPHONY HALL, RECITAL HALL, CHURCH, LIVE CLUB and STADIUM) are preset for instant recall.

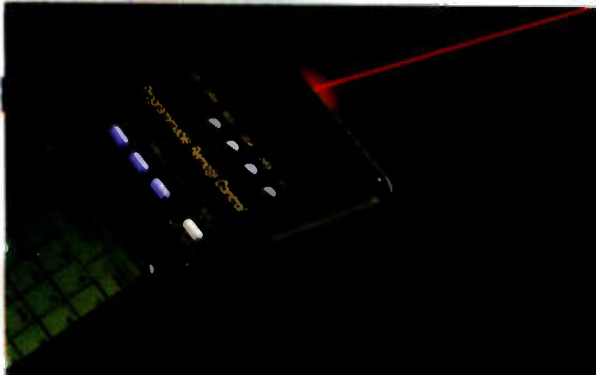
Computerized S.E.A. graphic equalizer
With a computer at command, our S.E.A. graphic equalizer is more versatile and easier to use than ever. You can equalize the sound from the remote, recall any from five "programmed" equalization curves, and create and put into memory the equalizations you've created, along with custom names.

Computerized digital tuner
Again, by using a computer, we've improved ease of tuning and added new tuning conveniences. Up to 40 FM and AM stations may be preset and recalled instantly. Preset scan lets you "sample" stations. A signal strength indicator is dB-calibrated for accurate direct readout. It's even possible to give each station the name of your choice.

RX-1001VBK Programmable Remote/Computer-Controlled Receiver

- 4-channel amplifier for front/rear speaker operation
- 120 watts per channel, min. RMS, both channels driven into 8 ohms, from 20Hz to 20kHz with no more than 0.007% total harmonic distortion (2-channel operation)
- "Programmable" remote control with touch-panel LCD
- Digital Acoustics Processor for precise sound field control
- Digital-delay Dolby Surround with adjustable delay
- Ready to control 3 video inputs, with dubbing and "Sound Selector"
- Computer-controlled 7-band S.E.A. graphic equalizer with 5 user-created and 5 "namable" programmed preset equalizations
- Computer-controlled digital synthesizer tuner, with 40 FM/AM presets, auto memory, more
- Dynamic Super-A with Gm Driver
- Interactive CCS (COMPU LINK Communications System)

The red beams in the photo are drawn for illustration only.



TD-V711BK Cassette Deck — wider dynamic range, flatter response and purer sound

With extremely wide dynamic range and low distortion, digital sound has been a single program source that conventional cassette decks cannot compete in terms of specifications. The TD-V711BK, however, is the cassette deck expressly designed for recording digital sounds whole and complete.

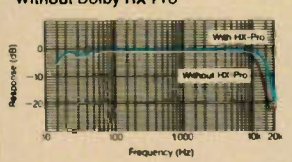
Closed-loop dual-capstan drive
With a sophisticated closed-loop dual-capstan drive, the portion of tape that runs across the heads is constantly held taut, pinched by two capstans/rollers. This design improves the head to tape contact for better response, and also shuts out external disturbances from vibrating the tape. This results in reduced intermodulation noise. It's thanks to our solid tape drive (and the 3 head design) that you can enjoy pure and clean taped sound.

Designs for purer sound
Another way we've ensured higher sonic purity is using a direct and straightforward circuit design, to reduce the chance of noise and distortion pickup. That's why input selector switches and the volume potentiometer are located at the back of the chassis, and operated by "remote shafts." For the same purpose, we also use PCOCC (copper of highest purity) wire and OFC (Oxygen-Free Copper) in the heads and in the circuit board, and provide two direct inputs to accept outputs from source programs like a CD player. Dolby HX-Pro contributes to purer sound, too, by expanding the high-frequency dynamic range.

Discrete 3-Head Design Featuring SA Head and Amorphous Head

Two-Motor Full-Logic "Silent" Mechanism

Frequency Responses With and Without Dolby HX-Pro



The Dolby HX-Pro circuit improves the tape's MOL (Maximum Output Level) at high frequencies. It lets you enjoy wider dynamic range at high frequencies as well as at others.

SX-911WD Speaker System — designed for high purity and transparency

JVC has designed the SX-911WD from the ground up, with the sole purpose of making a speaker system matched with digital programs in every way. Now you can enjoy pure, clean and transparent sound, completely stripped of any trace of muddiness and fuzziness of conventional systems.

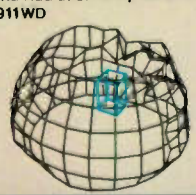
Cloth carbon woofer and midrange
Light weight, high rigidity, high speed of sound and optimized internal loss — our new cloth carbon diaphragm for the woofer combines the most ideal properties demanded of a diaphragm material. The result is the bass sound that's extended, crisp and rich. The midrange uses a similar material called "fine" cloth carbon to provide clear and natural mids.

Rigid Pure-Aluminum Frame for SX-911WD Woofer

Amorphous-diamond coated tweeter
Much of the reason for high transparency of the SX-911WD lies in the high-tech tweeter design. It uses a dome diaphragm with a titanium base on which a thin layer of amorphous diamond is coated by chemical vapor deposition. Featuring uniform thickness, high purity and smooth surface, this coating increases the diaphragm's speed of sound to almost that of natural diamond. So the transient response is dramatically improved, as are purity and transparency.

Unresonating, solid frames and enclosure
Every speaker unit is housed inside a solid, unresonating die-cast aluminum frame cylindrical in shape to disperse vibrations efficiently. The enclosure is constructed by solid 1-inch (25mm) particle boards. The panels are conifer-based to provide superb musical sonority. Front and rear baffles are mounted with additional cleats to increase the rigidity of the cabinet and make it resistant to resonance and vibration. And the front baffle has rounded corners to reduce diffraction and provide better definition.

Sound Radiation Response of the SX-911WD



TD-V711BK Discrete 3-Head Cassette Deck

- Monitor-capable 3-head configuration. SA head for record and amorphous head for play
- Computer-controlled two-motor full-logic mechanism
- Closed-loop dual-capstan drive with direct-drive motor
- 2 "DIRECT" inputs for direct connection with CD players, etc.
- PCOCC coil and lead wired in heads, and OFC plating on circuit boards for higher purity
- Straightforward circuit layout for clean signal transmission
- Separate circuit construction for low interference
- Low-impedance voltage-tracking regulated power supply
- High-rigidity chassis and large insulators for low resonance and vibration
- Dolby HX-Pro and double-Dolby B/C noise reduction

SX-911WD 3-Way Speaker System

- 12-3/8-inch (31.5cm) cloth carbon woofer for the bass sound that's crisp, extended and rich
- 5-inch (12cm) "fine" cloth carbon midrange for rich and natural midrange sound
- 1-3/16-inch (3cm) amorphous diamond coated tweeter transparency and superior transient response
- Low-resonance/vibration die-cast aluminum speaker frames
- High-density conifer-based particleboard enclosure for musical sonority
- Round-cornered front baffle to provide razor-sharp definition
- 3-part crossover network to prevent interference
- Computer-optimized speaker layout for natural sound field reproduction and clear sonic imaging
- High power handling capacity 150 watts/300 watts (music)

SPECIFICATIONS

AX-Z911BK Digital Pure-A Integrated Amplifier

OVERALL CHARACTERISTICS	
Output Power	**100 watts per channel, min. RMS, both channels driven into 8 ohms from 20Hz to 20kHz, with no more than 0.003% total harmonic distortion** 105 watts per channel, min. RMS, into 8 ohms at 1kHz, with no more than 0.0005%* total harmonic distortion
Total Harmonic Distortion	
AUX to SP OUT	0.003% at 100 watt output, 8 ohms, 20Hz to 20kHz 0.0005%* at 105 watt output, 8 ohms, 1kHz
PHONO to SP OUT	0.007% at 100 watt output, 8 ohms, 20Hz to 20kHz, −20dB volume
Power Bandwidth	7Hz to 60kHz (IHF, both channels driven, 8 ohms, 0.02% total harmonic distortion)
Frequency Response (8 ohms)	
TUNER/AUX/CD/TAPE	DC to 200kHz +0dB, −3dB
REC Output Level/Impedance	400mV/400 ohms (ANALOG) 2.0V/550 ohms (DIGITAL)
Input Sensitivity/Impedance (1kHz)	
PHONO MM	2.5mV/47k ohms (+6dB)
PHONO MC	200μV/470 ohms (+6dB)
TUNER/AUX/CD/TAPE	400mV/30k ohms
Signal-to-Noise Ratio ('66 IHF/'78IHF)	
PHONO MM	90dB/80dB (REC OUT)
PHONO MC	74dB (250μV input)/73dB (REC OUT)
TUNER/AUX/CD/TAPE	112dB/85dB
PHONO EQUALIZER SECTION	
Phono Overload (1kHz): MM	100mV (0.007% total harmonic distortion)
MC	7mV (0.007% total harmonic distortion)
RIAA Phono Equalization: MM	±0.2dB (20Hz to 20kHz)
MC	±0.2dB (20Hz to 20kHz)
D/A CONVERTER SECTION	
Sampling Frequencies (Auto Selection)	32k, 44.1k, 48kHz
Total Harmonic Distortion	0.0035% (1kHz)
Dynamic Range (1kHz)	97dB
Signal-to-Noise Ratio	102dB
Dimensions (W×H×D)	18-3/4×6-9/16×17-7/16 inches 475×166×442mm
Weight	44.1 lbs. (20kg)

* Measured by JVC Audio Analysis System

XP-A1000BK Digital Acoustics Processor

Level/Impedance: Input	2V/47k ohms
Output	2V/50Ω ohms
Total Harmonic Distortion:	
MAIN OUT	0.002% (1kHz, 2V output)
D.A.P. OUT	0.005% (1kHz, 2V output)
Frequency Response:	
MAIN OUT	5Hz — 100kHz (+0, −3dB)
D.A.P. OUT	5Hz — 20kHz (±0.5dB)
Dynamic Range: MAIN OUT	110dB
D.A.P. OUT	94dB
Signal-to-Noise Ratio:	
MAIN OUT	110dB
D.A.P. OUT	94dB
Dimensions (W×H×D)	18-3/4×4×14-3/16 inches 475×101×360mm

RX-1001VBK Programmable Remote/Computer-Controlled Receiver

AMPLIFIER SECTION	
Output Power	
2-Channel Operation	**120 watts per channel, min. RMS, both channels driven into 8 ohms from 20Hz to 20kHz, with no more than 0.007% total harmonic distortion**
4-Channel Operation	(Front Channels) **110 watts per channel, min. RMS, both channels driven into 8 ohms from 20Hz to 20kHz, with no more than 0.007% total harmonic distortion** (Rear Channels) 15 watts per channel, min. RMS, into 8 ohms at 1kHz, with no more than 0.07%* total harmonic distortion
Total Harmonic Distortion (8 ohms, 1kHz)	0.003%* at 125 watt output
Input Sensitivity/Impedance	
PHONO MM	2.5mV/47k ohms
PHONO MC	250μV/100 ohms
VIDEO SOUND/AUX/CD/TAPE	230mV/47k ohms
Signal-to-Noise Ratio ('66 IHF/'78 IHF)	
PHONO	80dB/80dB (REC OUT)
VIDEO SOUND/AUX/CD/TAPE	100dB/85dB
Frequency Response	
PHONO	20Hz — 20kHz (+0.5dB)
VIDEO SOUND/AUX/CD/TAPE	5Hz — 50kHz (+0, −1dB)
S.E.A. SECTION	
Center Frequencies	63, 160, 400, 1k, 2.5k, 6.3k, 16kHz
Control Range	±10dB
FM TUNER SECTION (IHF)	
Usable Sensitivity	10.3dBf (0.9μV/75 ohms)
50dB Quieting Sensitivity:	
MONO	14.8dBf (1.5μV/75 ohms)
STEREO	38.3dBf (22.5μV/75 ohms)
Distortion (1kHz)	
MONO/STEREO	0.08%/0.08%
Signal-to-Noise Ratio (IHF-A Weighted)	
MONO/STEREO (at 85dBf)	84dB/78dB
Selectivity (±400kHz)	70dB
Capture Ratio	1.5dB (10mV/300 ohms)
Frequency Response	30Hz — 15kHz (+0.5, −0.8dB)
AM TUNER SECTION	
Usable Sensitivity	250μV/m (Loop antenna) 30μV (External antenna)
Signal-to-Noise Ratio (100mV/m)	50dB
Selectivity (±10kHz)	38dB
VIDEO INPUTS/OUTPUTS	
Output Signal Level	1Vp-p (at 1Vp-p input)
Impedance	75 ohms unbalanced
Synchronization	Negative
Signal-to-Noise Ratio	45dB
Crosstalk	45dB (3.58MHz)
Dimensions (W×H×D)	18-3/4×6-3/16×15-1/8 inches 475×156×383mm
Weight	29.8 lbs. (13.5kg)

*Measured by JVC Audio Analysis System

XL-Z555BK Compact Disc Player

Frequency Response	2Hz — 20kHz
Total Harmonic Distortion (1kHz)	0.0035%
Dynamic Range (1kHz)	97dB
Signal-to-Noise Ratio	100dB
Channel Separation (1kHz)	92dB
Wow and Flutter	Unmeasurable
Output Level	2.0V RMS
Dimensions (W×H×D)	18-3/4×4-9/16×11-1/2 inches 475×115×291mm
Weight	12.6 lbs. (5.7kg)

TD-V711BK Discrete Three-Head Cassette Deck

Frequency Response (at −20 VU)	
Metal Tape	10 — 22,000Hz (15 — 20,000Hz ±3dB)
SA/Chrome Tape	10 — 20,000Hz (15 — 18,000Hz ±3dB)
Normal Tape	10 — 20,000Hz (15 — 18,000Hz ±3dB)
Signal-to-Noise Ratio	59dB● (Metal)
Wow and Flutter	0.022% (WRMS)
Crosstalk (1kHz)	65dB
Channel Separation (1kHz)	40dB
Harmonic Distortion	
Total (0VU, 1kHz)	1.0% (Metal)
K3 (0VU, 1kHz)	0.5% (Metal)
Input Sensitivity/Impedance	
Line Input×2	80mV/50k ohms
Output Level/Impedance	
Line Output×2	300mV/600 ohms
Headphones	0 — 1mW/8 ohms (Matching impedance: 8—1k ohms)
Dimensions (W×H×D)	18-3/4×5-1/4×13-1/4 inches 475×132×336mm
Weight	18.3 lbs (8.3kg)

● Measured from peak level, weighted, without NR. The S/N is improved by about 15dB at 500Hz and by about 20dB above 1kHz with Dolby-C NR on, and by 5dB at 1kHz and by 10dB above 5kHz with ANRS/Dolby-B NR on

SX-911WD 3-Way Speaker System

Type	3-way, acoustic suspension
Speakers:	
Woofer	12" (30.5cm), cloth carbon cone
Midrange	4-1/2" (11.5cm), cloth carbon cone
Tweeter	1" (2.5cm), amorphous-diamond coated dome
Power Handling Capacity	150 watts 300 watts (Music)
Impedance	6 ohms
Sensitivity (1m on axis)	91dB/W·m
Frequency Range	40 — 50,000Hz
Crossover Frequencies	500Hz, 4kHz
Dimensions (W×H×D)	15×26-3/16×13-7/8 inches 380×665×351mm
Weight	62.8 lbs. (28.5kg)

Two Sad Stories

By Robert Long

Just after my last column on tape squeal had gone to press, for the July issue, I received a copy of a paper on the subject, written by Scott Kent, a Boston-area recording engineer. The paper focuses on professional open-reel tapes, but the effects it describes are those about which so many readers have complained.

According to Kent, at least some tape-squeal problems appear to be caused by volatile elements that combine with binder elements to create a sticky "goo." If your deck's erase head starts picking up a residue that is difficult to remove, your tapes may be suffering from this syndrome. The alternate sticking and release of the tape caused by the goo produces the tape squeal. In extreme cases, Kent says, the fore-and-aft vibrations, which cause squeal acoustically in the tape and electrically in the reproduced signal, can actually redistribute the magnetic particles and permanently "record" a squeal on the tape.

The extent and nature of the problem has only recently been revealed as record companies haul out their priceless old analog tapes (some supposedly stored under ideal archival conditions) for digital remastering onto CD. To counteract the problem (at least for about 30 days—long enough to make a digital dub), Kent heats the affected tapes in an industrial forced-air oven that can maintain temperatures within ±3 degrees Fahrenheit. Times and temperatures aren't stated, since this is a proprietary process. I wouldn't try it at home, but open-reelers with important tapes to save may want to write Kent at BKM Associates, Box 22, Wilmington, Mass. 01887.

Tape stock made in the late 1960s is the most affected at present, and some tapes dating from as late as 1983 are showing symptoms. Among the specific brands mentioned in the paper, one name recurs insistently: Ampex. And that brings me to my other sad story. Ampex, once unarguably the premier name in tape, whether consumer or professional, is virtually unknown to many home recordists today. What happened?

Alexander M. Poniatoff, whose name forms the basis of the company's, began making radar subassemblies during World War II. By 1947 the Navy contract had ended, and Poniatoff was left with production facilities in the San Francisco area but nothing to produce. Enter Jack Mullin, with two Telefunken Magnetophons "liberated" from Hitler's Germany and with prospects of recording the Bing Crosby radio show for ABC. The catch was a Crosby stipulation that Mullin had to find a U.S. source of tape recorders as a backup for the Magnetophons; otherwise the deal was off. Working with Mullin—and with 3M (then Minnesota Mining & Manufacturing), which supplied the tape—Ampex created the Ampex 200 recorder. Then ABC itself ordered Ampexes, and Columbia Records used them to create the master tapes for its new LP medium. Soon the new Ampex 300s and 350s were *the* way of recording life.

Ampex entered the blank-tape field by purchasing the Irish Tape plant in Opelika, Alabama. Irish had been founded as a less expensive competitor to MMM's Scotch brand, which (thanks partially to the Ampex connection) had set the standards by which all other tapes were measured in this country. The next logical step was to add prerecorded tapes, and Ampex at one time offered dubs of masters licensed from the WEA (Warner/Elektra/Asylum) group, Deutsche Grammophon, London, Philips, Angel, and others. They were content to let Ampex do the work for what was, initially, a tiny market.

It was in the 1970s when I realized that something was amiss. At Ampex Tape's head office, then housed in a shiny new complex in Elk Grove Village, Illinois, I was received by a PR man who evidently cared nothing about music: To him, it was a commodity interchangeable with canned soups or disposable diapers. Corporate Big Time was the name of his game. I was not impressed.

Without my noticing, the unraveling had already begun. In the 1960s, Ampex put Rein Narma in charge of consumer products and gave him his head in designing an open-reel line that would blow the world's socks off. This part of the story is most painful to tell, because I had known Rein a decade earlier as an engineer of unquestionable intelligence and integrity, with a childlike enthusiasm that was altogether disarming. Now I saw him struggling to acquire the glib polish appropriate to a corporate executive. It didn't sit comfortably on him.

Narma's strikingly original recorder line included what I believe was the world's first self-threading automatic-reverse model. It also offered an ingenious approach to level monitoring: a pair of neon bulbs. You were told to keep the recording control low enough for the first bulb to flash only occasionally but high enough for the second bulb to stay lit most of the time in typical music. It was accurate, and it was simple.

But consumers hated the idea. "Professional" decks had meters. Who could take seriously a model using only a couple of little lightbulbs? Forget the problematic ballistics of even the most expensive meters and the expense of even the cheapest ones. The buying public wanted meters, and that was that. The decks' designs were just too radical to be successful. Later, Ampex was able to rouse a flurry of interest with Philips-built cassette decks—among the first to appear on the American market—but the rapid proliferation of competing models completed what had begun with the open-reel fiasco, and Ampex retreated from the consumer equipment business.

The prospect of profits from the growing market for prerecorded cassettes encouraged erstwhile suppliers to take over their own tape duplication, and Ampex backed out of that field. After one last and, technically, quite successful foray into premium blank cassettes, the company abandoned retail products altogether. R.I.P. □

Test Drive: Kenwood System

By Christopher J. Esse

Part of the fun—hell, *a lot* of the fun—in evaluating autosound systems is getting to drive a bunch of different cars. I was extra happy when Kenwood informed me that its system would be parked in a 1986 Saab 900 Turbo, because I'd never driven one. This would also give me a chance to confirm what I've always read about Saabs: that they are just a little weird. There *is* a very serious Kenwood sound system in this car, so bear with me for a moment.

Okay—the starter is on the center console, but you probably knew that. No problem. However, it's mid-July, 95 moist degrees, and I can't find the power-window buttons, but I do manage to open the sunroof. "International" symbols on all the controls are about as revealing as so much hieroglyphics. Check the gearshift. Is it in neutral? Can't tell, since it just won't budge. An irate New Yorker has been waiting for this parking spot for three minutes now. Put in the clutch, start the car. Finally, the shifter moves—but where's reverse? A leather knob covers the gear map, and the car is inching toward the garage wall in front as I keep selecting forward gears. Ah! Found the window buttons. The guy is honking now. And there's reverse, down and to the right, just pull up on a ring under the knob. Pay the cashier a couple hundred dollars (New York, remember?), and we're off.

Close to the family estate now, opening up the throttle. My right foot gets momentarily caught under the edge of an underdash panel, pinned against the pedal: unintended continued acceleration. Pull into the mile-long driveway, power down, key won't come out. Fifteen minutes later I discover that the shifter must be put in reverse to release the key. The Saab has managed to make me feel as if I just got my license.

Kenwood packed a lot of its best stuff into the Saab, starting with the ultrasophisticated KRC-9991I cassette/tuner. Back in March 1986 HIGH FIDELITY reviewed the original 999, calling it the "most complex car stereo unit we've tested." How complex is the new version? Consider that it has the same three-piece configuration as its predecessor: a small power-supply module, a separate chassis housing the tuner circuitry, and the main head unit, which has an input for a CD player and front and rear preamp outputs (all DIN connectors) on its back panel. The head unit's control layout has been modified, some features added and a couple dropped. There is now a wireless remote control, about the size of a deck of cards, that operates volume, mute, tuning or tape-wind, and tape eject. The infrared receiving "eye"—not an integral part of the head unit—can be positioned over a wide area. The price of admission for the 9991I is about $1,500, and you may rightfully ask what kind of show you get for your money.

The question should really be: What *don't* you get?

Operation is divided into three sections: tape, tuner, and equalizer. The full-logic, autoreverse tape deck has most of the playback features of a good home model: Dolby B and C *and* DBX noise reduction, nine-selection skip search, "index scan" (samples the beginning of each selection), and blank skip. The last automatically forwards the tape (even to the next side) through unrecorded sections lasting more than about ten seconds—particularly useful at the end of a short tape side. You can load a cassette by pressing TAPE or simply by pushing in the cassette itself; in either case, the powered loading mechanism finishes the job, and does so very quickly. Play is stopped by ejecting the cassette or turning off the power (which does the same).

Kenwood KRC-9991I cassette/tuner (top) and KDC-80 CD player

Below the spectrum analyzer display is a row of nine LEDs that extinguish, one by one, to represent remaining time on a tape. In the tuner mode the same indicators light to show signal strength of the received station. When you press BAND, the tuner cycles through three banks of FM presets (5 each, 15 total) and one bank for AM. Tuning comes in four flavors: manual, seek, preset seek (steps to the next preset), and "auto memory." The last simply fills any bank with the next receivable stations up the band. So you can automatically fill the 5 AM and 15 FM presets with little effort. However, unlike similar functions in other models, this one does not search out just the strongest stations (although setting the tuner for "local" reception will raise the seek threshold and discriminate against the weakest stations). One other tuner feature is unique in my experience: When a station's signal level drops below the seek threshold, the tuner automatically advances to the next receivable station. Unfortunately, I found this feature in the manual after I turned in the car, so I can't comment on its behavior. Oops.

You can enter the equalizer mode at any time by pressing EQ. The tuner preset buttons—which already serve other functions in the tape mode—give you similar access to five EQ curves of your own making. To create a curve, you must switch to the EQ display (normally showing the spectrum analyzer) and open the motorized sliding drawer on the bottom right of the unit. There resides a pair of large buttons, among others, for stepping through the seven EQ bands. Levels for each band are set with the tuning/tape-wind toggle switch, and curves are stored like radio stations. Kenwood's choice of EQ bands is wise, with five octave-spaced stops from 60 Hz to 1 kHz, a range where response is likely to need tailoring.

The 9991I is only the second head unit I've encountered with a switchable automatic-volume function that compensates for road noise (very low frequencies). It has two sensitivity levels, one recommended for local driving and one for highway driving where noise would be higher. You set the desired listening level while the car is at rest; as speed and therefore noise increase, the relative volume should be maintained. The difficulty with this is how quickly the system responds to swift reductions in road noise; at stoplights I sometimes found myself reaching to turn down the volume before the unit reacted. However, I suspect the auto volume might be more effective in a sedate sedan than in this rather noisy Saab.

The 9991I's tape section worked flawlessly, with a sureness of operation rarely encountered in a car deck. It reproduced my tapes splendidly, although for added crispness I found it desirable to play high-bias tapes in the normal position. I was even encouraged to dust off a DBX recording I made a few years ago. The tuner performed well, but in my subjective tests I was not able to identify any clear areas of superiority over other fine car tuners. Ask a Mercedes owner to substantiate the cost of his car and you may get a good view of the underside of his nose. Like a Mercedes, the 9991I is expensive, but I would say that in no performance category is it clearly beaten. And never have I put my hands on a more solidly built head unit. This model, she is *built*.

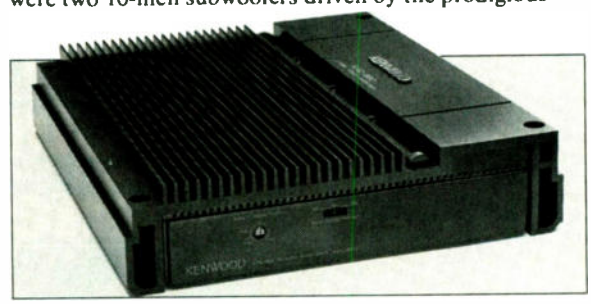
Despite the 9991I's dominating presence, I was more interested in the KDC-80 Compact Disc player ($749), which was connected to the former's CD input. It is one of the new breed of removable players, with a nicely integrated handle that pops up at the push of a small button. Volume, balance, fader, bass, and treble are all adjusted by a single toggle switch—you just press AUDIO to cycle through the choices (the unit defaults to the volume mode). The display shows either the track number or the track time, and RETURN recues the disc to the first track. Scanning proceeds at a pleasingly quick pace. The control layout is utterly functional, and there's even a front-panel button to change the night-illumination color from orange to green.

Kenwood provides a screw adjustment on the KDC-80's top panel for installation angle, one setting for a tilt of less than 20 degrees, the other for tilts up to 30 degrees. There is also a choice of preamp output levels: 300 millivolts (typical) or 1 volt (high). The pair of pre-out cables on the back of the KDC-80's mounting sleeve terminate in DIN plugs (as do the 9991I's), but DIN-to-RCA adapters are available.

The KDC-80 performed well, seldom skipping on anything less than a rapid series of sharp bumps. Of course, the suspension characteristics of a car and where a CD player is mounted contribute significantly to the amount of vibration that reaches the player. I suspect that this Saab presented a fairly challenging test bed. In case you're wondering, the KDC-80 sounded good, though I defy anyone to hear true differences among CD players in a moving car.

Removable head units are quite amazing. You can pull out the Kenwood while it's on and playing a disc, plug it in the next day, and it starts playing from where it left off. I can't think of one reason not to prefer a removable as long as it has the features you want.

Kenwood was showing off its new amps and component speakers in the Saab. In the dash were pairs of 1-inch dome tweeters and 4-inch cone midrange drivers, powered by the 75-watt KAC-820 (all ratings are per channel into four ohms, 20 Hz to 20 kHz, with less than 0.5 percent THD). The front doors and the rear side panels also sported two-way systems using the same tweeter and a 5-inch midrange driver, each system driven by the 95-watt KAC-920. Facing up on the back shelf and propelled by the 35-watt KAC-720 were a pair of 4-by-10 coaxials. Behind the seats, in a custom enclosure, were two 10-inch subwoofers driven by the prodigious



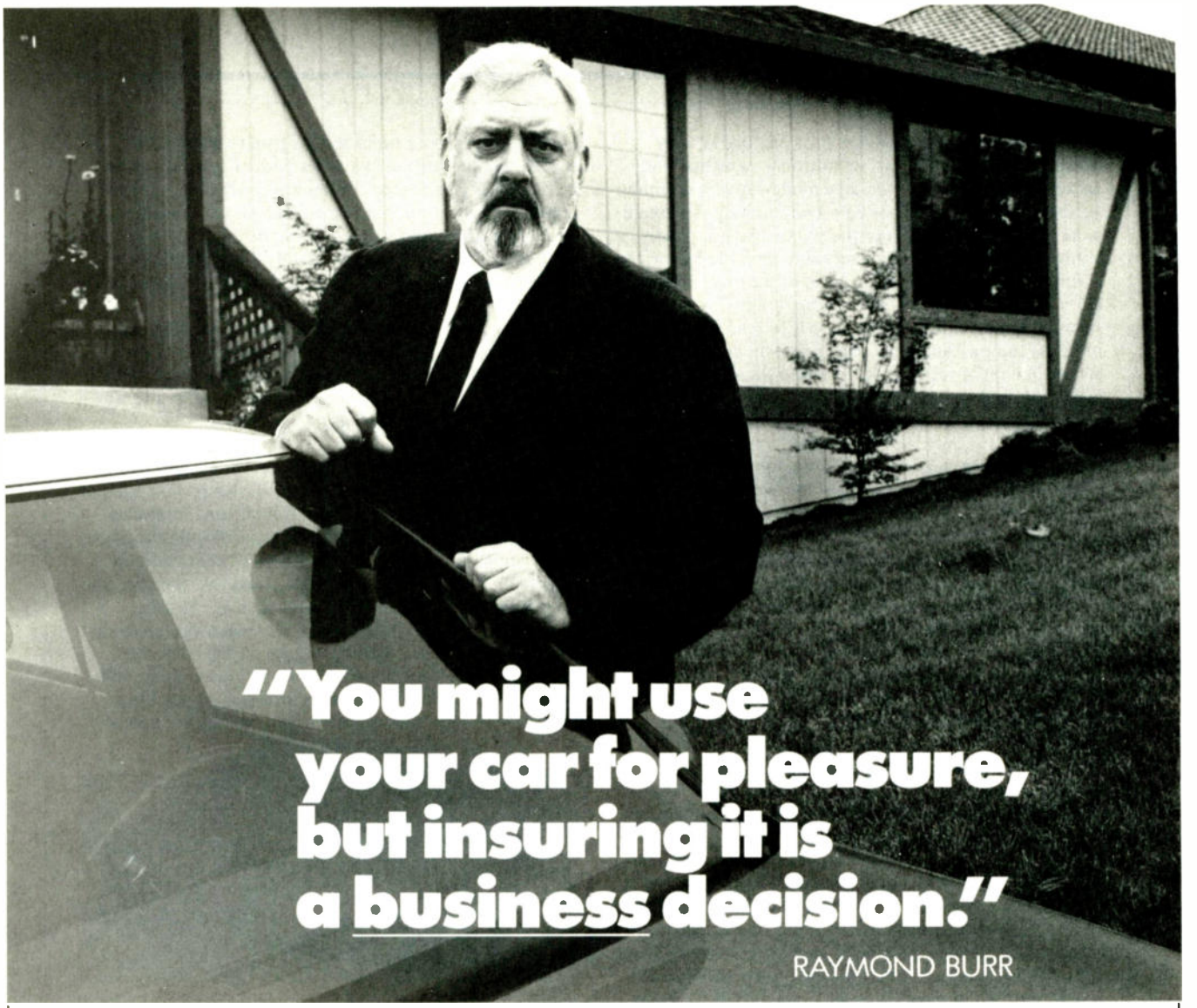
Kenwood KAC-920 power amp

200-watt output of Kenwood's top-of-the-line KAC-1020. Deep bass and lots of it.

Passive crossovers for the tweeter and midrange pairs were set at 300 Hz. The rest of the low-pass filtering was accomplished with Kenwood's KEC-300 electronic crosscrossover network ($229), which supplies five outputs. (An electronic crossover is inserted between the head unit and the amplifiers, distributing frequencies above or below a chosen point.)

I did not set out specifically to evaluate Kenwood's speakers, although I was pleasantly surprised by what I heard. Plenty of punch was provided by the amplifiers, especially the monster 1020, which calmly handled its assigned low frequencies despite a too-high setting (for my taste) of the subwoofer level. Kenwood says it has incorporated much of its home-amplifier technology into the car amps. Perhaps most notable is the use of dual power supplies, for low- and high-output demand, that are said to prevent rising distortion at low listening levels (where it usually does increase). True enough in my experience.

With all of this audio gear stuffed into the Saab, it's hard to believe that the installer also squeezed in Kenwood's comprehensive KPC-70 security system. It will have some pretty fine equipment to protect. □



Here's why... With the cost of auto insurance, particularly with two or more cars, you must make informed decisions. The right insurance company with the right coverages, with the proper limits at appropriate rates. Those are *business* decisions that require the advice and counsel of an Independent Insurance Agent. We represent several fine companies...not just one...so you choose the right policy at the right price, with the right service. An Independent Agent—always a good *business* decision.

Independent Insurance Agent

INDEPENDENT INSURANCE AGENTS OF AMERICA INCORPORATED

...and the insurance companies they represent

Report preparation supervised by Michael Riggs, David Ranada, Christopher J. Esse, Robert Long, and Edward J. Foster. Laboratory data (unless otherwise indicated) is supplied by Diversified Science Laboratories.

Sony CDP-507ESD Compact Disc Player

DAVID A. WAGNER

Sony has never been given to resting on its laurels (though goodness knows it has an enviable collection to rest on), and the CDP-507ESD continues the tradition of innovation. It's not a question of breaking ground for some brave new CD world, but this model—which, not incidentally, is from the premium ES Series—exudes more individuality than most you are likely to come across these days. And that stands out when designers, generally, seem preoccupied with covering whatever the competition is up to.

All the usual features are present: a dedicated wireless remote (powered by two AAA cells) that encompasses all of the standard transport features plus the various play-mode options; a headphone jack with its own level control; a timer switch; multiple elapsed/remaining-time display modes; a "calendar" display of programmed or unplayed bands; programmed play of as many as 20 selections (or 100 minutes of music, if you repeat selections); multimode repeat; automatic pause (an extra three seconds) at the end of each selection; single-selection play (which stops after the end of the current track); and Shuffle (random) play.

Both optical and pin-jack digital outputs are provided on the back panel. A switch nearby chooses between these and the two sets of analog outputs: one with a fixed level and one whose level depends on the setting of the headphone-level control. This should supply all the flexibility anyone would want. (Some players let you use analog and digital outputs simultaneously, but any application I can think of that would profit from this capability is really pretty farfetched.)

Before getting to the more arcane stuff—where the real fun is—a word of appreciation for Sony's manual. Though the one I have is merely a photocopy, and therefore renders as gray what evidently is in color, it obviously is of rare quality. The graphics are classy, if very

Dimensions: 17 by 4¼ inches (front), 13 inches deep plus clearance for connections.

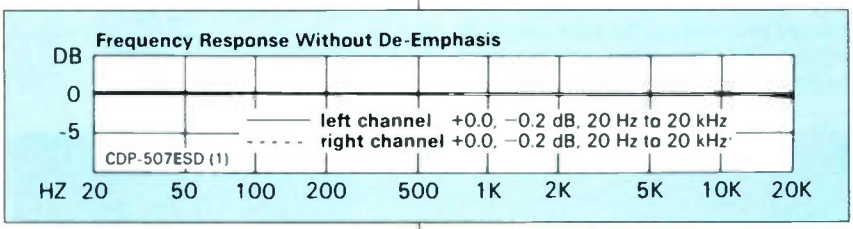
Price: $600.

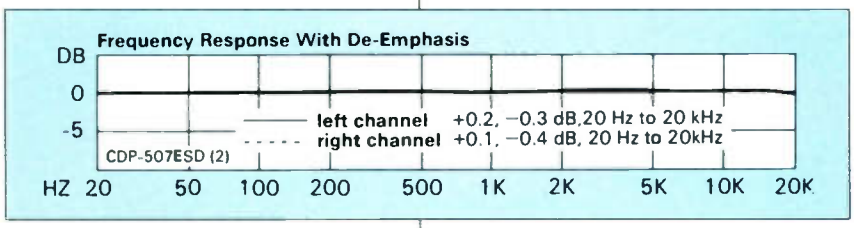
Warranty: "Limited," three years parts and labor, except one year on laser pickup and drive parts.

Manufacturer: Sony Corp., Japan.

U.S Distributor: Sony Corporation of America, Sony Dr., Park Ridge, N.J. 07656.

All data were obtained using the Sony YEDS-7, CBS CD-1, and Philips 410 055-2 and 410 056-2 test discs.





Channel Separation (at 1 kHz)		117 1/4 dB
Channel Balance (at 1 kHz)		± <0.1 dB
S/N Ratio (re 0 dB; A-weighted)		
without de-emphasis		115 dB
with de-emphasis		115 3/4 dB
Harmonic Distortion (THD+N; 40 Hz to 20 kHz)		
at 0 dB		<0.01%
at −24 dB		≤0.037%
IM Distortion (70-Hz difference; 300 Hz to 20 kHz)		
0 to −10 dB		<0.01%
at −20 dB		0.012%
at −30 dB		0.021%
Linearity (at 1 kHz)	**undithered**	**dithered**
0 to −60 dB	no measurable error	
at −70 dB	+0.4 dB	+0.4 dB
at −80 dB	+2.2 dB	+1.5 dB
at −90 dB	+4.6 dB	+4.5 dB
at −100 dB		+8.2 dB
Tracking & Error Correction		
maximum signal-layer gap		>900 µm
maximum surface obstruction		>800 µm
simulated-fingerprint test		pass
Maximum Output Level		
line output (variable or fixed)		2.24 volts
headphone output		4.65 volts
Output Impedance		
line output		200 ohms
headphone output		115 ohms

low-key, and add materially to the exceptional clarity of both text and layout—particularly the latter, which leads you directly from a two-page overview (plus one more for the remote) to the specific text that will explain a feature in more detail. I wish all companies took such care with—and, evidently, pride in—their work.

Paradoxically, my one complaint about the player's overall design is with respect to functional clarity. The display includes index numbers, designed into the CD system as cueing marks within individual tracks but—unfortunately—seldom employed when CDs are cut. Sony also uses the word "index" for a different and most intriguing feature, adding further confusion to a subject that already is a source of distress to the classics lovers who could most have profited from disc indexing.

Sony's version, which it calls Custom Indexing, does to some extent pick up the ball that was so clumsily dropped by record producers. It lets you mark as many as six specific spots anywhere on a CD and begin play from any one of them. They are designated A through F, so they can't be confused either with track numbers or with the original indexing, if your disc has it. Like the track-display calendar, that for the Custom Indexing disappears progressively as each cueing point is passed during play.

Among other unusual features, the player will remember your designation for the disc—up to ten characters long—and display it each time you insert the disc. By using the keypad as a sort of typewriter (albeit an awkward one), you can choose among all 26 letters, ten digits, ten miscellaneous symbols, and a blank space. You can also ask the player to store your programmed sequence in memory, for recall when you again play the same disc. These features aren't altogether unique, but they can contribute materially to your enjoyment of the player, depending on your habits and tastes.

Not only does the Custom Indexing system add an option for exploring (or—dare I say it, in this paranoid era?—dubbing) the musical minutiae of your discs, but you can also cue on the *original* index numbers, if your disc is so blessed. The index controls step forward and back just like the standard track-seek buttons: one number at a time. The dual-speed musical scan feature also helps find specific spots in the music and can be helpful in setting the Custom Indexing. One nice feature in the scan: When you run off the end of the disc, you don't land in the stop mode; instead, the display reads "OVER," and you can back the pickup into the end of the music—perhaps to savor just that final, cataclysmic chord.

And I expect you *will* savor it, because the performance—to quote from a note in Diversified Science Laboratories' report—"ranks up there with the best of them." Frequency response is very flat, distortion and noise very low, linearity very good. Even at the lowest levels that our dithered test disc now permits us to investigate, linearity remains better than average among the players we have had a chance to measure. Tracking is as perfect as the standard Philips disc will measure; it also looks good in trials with a Pierre Vérany test disc, but we haven't yet compiled a large enough record for comparison on this basis.

How much of the CDP-507's obvious quality is attributable to its 18-bit, eight-times resampling digital filter feeding a specially configured *pair* of 16-bit D/A (digital-to-analog) converters in each channel is hard to say. The oversampling digital filter undoubtedly contributes to the flatness of the audio band's top end in the final response, but when Sony claims behavior comparable to that of a "293rd order network," even the technophilic mind boggles. Suffice it to say that high-tech seldom hurts in such a context, and the tech here is among the highest.

Aside from my complaint about the indexing semantics—a cavil that, I hope, doesn't obscure how well the music-accessing scheme works—I simply can find nothing to fault in this player. It is surprisingly easy to master, considering the complexity of its controls. It looks good and it sounds great. And the comprehensiveness of the controls is welcome. For instance, I really appreciate the single-track play mode for picking an individual selection out of a recital program, and this feature is extremely rare despite its obviousness. Bravo, Sony!

Robert Long ▶

The Monitor Series

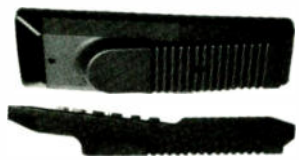
Designed not to a price, but to a standard.

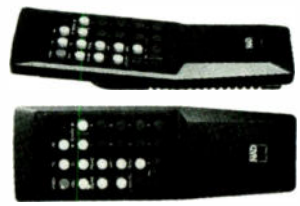
NAD 7600 Remote Control Receiver

Rack handles are optional equipment.

"In sum, we have no hesitation in calling the 7600 an outstanding receiver and, ultimately, a logical candidate for the status of a classic model."

High Fidelity
April, 1988





The Monitor Series

Preamplifiers
Preamplifier Tuners
Power Amplifiers
Integrated Amplifiers
Tuners
Compact Disc Players
Cassette Decks
Receivers

"The NAD 7600 must be used to be appreciated fully. Its features and performance make it not only the most powerful receiver on the market, but one of the very best you can buy at any price. If any compromises were made in its design, we didn't find them."

Stereo Review
November, 1987

NAD

For the music, pure and simple.

NAD. A name that has stood for unparalleled technical prowess and integrity in audio components since 1979, when the company stunned audio dealers with blind demonstrations of the legendary 3020 Amplifier, which was rated at 20 watts, yet performed like an amplifier rated at 100.

A company that tolerates no design compromises whatsoever in areas which directly affect performance in real-use conditions. A company whose product philosophy has always been to design and build no-nonsense components that deliver the highest possible audio performance for the lowest possible cost.

The Monitor Series. A growing line of professional quality audio components, employing advanced technology and ergonomics, that has, in one short year, garnered accolades from the audio press, customers, and dealers worldwide. Each member of the Monitor Series establishes new standards in its category.

Why? The music. Pure and simple.

The 7600 Remote Control Receiver, shown above, is undoubtedly one of the world's most powerful, most sensitive and most flexible stereo receivers. The 7600 combines NAD's three finest Monitor Series Components within a single chassis: The 2600A Power Amplifier, the 1300 Preamplifier, and the 4300 Tuner.

Regarding power and fidelity, the amplifier section incorporates NAD's Power Envelope circuitry, which virtually redefines the concept of dynamic headroom (up to 800 watts per channel), providing all the power that you are ever likely to need. It is a rare speaker that will exceed the 7600's ability. The delicacy and purity of low-level musical information is retained, as well as the crescendos, providing an extraordinary richness of music quality.

One spin of the tuning control knob will convince you that this is no ordinary receiver. According to *Stereo Review*, "The control is nearly frictionless, and a single spin will turn the knob for up to ten seconds, time enough for the tuner to scan the radio band from end to end." This unique tuning system combines the precision and stability of digital tuning with the natural, intuitive feel of analog knob tuning.

Similarly, the infinitely adjustable volume control is an "analog" knob, which is actually motor driven by the remote, accomplishing a control that, unlike a digital IC, adds no noise or distortion whatsoever.

These are merely a few examples of NAD's design philosophy applied: Each and every decision is made with direct reference to a perceivable enhancement of performance and sound quality. You will feel the difference. You will see the difference. You will hear the difference.

The place to do that is your selected NAD dealer. You don't have to know the difference between a watt and a decibel to distinguish NAD from the competition. Nor is extended study of the user's manual required. Simply ask for a comparative demonstration. Be forewarned, however. You will like what you'll hear.

Call us at (617) 762-0202 for your nearest dealer, or send the coupon for detailed product literature, to: NAD(USA), Inc., 575 University Avenue, Norwood, Massachusetts 02062.

Please send 7600 Receiver information and dealer locations to:

Name _____

Address _____

City _____

State _____ Zip _____

HF 1

Cambridge Audio CD-2 Compact Disc Player

DAVID A. WAGNER

Dimensions: 17 by 3¼ inches (front), 10½ inches deep plus clearance for connections.

Price: $1,699.

Warranty: "Limited," two years parts and labor if warranty card is submitted within 14 days of purchase; otherwise, 90 days.

Manufacturer: Cambridge Audio Systems International, Ltd., England.

U.S. Distributor: Celestion Industries, Inc., 89 Doug Brown Way, Holliston, Mass. 01746.

Hailing from across the Big Pond, England's Cambridge Audio has been known primarily for its midline amps and preamps. However, it has recently made a splash with a series of expensive, technically sophisticated Compact Disc players. While many of us are still pondering 18-bit digital-to-analog converters (DACs) and eight-times-oversampling digital filters, Cambridge has (or have, to be British) announced an upcoming *32*-bit machine with *16*-times oversampling. In the meantime, the latter development is currently on display in the 16-bit Cambridge CD-2.

Like a number of European and American audio companies, Cambridge does not build CD players from the ground up but, rather, bases them in part on an existing chassis from Philips. Such is the case with the highly modified CD-2. According to Cambridge, here's how the "16 x 16" decoding system works: Each channel employs a Philips four-times oversampling digital filter, which feeds the original data plus three resamples (for a total of four samples per 16-bit "word") to the custom-made Cambridge "16 Times Module."

This module is essentially another four-times oversampling filter that quadruples the data again and passes it successively to four Philips 16-bit DACs. The outputs of the DACs—four per channel, eight total—are summed and fed via a coupling capacitor *directly* to the analog outputs. As you can see, each DAC ends up processing four samples per 16-bit word, just as it would in a conventional four-times oversampling player. Because of this parallel processing, the extraordinarily high data rate (bits per second) of the entire system is brought down to match the processing speed of the individual DACs.

If you noticed something missing in this chain of events, you're right: Because of the high sampling rate, the ultrasonic "images" created at multiples of the sampling frequency begin so far out (in this case, at around 705.6 kHz) that no analog output filter is needed to remove them. It has been suggested, and Cambridge contends, that a typical analog filter can introduce audible side effects. Using 16-times oversampling simply eliminates a suspected source of problems.

Given the CD-2's sophisticated innards, you may be taken aback by its limited array of operating features. However, those that are conspicuous by their absence—a headphone jack, a keypad for direct track selection, and A-B segment repeat—are somewhat compensated for by three less common features: an LED indicator for disc errors (those requiring interpolation, extremely rare on undamaged discs); another to indicate playback of discs made with treble preemphasis; and an index search function. Even though it has only 13 buttons, the front panel takes some getting used to because the buttons are all the same size. Fortunately, the remote control is quite manageable and can be used to program and review the 20-selection memory.

Functionally, the CD-2 reminds me of the stereotypical British sports car in that it demands a certain appreciation of electronic quirkiness (you know—turn on the wipers to get headlights). A supplement to the well-written owner's manual serves up this understatement: "The CD-2 is a very advanced Compact Disc player but some of the operating modes are a little unusual." To begin with, the CD-2 cannot be turned off unless you unplug it—this explained as avoiding a warm-up time for the complex decoder system. Pressing STANDBY only switches power to the display panel. In additional documentation supplied to me, Cambridge mentions that some audiophiles claim improved sound playing discs with the display off.

Those audiophiles may actually be protesting the (admittedly) anarchic behavior of the LED panel, which is arranged to show track and index numbers on the left and time into a track on the right. But sometimes the display gets confused and swaps the positions of the track/index and time indications, requiring that you unplug the player to restore order. More distressingly, the display limits the usefulness of the three-speed (first two audible) search functions by failing to keep time with—or at least trail consistently—the movement of the laser across the disc. Sometimes the time display doesn't change at all until the search button is released. Another oddity is that the remote can initiate play from the open-drawer position, but the same control on the front panel cannot. Out of all this comes an unusually positive feature: Hitting the play button while play is in progress recues the laser to the start of that track; as a result, the previous-track function does, in fact, skip back one full selection.

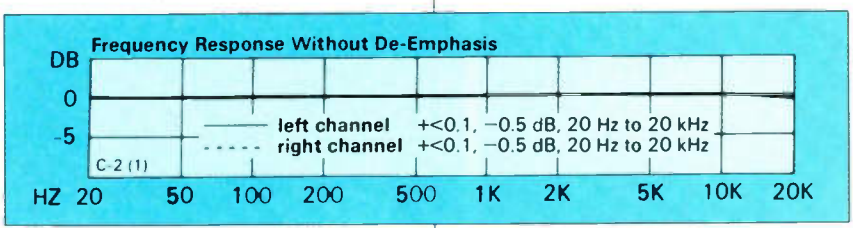
On the back of the CD-2 is a pair of conventional analog outputs as well as a digital-output pin jack and another that can, in the future, link the CD-2 with other Cambridge components for system-wide remote control. Although they are clearly labeled, these four like-colored jacks are arranged as two vertical pairs, creating the potential for unpleasant misconnections.

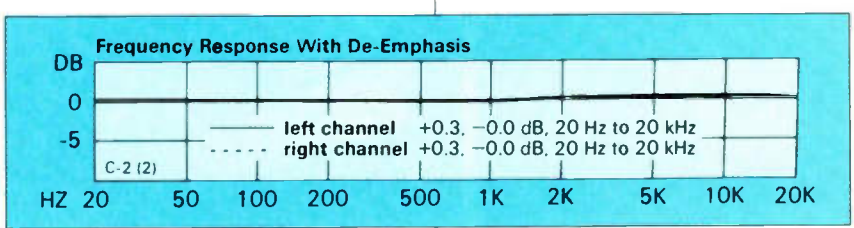
None of the CD-2's unusual operating characteristics affect its audio performance, which is more than adequate in the most important respects. For example, frequency response is ruler-flat to about 7 kHz, where rolloff commences smoothly to $-\frac{1}{2}$ dB at 20 kHz—preferred, if you find, as I have, some CDs with rather bright top ends. Linearity is excellent all the way down to −80 dB in tests (dithered and undithered), with the result that distortion is minuscule and totally inaudible. We have tested a number of players this year with disappointing linearity figures, leading us to appreciate even more the CD-2's good performance in this area. We have also tested players (less expensive ones, too) that meet or exceed any of the CD-2's marks; but microscopic distinctions in test data among competent players vanish in the full-frequency spectrum of music. And here, I was perfectly satisfied with the CD-2's sound, display on *or* off.

If I could point to a definite audible—or even measurable—positive consequence of 16-times oversampling, I would object less to the CD-2's twisted display and dear price. It's possible that our sample unit, although a production model, had a defective control microprocessor, but I doubt this, given the near-admission in the manual's supplement of some quirks in this area. Cambridge is to be commended for its earnest effort to optimize the CD-2's sound quality; taken as a package, however, the player is a mixed blessing.

Christopher J. Esse ▶

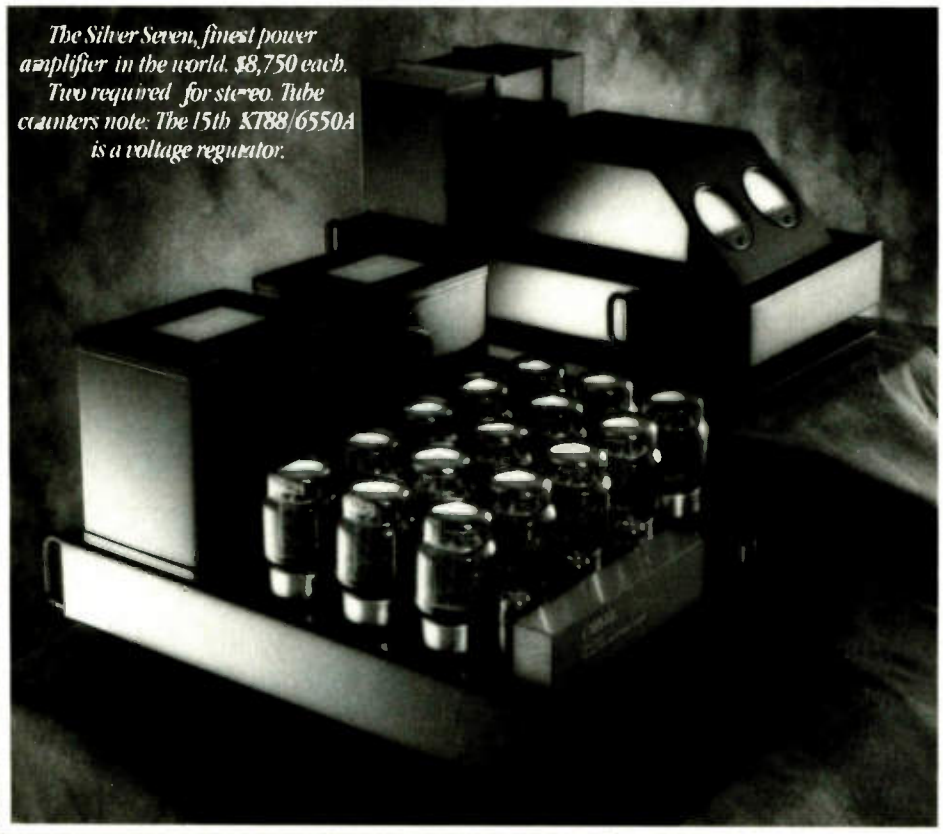
All data were obtained using the CBS CD-1, Sony YEDS-7, Philips 410 055-2, and Philips 410 056-2 test discs.





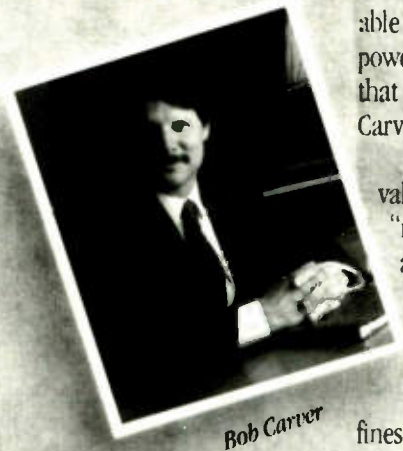
Channel Separation (at 1 kHz)		90 dB
Channel Balance (at 1 kHz)		± < 0.1 dB
S/N Ratio (re 0 dB; A-weighted)		
without de-emphasis		115 3/4 dB
with de-emphasis		116 1/2 dB
Harmonic Distortion (THD+N; 40 Hz to 20 kHz)		
at 0 dB		≤ 0.035%
at −24 dB		≤ 0.042%
IM Distortion (70-Hz difference; 300 Hz to 20 kHz)		
at 0 dB		0.028%
at −10 dB		0.023%
at −20 dB		0.016%
at −30 dB		0.045%
Linearity (at 1 kHz)		
	undithered	**dithered**
0 to −60 dB	no measurable error	
at −70 dB	+0.1 dB	+0.1 dB
at −80 dB	−0.4 dB	−0.5 dB
at −90 dB	−7.1 dB	−7.1 dB
at −100 dB		−6.2 dB
Tracking & Error-Correction		
maximum signal-layer gap		> 900 µm
maximum surface obstruction		> 800 µm
simulated-fingerprint test		pass
Maximum Output Level		2.55 volts
Output Impedance		550 ohms

"Because I wanted to have the world's finest amplifier and the world's greatest transfer function, I built the astonishing Silver Seven."



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

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



Bob Carver

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

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

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

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

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

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

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

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

Powerful

Distributed in Canada by: evolution technology

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

Superlatives are insufficient.

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

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

Ever wondered why two amplifiers of identical wattage can sound different? Or why two designs with different output ratings can sound much the same? In many cases, it's because each power amplifier exhibits a unique relationship between its input and output signals. Like human fingerprints, this *transfer function* is subtly distinct, defining much of the sonic character of the design. Bob has not only perfected the art of measuring an amplifier's transfer function, but is able to duplicate it in a completely dissimilar amplifier design! That's how he invested his solid state M-1.0t with the transfer function of a set of $5000 esoteric tube amps several years ago.

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

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

Though in choosing the M-4.0t you may miss the warm glow of the Silver Seven's silver tipped vacuum tubes reflecting in polished black lacquer, be assured both amplifiers are the most musical, effortless, and open sounding you have ever heard. Bass is full and tight, midrange is detailed, treble is pure and transparent.

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

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

Listen to the new, incredibly affordable M-4.0t at your nearest Carver dealer. Or write us for more information. We'll even send you data on the Silver Seven. After all, if you ever want to move up from the M-40.t, there's only one possible alternative.

CARVER

Musical *Accurate*

P.O. Box 1237, Lynnwood, WA 98046

Yamaha CDX-1110U Compact Disc Player

DAVID A. WAGNER

Dimensions: 17¼ by 4¾ inches (front), 15¾ inches deep plus clearance for connections.

Price: $1,199.

Warranty: "Limited," one year parts and labor.

Manufacturer: Yamaha Corp., Japan.

U.S. Distributor: Yamaha Electronics Corporation, U.S.A., 6660 Orangethorpe Ave., Buena Park, Calif. 90620.

Externally, Yamaha's CDX-1110U CD player is virtually identical to its direct predecessor, the equally excellent CDX-1100U, which was reviewed in the October 1987 issue and to which this magazine gave a Product of the Year award for its Hi-Bit technology. The new unit has only a few changes on the front panel. First, and most trivially, the track-skip buttons have had their identifying symbols changed from a plus and a minus to the more common double arrows. The disc drawer also now carries three bits of printed-on self-advertising: "Hi-Bit Twin D/A Converter" (a fact left unstated on the 1100), "18-bit D/A Converter System" (which, strictly speaking, is true of neither the 1110 nor the 1100), and, most significantly, "8x Oversampling Digital Filter"—this last a feature new to three of Yamaha's latest CD players (the CDX-1110U, -910U, and -810U).

Yamaha's proprietary digital output filter does operate at eight times the normal CD sampling rate (352.8 instead of 44.1 kHz), but this too implies the wrong thing. The 1110 indeed generates seven mathematically interpolated data points between every two original samples, but the filter itself is not a brute-force eight-times device. Instead, it has three separate processing stages, each correcting for the resampling artifacts generated by the preceding stage's processing.

The first stage of the digital filter is a 225th-order digital low-pass process operating at twice the CD sampling rate (88.2 instead of 44.1 kHz). The second stage is a 41st-order low pass filter with resampling at four times the CD sampling rate (176.4 kHz). This stage removes the ultrasonic artifacts ("images") around 88.2 kHz and 264.6 kHz that were generated by the first stage. The last stage operates at 352.8 kHz and is a 21st-order low-pass filter designed to remove the components around 176.4 kHz created by the first two filter stages. The resulting spectrum, as shown in the Yamaha literature, is essentially that of an eight-times resampling device, with the only remaining ultrasonic image centered around 352.8 kHz. And this energy, explains a Yamaha white paper, "is so high in frequency it virtually disappears when it is run through a normal audio buffer amplifier."

What all this processing has enabled Yamaha to do is remove altogether the analog output filter used in the earlier 1100 (and in virtually every other CD player ever made). As the white paper puts it: "The benefit of eliminating the analog filter, of course, is that the intra-channel phase shift (which can be quite gross even in highly regarded players) and distortion associated with such filters is virtually eliminated. . . . Descriptive terms such as clear, open, transparent, a well-positioned image, and good dimensional quality are often used to describe signal improvements associated with reductions in phase distortion."

We're skeptical, however, of the assumption that any and all reductions in phase distortion are audible, even the elimination of the small audible-band phase nonlinearity introduced by the 1100's slow-rolloff filter with its −3-dB point already in the ultrasonic range. I, for one, will not believe this until I am presented with reliable evidence. And I find it ironic that after all this talk about phase response, the new 1110 applies a 180-degree phase shift to everything—i.e., it is polarity-inverting (which is neither rare nor of audible consequence).

You can judge for yourself the effect of eliminating the analog filter. For in addition to a new optical digital bit-stream output to accompany the pin-jack digital output that is already present on the 1100, the back panel of the 1110 has two pairs of analog outputs: Direct and Filter. The Direct output is fed straight from the output of the Hi-Bit digital-to-analog converters (DACs), and its signals contain the residual low-level ultrasonic noises (centered around 352.8 kHz) associated with the digital filtration and digital-to-analog conversion process. These spurious signals are visible on a magnified oscilloscope trace, but they are inaudible. The Filter output is the analog-filtered version of the Direct

signal and is provided for those people who "actually may prefer the 'softer' treated sound," as Yamaha's literature puts it.

I could not hear any difference between the outputs, with music or test signals, but I prefer using the Filter output to prevent the residual ultrasonic garbage of the Direct output from possibly cluttering up the rest of my audio system. The analog filter used is a three-pole Butterworth design with a turnover frequency of 38 kHz.

The CDX-1110U's true value is hinted at in Diversified Science Laboratories' test data (all taken from the Filter output), which indicate excellent to superb audible performance. Note especially the linearity figures, which are among the most accurate I have seen. The only real disappointment is the relatively high calculated deviation from the player's otherwise extraordinarily flat response that occurs when the analog de-emphasis circuits are switched in for playback of discs made with treble pre-emphasis. This amount of deviation would be audible if compared to another player with equal but opposite changes in de-emphasized frequency response. (When is some company using high-resolution filtering and conversion circuitry going to do de-emphasis in the digital domain and, for once, get it exactly right?)

The 1110's superior linearity performance is audible as such. It can be heard most clearly on the ultracritical Track 20 of CBS's CD-1 test disc, probably the single most difficult-to-reproduce track in all of CD-land. This track contains a 500-Hz dithered sine wave slowly decreasing in level from −60 dB to −120 dB (yes, it is possible to hear signals below the CD dither-noise level of around −90 dB).

On a player with perfect low-level linearity, that's all you will hear: a sine wave dropping into white noise. There will be no distortion of the sine wave audible above the noise level, and the noise itself will not change in perceived "whiteness" as the signal decays. In this regard, the Yamaha 1110 is equaled in my experience only by its predecessor and a few (not all) players using true 18-bit DACs. The distortion in the sine wave is lower than in most players and the noise remains white throughout. This performance can be attributed to Yamaha's Hi-Bit technology that provides not so much 18-bit performance as greatly reduced 16-bit nonlinearity at low levels.

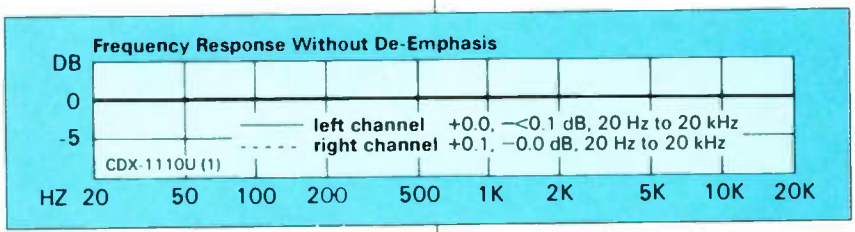
Keep in mind that, to hear any of these effects, I had to boost the 1110's output some 60 dB by sending it through the *microphone* inputs of a cassette deck and turning the recording-level controls all the way up. The deck outputs were then fed to a preamp for more boosting and listened to through headphones and observed on a one-third-octave spectrum analyzer. This is hardly normal listening procedure for music. Still, it is a testament to the quality of Yamaha's D/A circuitry.

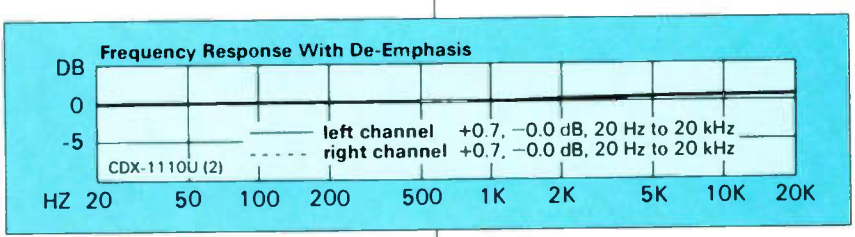
Operationally, the 1110 and its infrared remote control work absolutely identically to the earlier model. The 24-selection programmed playback, random-track playback, high-speed track/index-point cueing, two-speed disc scanning, and track/disc/A-B loop repeat functions remain unaltered. Also retained in the 1110 is the 1100's solid feel, which stems as much from the all-metal front-panel controls as from the unit's considerable mass (more than 30 pounds). Unfortunately, the digital volume control also seems to be unaltered from the earlier model. I recommend that perfectionists keep it at full-on or use it only as a temporary muting device, because at medium to high attenuations it adds visible (on the scope) and slightly audible distortions to low-level signals, thus erasing some of the advantages of Hi-Bit conversion.

My recommendation? Forget about 18-bit filters, the degree of oversampling, and the elimination of the analog output filter. Simply listen to the CDX-1110U realizing that you won't *hear* a more linear-sounding CD player in even the most stringent direct comparisons, whether with music or with test signals. It may lack the glittering front-panel and splashy programming/cueing features of other CD players, but the features most people actually need are well provided for—and, sonically, Yamaha's CDX-1110U is as good as they get.

David Ranada ▶

All data were obtained using the CBS CD-1, Sony YEDS-7, Philips 410 055-2, and Philips 410 056-2 test discs. Except where noted otherwise, data are for the analog-filtered output.





Channel Separation (at 1 kHz)		104 1/4 dB
Channel Balance (at 1 kHz)		±0.1 dB
S/N Ratio (re 0 dB; A-weighted)		
	direct	**filtered**
without de-emphasis	114 1/4 dB	112 dB
with de-emphasis	117 dB	113 dB
Harmonic Distortion (THD+N; 40 Hz to 20 kHz)		
at 0 dB		<0.01%
at −24 dB		≤0.026%
IM Distortion (70-Hz difference; 300 Hz to 20 kHz)		
0 to −10 dB		<0.01%
at −20 dB		0.011%
at −30 dB		<0.01%
Linearity (at 1 kHz)		
	undithered	**dithered**
0 to −60 dB	no measurable error	
at −70 dB	+0.3 dB	+0.3 dB
at −80 dB	+1.1 dB	+1.0 dB
at −90 dB	+3.9 dB	+3.0 dB
at −100 dB		+2.3 dB
Tracking & Error-Correction		
maximum signal-layer gap		>900 μm
maximum surface obstruction		>800 μm
simulated-fingerprint test		pass
Maximum Output Level		
line output		2.11 volts
headphone output		5.92 volts
Outpout Impedance		
line output		5 ohms
headphone output		150 ohms

Vector Research VRX-5200R AM/FM Audio-Video Receiver

DAVID A. WAGNER

Dimensions: 17 by 4¾ inches (front), 12 inches deep plus clearance for controls and connections.

AC Convenience Outlets: One switched (100 watts max.), one unswitched (200 watts max.).

Price: $370

Warranty: "Limited," two year parts and labor

Manufacturer: Made in Korea for Vector Research Inc. 1230 Calle Suerte, Camarillo, Calif. 93010

Vector is one of those companies that designs its own products but, to keep costs competitive, has them built overseas. Such components can be free of the fads that overtake other markets and responsive to the needs and wishes of the U.S. consumer, yet their value can be higher than could be achieved with domestic manufacture. These virtues are clearly evident in the Vector VRX-5200R, whose price is actually lower than I would expect for a competing Japanese product. More elaborate approaches to audio-video receivers admittedly offer more flexibility for some applications, but Vector has put its flexibility where it really counts: The logic controlling the design is exceptionally direct and clear-headed.

There are, for example, 20 radio presets, accessible via a keypad with buttons numbered 1 to 10, plus an eleventh that adds 10 to the selected number. Each preset will hold one station—AM or FM, as you choose—so you can apportion the presets however you want. In FM tuning, you can also switch independently to mono reception and interstation muting; the usual single-button design forces you to listen in mono if you want to hear any station whose signal strength is below the muting threshold.

Manual tuning is the default mode. Many tuners leave you in the last-used mode, no matter what; when you press a preset on the 5200, however, it automatically puts you in manual tuning so that, unless you've deliberately set the receiver to the scan mode, the next time you press the UP or DOWN buttons the tuner won't go skittering off in search of a receivable station. This is, perhaps, an exceedingly small point, but one that I find I appreciate. Incidentally, manual tuning proceeds by half-channel (0.1-MHz) steps on FM; on AM, where the scan mode does not apply, it's in full-channel (10-kHz) steps.

There is a three-LED signal-strength "meter" to help you orient an antenna. Normally, three steps would be pretty meager for that purpose, but Vector has maximized their usefulness by canny design. The thresholds are in the most critical range (at about 36, 40, and 44 dBf—where significant audible improvement can be achieved by the right antenna orientation) and they light gradually, as signal strength rises above these thresholds. The meter won't help you distinguish between good and excellent (say, in the 50-dBf range), but it does supply infor-

mation that is more useful than that from many designs employing four or five LEDs.

The back panel has provision for 75-ohm coaxial FM connectors (a threaded F connector), 300-ohm twinlead, long-wire AM antenna and ground or, alternatively, the supplied 150-ohm AM loopstick. These last attach to a row of light-duty binding posts that also include an option for a 75-ohm co-ax FM lead, should you want to dispense with the F connector. Connections for two speaker pairs are relatively lightweight spring clips. The signal connections are pin jacks with the standard coding: white and red for the two audio channels, yellow for composite video.

The approach to signal selection and routing is, at once, exceedingly simple and quite sophisticated. There are selectors for AM and FM (the tuner section), phono, CD, AV/Tape 1, and AV/Tape 2. All but the tuner are represented by back-panel connections. In addition, there are jumpered jacks for signal-processor out and in, and for pre-out and main-in. The two sets of tape connections and the processor loop have composite-video jacks (pin connectors) as well as audio jacks; there's a video-monitor output as well.

The processor loop is electrically wired into both the dubbing path and the monitoring output. It thus can be used to alter audio or video signals during dubbing, which can occur in either direction between Tape 1 and Tape 2. (The switching evidently defeats a source feed to the source deck, since there is no feedback when you switch to this illogical configuration.)

There are no dubbing or monitoring controls as such. If you have a three-head deck, you can attach it in the processor loop (perhaps even outboarded from, say, an equalizer) and use the deck's monitor switch to check signal quality off the tape during recording. You may consider this an awkward approach to three-head monitoring, but then we're not talking luxury goods here. Similarly, you may have to do some jury rigging if you want to receive or record FM/TV simulcasts. But I don't see this as a long-term problem, because I hope that MTS stereo and improved TV-audio practices will make simulcasts obsolete in the near future.

One particularly creative touch in the design—and one so logical that I am astonished it doesn't appear more frequently—is the matrix switch that converts the B speaker pair to the back channels of a surround setup. Again, this isn't a luxury unit, and the decoding circuitry (providing a channel-difference signal) is very simple by comparison with the Dolby Surround and similar processors now available at the top of the price scale. There isn't even any built-in means of adjusting front/back balance. But the effect is available, is pleasant, and may add to your enjoyment of both music and video soundtracks.

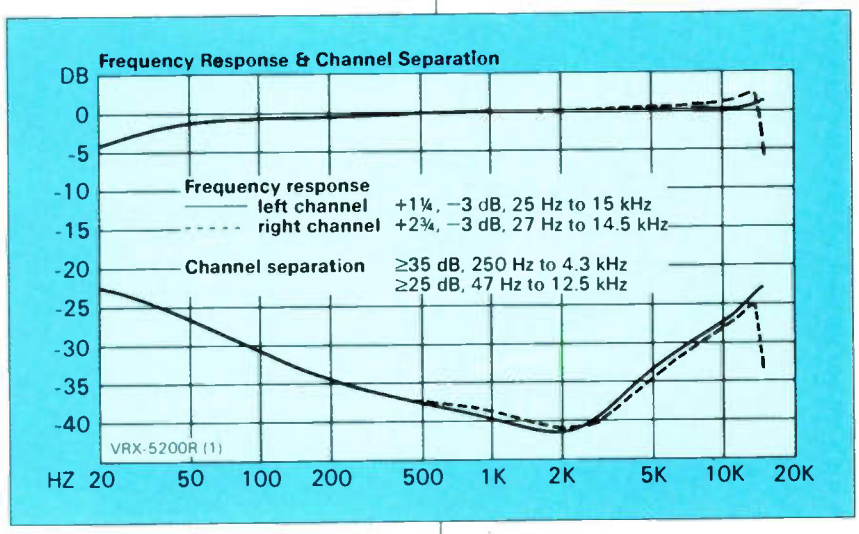
Also useful is the inclusion of a mid-range control, in addition to those for bass and treble, that makes the tone-control section essentially a three-band equalizer. In fact, the only feature of the 5200 that I consider poorly chosen is the power meter. If you like to know roughly (very roughly) how much current is being dumped into your speakers and don't mind flashing lights, you'll disagree with me on this. Obviously, many users—or, at least, designers—do.

The supplied wireless remote, which runs on two AAA cells, includes major functions only: AC power, source selection (including tuner presets), "mute" (a 20-dB attenuator), and volume up and down. The rotary volume control on the 5200 is motorized, and the calibration mark on the knob (which lets you see how it's set from across the room) is actually the power pilot light, appearing in red when the set is on.

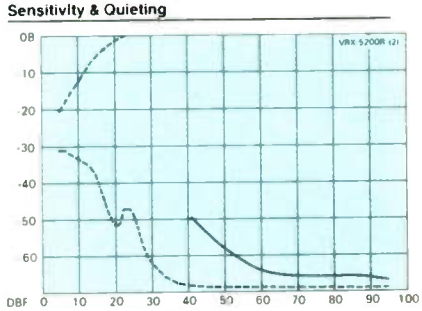
The receiver's moderate power rating (50 watts, or 17 dBW, per channel) is exceeded comfortably in both the sine-wave and dynamic tests, and its dynamic headroom of 2 dB or better is, in fact, above par even for pricier gear. But the alacrity with which the protection circuitry kicks in with a 2-ohm load suggests that very low speaker impedances should be avoided; the lab was unable to get useful measurements at 2 ohms. Distortion figures are not particularly low, but they aren't high enough to be of con-

Test Reports

FM Tuner Section



Sensitivity & Quieting



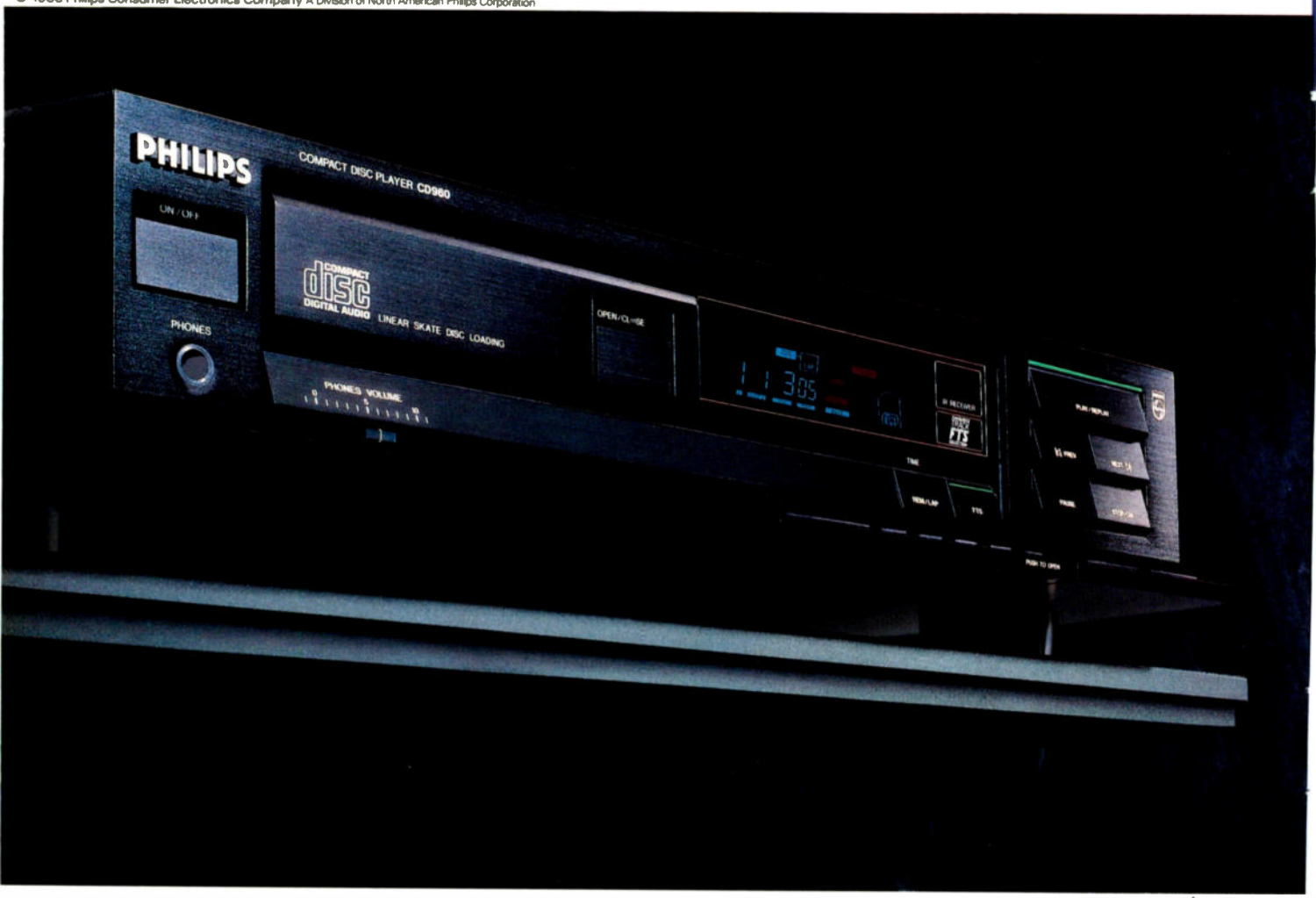
Stereo Sensitivity (for 50-dB noise suppression)	41 1/2 dBf at 98 MHz, with 0.37% THD+N (40 1/2 dBf at 90 MHz, 41 3/4 dBf at 106 MHz)
Mono Sensitivity (for 50-dB noise suppression)	see text
Muting Threshold	35 dBf
Stereo Threshold	38 dBf
Stereo S/N Ratio (at 65 dBf)	65 dB
Mono S/N Ratio (at 65 dBf)	68 1/2 dB
Capture Ratio	1.8 dB
Selectivity	
alternate-channel	58 3/4 dB
adjacent-channel	4 3/4 dB

Harmonic Distortion (THD+N)	stereo	mono
at 100 Hz	0.23%	0.28%
at 1 kHz	0.09%	0.10%
at 6 kHz	0.26%	0.17%

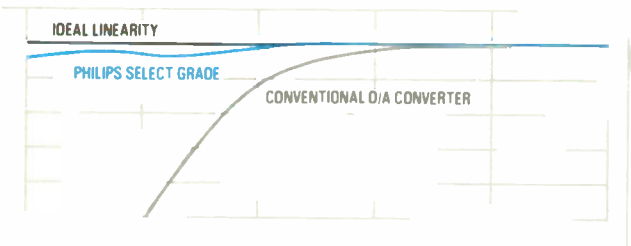
Stereo Pilot Intermodulation	0.17%
Intermodulation Distortion (mono)	0.14%
AM Suppression	40 dB
Pilot (19-kHz) Suppression	68 dB
Subcarrier (38-kHz) Suppression	86 dB

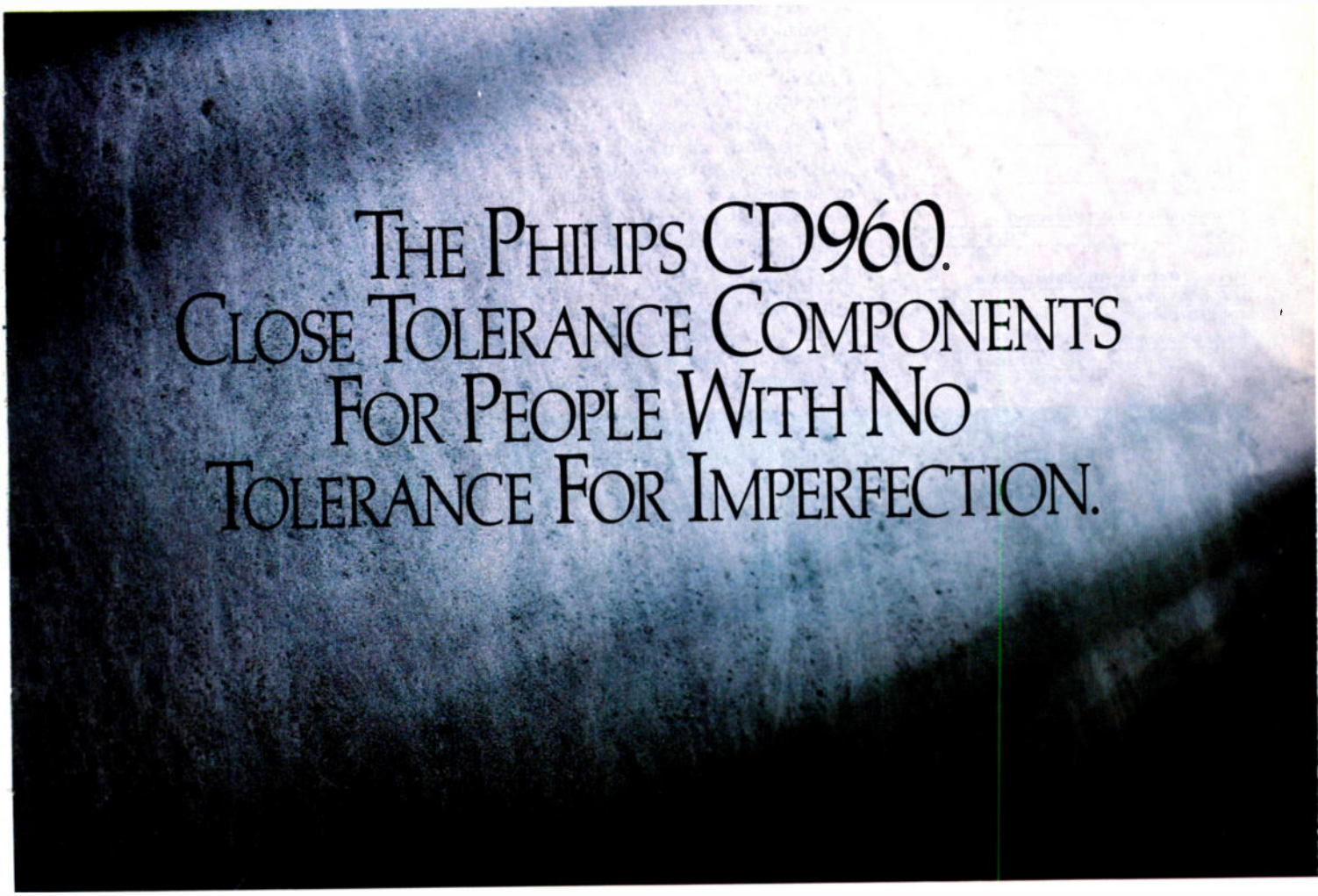
Amplifier Section

Rated Power	
8 ohms	17.0 dBW (50 watts)/channel
4 ohms	17.8 dBW (60 watts)/channel



Deviation from ideal linearity (dB) vs. recorded level (dB).





The CD960 compact disc player incorporates only the most uncompromising components because it has been designed by the world's most uncompromising audiophiles: Philips engineers. The same engineering experts who invented compact disc technology.

▪ Superior digital-to-analogue conversion. It comes as no surprise that the heart of the CD960 is the Philips dual 16-bit D/A converter chip. The TD-1541 select version. A chip so refined it substantially improves low-level linearity, flawlessly reproducing even the quietest passages with a clarity never before achieved.

This exceptional D/A converter is mated to a Philips 4X oversampling digital filter for superior performance. Philips pioneered 4X oversampling and our experience with digital filtering is unequalled.

▪ Broadcast standard "Radialinear" transport. Philips commitment to exacting specifications is also evident in the CD960's mechanical construction. It features a high-grade cast alloy chassis. A linear-design motor was chosen to drive the radial pivoting arm for fast track access and exceptional resistance to external vibrations.

▪ Multiple power supplies. To eliminate cross talk, the CD960 incorporates no less than four separate power supply sections. And the 100-watt main transformer is partitioned to further shield against magnetic and power line interference.

From the company that created the compact disc, Philips proudly offers the CD960 for those who won't tolerate anything less than perfection. To audition the CD960, call 1-800-223-7772 for your nearest Philips audio specialist.

WORLD-CLASS TECHNOLOGY. EUROPEAN EXCELLENCE.

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Test Reports

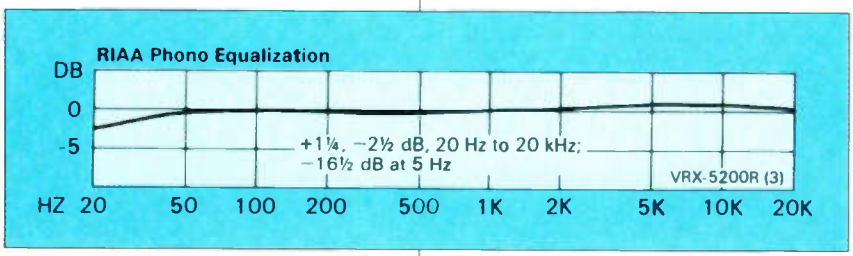
Output at Clipping (at 1 kHz; both channels driven)	
8-ohm load	18.4 dBW (69 watts)/channel
4-ohm load	19.3 dBW (85 watts)/channel

Dynamic Power (at 1 kHz)	
8-ohm load	19.0 dBW
4-ohm load	20.4 dBW
2-ohm load	see text

Dynamic Headroom (re rated power)	
8 ohms	+2.0 dB
4 ohms	+2.6 dB

Harmonic Distortion (THD; 20 Hz to 20 kHz)	
at 17.0 dBW (50 watts)	≤0.119%
at 0 dBW (1 watt)	≤0.133%

Frequency Response	
	±1/4 dB, 11 Hz to 24.3 kHz
	+1/4, −3 dB, <10 Hz to 79.2 kHz



Sensitivity & Noise (re 0 dBW; A-weighting)		
	sensitivity	S/N ratio
aux input	22 mV	76 1/2 dB
phono input	0.37 mV	74 dB
Phono Overload (1% THD+N at 1 kHz)	105 mV	

Input Impedance	
aux input	29k ohms
phono input	51k ohms; 120 pF

Output Impedance (to tape)	100 ohms
Damping Factor (at 50 Hz; re 8 ohms)	44
Channel Separation (at 1 kHz)	51 3/4 dB

cern—a statement that might apply just as well to the amplifier's output impedance.

Overall frequency response is similarly good: within ¼ dB of flat across the audio band. The loudness-compensation control, which is essentially unaffected by level, adds boosts of about 9 dB below 50 Hz and of 6 dB above 10 kHz (relative to the response in the 1-kHz range). The tone controls are unusually well behaved. Approximate adjustment ranges are ±10 dB at 10 kHz for the treble, ±9 dB at 1 kHz for the midrange, and ±15 dB at 20 Hz for the bass. The midrange is broader in its frequency "reach" than is the treble; the bass also is quite broad, but (assuming relatively symmetrical effect, like the other two controls) about half of its adjustment range is below 20 Hz.

Judging from Diversified Science Laboratories' findings, the phono section includes a nondefeatable and fairly gentle infrasonic filter that begins to attenuate response below 100 Hz and is down 3 dB at 18 Hz and about 16 dB at 5 Hz (the middle of the warp-frequency region). This certainly offers significant help with warps, but not without a slight cost to response in the audible range, which also exhibits a rise of a bit over 1 dB in the range around 7 kHz. Phono overload was measured at 105 millivolts—a satisfactory, if not overgenerous figure. Usually the measurement is made at clipping; here distortion rose gradually (and asymmetrically), so the measurement was made at 1 percent THD+N (harmonic distortion and noise). Overall, this is good, though not outstanding, phono performance.

Regular readers will note that we now graph output level for home tuners the same way we do for car radios. Paradoxically, this is the first time, as well, for the kind of anomaly that showed up in the 5200's mono quieting curve. Net signal-to-noise ratio reaches 50 dB (the sensitivity rating point) at 21 dBf but then degrades to 46¼ dB at 23 dBf. It achieves 50 dB again at about 25½ dBf. Perhaps this worse-case figure is the only legitimate reading for the test sample, though it does hover around the rating point over a uniquely wide range. Besides, if you wish to receive only strong local stations, this low-signal behavior is irrelevant.

But even including this anomaly (for which we have no explanation), measured performance is more than acceptable, given the price range. I did think the sound perhaps a shade crisper and more alive than with most tuners of comparable test results, but my area broadcasters may have been on their best behavior during the trial period. The AM section stuck me as average for a receiver: firmly focused on quiet reception of strong local stations.

The most enjoyable factor in the tuner section—as in the entire receiver—was the way in which Vector has rethought conventional priorities. No other receiver I have worked with in recent memory will switch between AM and FM with the presets alone (usually, you have to switch band first, then choose the preset), and the directness of this approach is as delightful as it is rare. Even better is the tape/processor switching, which I found exceptionally efficient for audio-only use and above average even with video. Admittedly, video takes a backseat to audio in this design, but that is precisely what keeps it so logical and functional—and so inexpensive for what it offers. Add to this the generally good audio performance and the convenience of the remote control and I suspect that Vector has a hit on its hands.

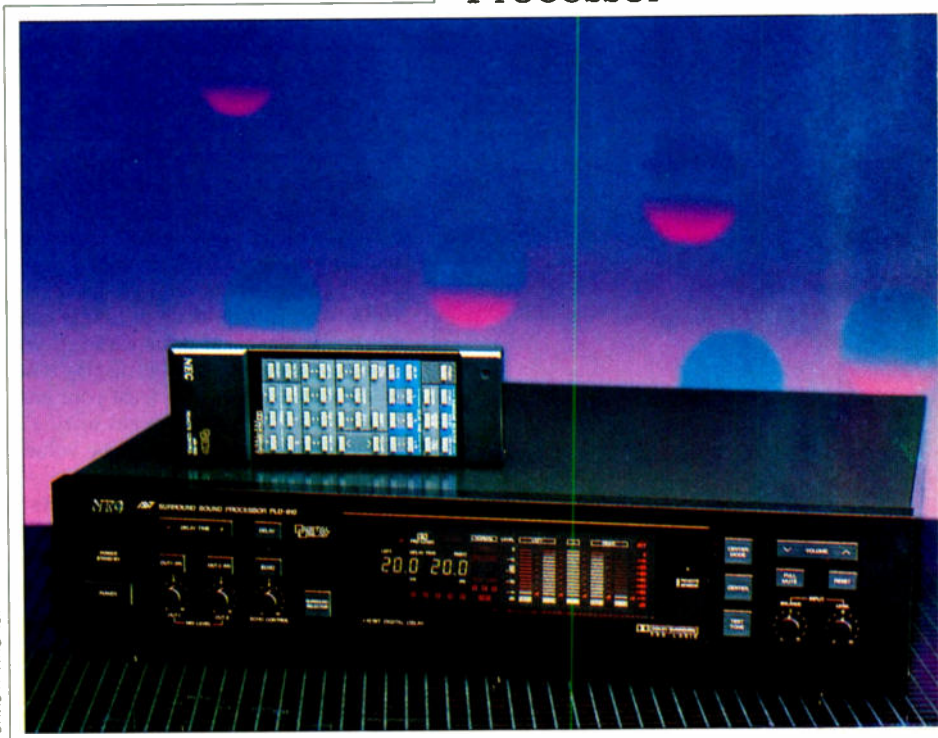
Robert Long

ABOUT THE dBW

We currently are expressing power in terms of dBW—meaning power in dB with a reference (0 dBW) of 1 watt. The conversion table will enable you to use the advantages of dBW in comparing these products to others for which you have no dBW figures.

WATTS	dBW	WATTS	dBW
1.0	0	32	15
1.25	1	40	16
1.6	2	50	17
2.0	3	63	18
2.5	4	80	19
3.2	5	100	20
4.0	6	125	21
5.0	7	160	22
6.3	8	200	23
8.0	9	250	24
10.0	10	320	25
12.5	11	400	26
16.0	12	500	27
20.0	13	630	28
25.0	14	800	29

NEC PLD-910 Surround-Sound Processor



DAVID A. WAGNER

The PLD-910 is not the first NEC surround-sound processor we've reviewed, nor is it the first processor to use digital delay. But it is NEC's first to incorporate Dolby Pro Logic and one of the most up-to-date we have seen. The PLD-910 is the first processor we can recall with double-oversampled 16-bit analog-to-digital (A/D) conversion (at a data rate of 88.2 kHz) and quadruple-oversampled 16-bit digital-to-analog (D/A) conversion (at a rate of 176.4 kHz). Oversampling makes it possible to use digital *input* as well as digital *output* filters, and these, in turn, are said to provide smoother frequency and phase response to 20 kHz.

The Dolby Surround buff may greet the above statement with a resounding "So what?" since the surround channel (the only one that passes through the PLD-910's digital delay line) is band-limited to 7 kHz by the Dolby standard anyway. That's true enough, but the PLD-910 is more than simply a Dolby Surround processor. In its "Creation" mode it serves as a full-bandwidth surround-sound simulator by creating an extra pair of channels from the original stereo pair.

Creation is an apt description of the PLD-910's alternate mode. Unlike some other digital signal processors that are preloaded with simulated patterns, the PLD-910 lets you roll your own from the tools provided: adjustable front-to-back delay, from 1 to 94 milliseconds in 0.1-millisecond increments; echo, to create a reverberation effect; and adjustable left/right crossfeed. The amount of crossfeed between front and rear channels is independently adjustable by front-panel mix-level controls. In addition, it can be made either in-phase (which tends to shrink stage width) or out-of-phase (which tends to widen and diffuse the sound field) by inverse buttons for each set of outputs. Echo can be switched on or off and adjusted in degree by a knob. From the remote, you can store as many as five sets of surround-sound parameters for later recall, although these would not include such analog control settings as mix and echo levels.

Front-to-back delay is activated by another button and adjusted (simultaneously in both channels) by the delay time +/− rocker. The remote can switch delay and echo on and off and adjust left- and right-channel delay time simultaneously or independently. (Independent adjustment is available only from the remote.) Although delay is adjusted in 0.1-millisecond increments, the rate of change is rapid when the rocker is continuously depressed.

The front panel's surround selector cycles the PLD-910 through its three modes: stereo, in which the processor is bypassed; Dolby, which activates the Pro Logic system and limits the surround-channel delay to 15 to 30 milliseconds in accordance with Dolby standards; and Creation, which gives access to the full range of effects. Three buttons provide the same choices on the remote.

In the Dolby Pro Logic mode, the PLD-910 re-creates the center channel from the left and right channels to help keep dialogue centered on the screen. Since not all users will opt for an extra center-channel power amp and speaker, NEC gives you the option of a "phantom" center, in which dialogue is sent equally to the left and right front speakers. You can switch between the re-created center and the phantom center with the CENTER button (on front panel and remote). If you are using a re-created center, you have a choice of two center modes, Normal and Wide. In the Wide mode, a full-bandwidth signal is sent to the center amplifier; in the Normal mode, the low end is cut off below 100 Hz (presumably to avoid overloading a small center speaker). In the stereo and Creation modes, the center channel is not generated.

To prevent overloading of the A/D converter, there's a front-panel input-level control and, to ensure best Dolby Pro Logic operation, an input-balance

Dimensions: 17 by 3½ inches (front), 13½ inches deep plus clearance for connections.

Price: $999.

Warranty: "Limited," three years parts and labor.

Manufacturer: NEC Corp., Japan.

U.S. Distributor: NEC Home Electronics (U.S.A.), Inc., 1255 Michael Dr., Wood Dale, Ill. 60191.

Test Reports

All measurements are for the Dolby Pro Logic mode.

Output at Clipping (at 1 kHz)	
main channels	6.0 volts
center channel	5.8 volts
surround channels	6.2 volts
Maximum Input Level (at 1 kHz)	3.07 volts
S/N Ratio (re 0.5 volt; A-weighted)	
main channels	83 1/2 dB
center channel	81 1/2 dB
surround channels	75 dB
Distortion (THD; 100 Hz to 20 kHz; 1-volt input)	
main channels	≤ 0.081%*
surround channels	≤ 0.45%**
Frequency Response	
main channels	+0, −1/2 dB, 20 Hz to 20 kHz
center channel	+0, −3 dB, 25 Hz to 20 kHz***
surround channels	+0, −3 dB, 20 Hz to 7.9 kHz
Input Impedance	49k ohms
Output Impedance	≤ 1,000 ohms

*Distortion measured 0.41 percent at 40 Hz and 3.0 percent at 20 Hz.
**From 40 Hz to 6 kHz. Distortion measured 3.1 percent at 20 Hz.
***In the Wide mode. In Normal mode, response measured 3 dB down at 108 Hz.

control. The level of all five output channels is controlled in 2-dB steps by the front-panel (or remote) volume up/down buttons.

Channel output levels are adjusted individually or in pairs by pads on the remote. These enable you to increase or decrease the levels of the two front channels together, the two rear channels together, or the center channel and the two left and right pairs alone. Three other useful controls appear on both the remote and the front panel: RESET reestablishes a standard volume setting of −40 dB; FULL MUTE does as its name suggests; and TEST TONE cycles pink noise from channel to channel as a setup aid.

Five indicators monitor the output level in each of the output channels. If dancing displays bother you, you can disable the indicator via the remote's meter button or dim the display with DIMMER. Since the display monitors *output* level (not input level), Diversified Science Laboratories found that it is possible to overload the input circuitry without eliciting a warning indication. By reducing the input level setting, the input clipping point can be raised to just over 3 volts, which should be perfectly adequate. However, if your ears tell you something is wrong but the display is nowhere near topping out, trust your ears. Just reduce the input level until the sound clears up, then raise the volume control to make up the difference.

DSL made its basic measurements in the Dolby Pro Logic mode with 20.0-millisecond (standard) delay to the surround output and using the re-created center channel. Performance is eminently satisfactory. Front-channel response is flat across the audio band, center-channel response is down 1 dB at 37 Hz in the Wide mode and 3 dB at just over 100 Hz in the Normal mode. (Below 100 Hz, response falls at 12 dB per octave.) In the surround channel, response is within 1 dB of flat from 20 Hz to 5.6 kHz and down 3 dB at 7.9 kHz (close to the Dolby standard), above which it falls at a rate of 18 dB per octave.

Thanks to Dolby Pro Logic, channel separation is very good on continuous signals. Except at *very* low frequencies, center-front to center-back separation (and vice versa) is 40 dB or better—truly excellent. Similarly, leakage from the front-left or front-right channels into either the surround channel or the center-front channel is down 35 dB or better above 100 Hz. Separation between right and left channels is 40 dB or better above 100 Hz and is 28 dB or better between the surround channel and either of the front pair. In the Normal CENTER mode there is purposeful introduction of low-frequency center information into the front channels to compensate for the rolloff designed into the center channel below 100 Hz. Separation increases rapidly and is more than 20 dB at 300 Hz and above.

With the input level adjusted to avoid input clipping, there should be no problem interfacing the PLD-910 with the rest of your system. Input impedance is sufficiently high, output impedance is sufficiently low, and there's more than adequate channel gain and output level for any conceivable application. A-weighted noise output is negligible in the front and center channels and quite satisfactory in the surround channel. With a 1-volt drive, distortion is well under 0.1 percent from 100 Hz to 20 kHz in the front and less than 0.5 percent from 40 Hz to 6 kHz (the upper limit of the measurement) in the back. Distortion increases to approximately 3 percent at 20 Hz in both front and back, but this should not be noticeable. DSL found the delay time accurate as indicated.

NEC's experience in Dolby Surround sound goes back a long way. If I remember correctly, the PLD-910 is the third NEC Dolby Surround system we've reviewed and, undoubtedly, its adoption of Dolby Pro Logic makes it the most advanced of the three vis-à-vis stability of dialogue, breadth of stereo image, and absence of artifacts in the surround channel. As with its forebears, the PLD-910 has its minor peculiarities: an NEC penchant for calling the surround channel "Output 2" rather than back or surround, lack of a subwoofer output (although there is a mono output that's recommended for that purpose), and a less than clearly written owner's manual (although ours was a draft version and the published one may be better). In the final analysis, it is performance that counts and, from that standpoint, the NEC PLD-910 clearly deserves serious consideration. *Edward J. Foster*

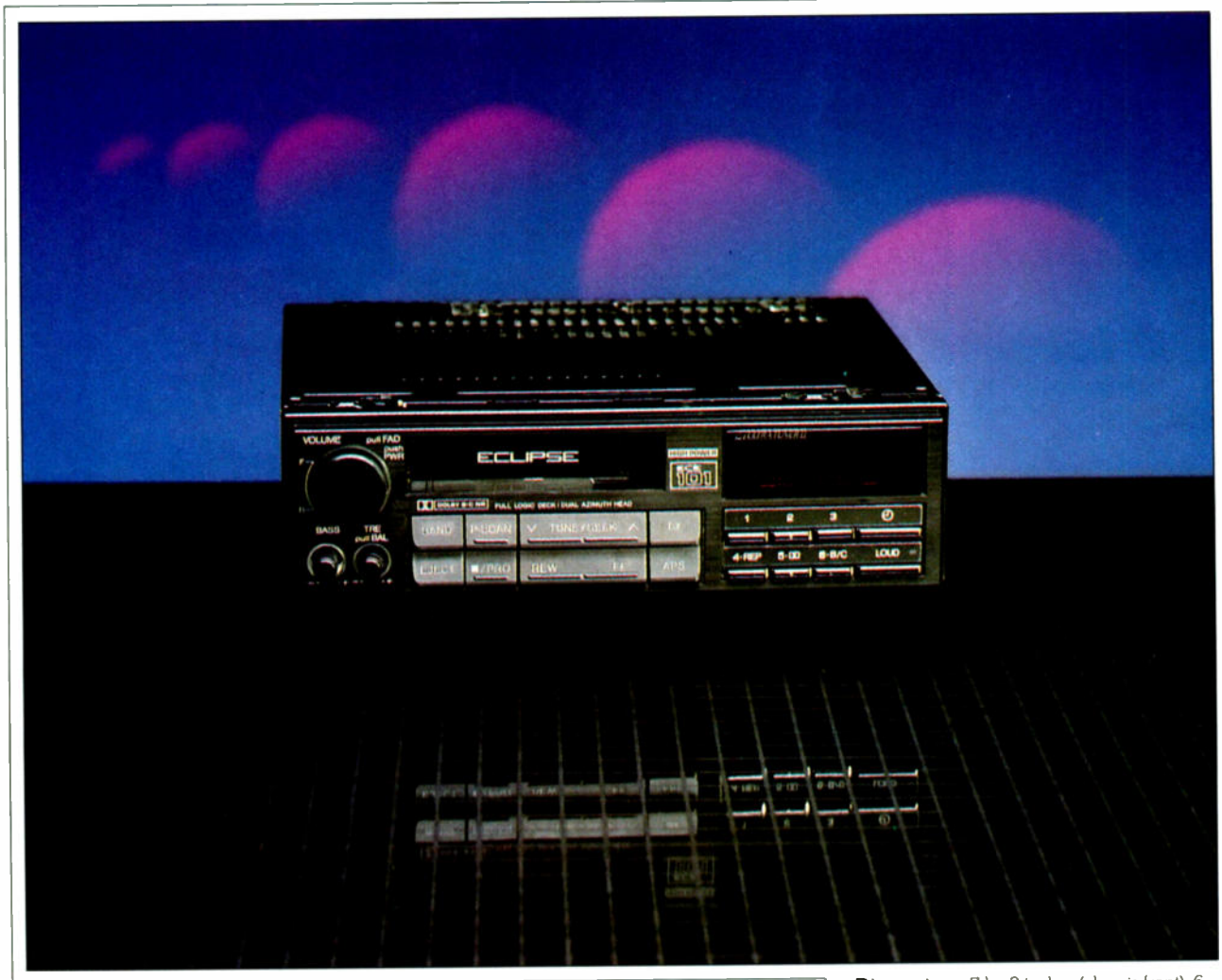
Eclipse ECE-101 Car Cassette/ Receiver

Eclipse is a new premium car stereo line (though built by old-hand Fujitsu Ten)—and a welcome one, on the basis of this initial test of a cassette/receiver with more flexibility than most. Certain features of the ECE-101's ergonomics struck me as particularly gratifying during the road tests, and there is a low-key elegance to its front panel that won't disgrace even the most sedate of automotive interiors. There is even an optional dimmer connection, so the readout panel can be fully illuminated during the day (when the dash lights are off) and dim automatically at night to suit ambient light conditions.

Three rotary controls are at the left end of the unit, all with lighting green collars that (together with a similar light in the cassette slot) serve as an on/off pilot. The large knob is the power switch (push), volume (turn), and fader (pull and turn). The other two controls are for tone. The TREBLE doubles as a balance control if you pull it out before rotating it. All three of these functions have clearly detectable center detents. The two knobs will stay virtually flush with the front panel (preventing accidental resetting when you're adjusting volume) if you push them in; another push will pop them back out. Although the fader is awkward to adjust and the balance/treble combo seems a bit arbitrary, the scheme works because all but the easily used VOLUME and POWER are set-and-forget functions.

The tuner and tape controls are just to the right, beneath the cassette slot; those for the tuner are located above roughly comparable tape controls. In the upper rank are buttons for tuner band, preset scan, up and down tuning, and seek sensitivity. (The last, marked DX, has no effect in manual or preset tuning.) Below these are eject, "program" change (reverse—or stop, if you're fast-winding a tape), the two directions of fast wind, and APS (Automatic Program Selector,

(Continued on page 48)



DAVID A. WAGNER

Dimensions: 7 by 2 inches (chassis front), 6 inches deep; trim, 7½ by 2¼ inches.

Connections: Plug-in harness with flat male triple-connector for battery, ignition, and power antenna; round male and female for dimmer (panel lights); plug-in harnesses with flat male contacts in four-pin connectors for speakers; special multipin connector for CD player; female pin connectors for line in and line out; chassis stud and spade-lug wire for ground; coaxial female chassis socket for antenna input.

Fuses: 10-amp in ignition line.

Price: $630.

Warranty: "Limited," three years parts and labor with warranty card (one year if you don't submit it).

Manufacturer: Fujitsu Ten, Ltd., Japan.

U.S. Distributor: Eclipse Div., Fujitsu Ten Corporation of America, 19281 Pacific Gateway Dr., Torrance, Calif. 90502.

ACCULINEAR 18-BIT TEC

ENTER THE NEW

Everything has limitations. Including conventional CD players.

That's because 16-bit digital processing simply isn't accurate enough to retrieve all the data that's on a disc. So some of the music is lost.

Onkyo's linear 18-bit technology, on the other hand, assures you that all the musical information gets processed. So you don't lose anything. Even the subtle clues that tell you about the space the music was recorded in. And how well the engineer chose the microphones.

Dual Acculinear D/A Converters with calibrated accuracy to the 4th Significant Bit.

But getting all the data off the disc is only the first step. Getting it to your ears is at least as important.

That's why Onkyo developed the Acculinear D/A Converter. And individually calibrates each one to minimize crossover distortion. This unprecedented accuracy means you'll be able to listen to music, even at low levels, and still hear the delicate harmonic structures that distinguish a Gibson guitar from a Martin.

Exclusive Opto-Coupling Modules use light to transmit digital data and reduce harshness.

Onkyo's extensive use of optical transmission techniques instead of conventional wiring further increases musical enjoyment. Proprietary Opto-

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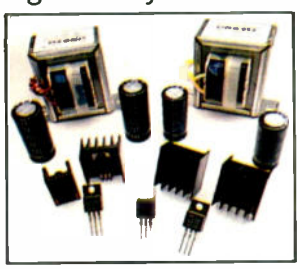
DIGITAL DOMAIN

Coupling Modules at critical circuit junctions eliminate Digital Signal Interference (DSI) and its consequent metallic harshness. So you can enjoy the sound of the Philadelphia Symphony without wondering if the entire string section was playing aluminum violins.

The power supply combines low impedance/low loss transformers, regulators, and capacitors for high stability and isolation.



Dual transformers in the DX-7500 thoroughly isolate digital and analog stages.

In addition, the critical D/A converters benefit from Opto-Drive, a new Onkyo technology that uses LED/phototransistor arrays for the ultimate in current stability and operating accuracy. Which means that any sonic variations you hear will be in the music, not in the disc player.

And the best part? We didn't reserve these technical innovations for one outrageously expensive flagship model. All the musical benefits are affordable.

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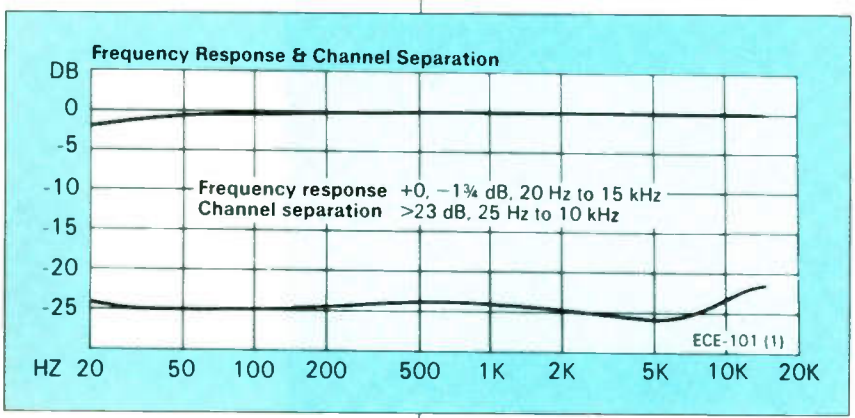
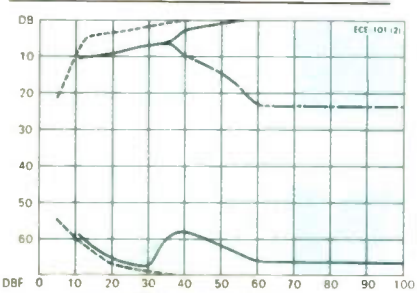
FM Tuner Section



Sensitivity & Quieting



Stereo sensitivity (for 50-dB noise suppression)	see text
Mono sensitivity (for 50-dB noise suppression)	10 1/4 dBf at 98 MHz
Stereo S/N ratio (at 65 dBf)	66 dB
Mono S/N ratio (at 65 dBf)	71½ dB
Capture Ratio	5.8 dB
Selectivity (alternate-channel)	77 dB
AM Suppression	60¼ dB

Harmonic Distortion (THD+N)

	stereo	mono
at 100 Hz	4.2%	2.8%
at 1 kHz	0.81%	0.70%
at 6 kHz	1.4%	0.56%

(Continued from page 45)

which stops the fast-wind modes automatically at the nearest interselection blank).

Finally, there is a bank of small switches, of which the two at the right (with quite different functions) are larger than the others. The small ones are all for tuner presets and will hold six AM stations (one bank) and 12 on FM (two banks). When you're playing tapes, the bottom three buttons are used, respectively, for repeat of the current tape side, Dolby noise-reduction on/off, and B/C Dolby decoding. Playback equalization is set automatically based on the keyway (or lack of it) in the cassette shell. (As usual, 70-microsecond EQ is identified as "metal" in the rather skimpy manual.) The switches at the far right are used to display (or set) the clock time and to engage the loudness compensation circuit.

All of this adds up to an exceptionally simple, intuitive control scheme: one that's easily mastered and easy to use while your eyes are on the road. Perhaps the function that sums it up is the tuning. If you tap the up or down side of the rocker bar, frequency steps up or down manually by full channels: 0.2 MHz on FM, 10 kHz on AM. But keep the bar pressed for more than a half-second, and the tuner automatically enters the seek mode and skips over the frequencies that harbor no station above the seek threshold. I can't recall such a feature in any of our past tests, and I hope it becomes an industry standard in the future.

FM response is very flat, with only a moderate rolloff in the deep bass. Separation is just about 25 dB (moderate, but more than adequate) across the band under standard test conditions. Greater signal strength doesn't add very much separation; weaker stations encounter a progressively greater blend. The blend also seems to depend on modulation level; on Diversified Science Laboratories' test bench, the reduction in noise and distortion was noticeable when audio level dropped. During the road test, I noticed similar effects occasionally, but they tended to be masked by road and wind noise.

Below 40 dBf, stereo is little more than nominal, though quieting remains better than 50 dB (the sensitivity rating point) to less than 13 dBf, where separation is nil. As usually is the case in car stereo tests, we consequently list no stereo sensitivity point, though the 101's mono sensitivity is outstanding. Eclipse says its proprietary differential-input IF buffer amp is responsible for the excellent noise performance that makes this possible.

Output attenuation begins at a fairly high input level (output is down about 3 dB at 40 dBf), and the fading action increases gradually as signal level continues to drop. The resulting attenuation of poor-reception noise bursts and the avoidance of rapid attenuation or collapse of the stereo image make the listening experience notably less disturbing than it often is in the severe-multipath/fading road test. In fact, both FM and AM (despite a response peak in the latter's very deep bass that you might need to tame, if you have a good subwoofer) perform exceptionally well on the test bench and on the road.

Eclipse is understandably proud of the dual azimuth adjustment in its autoreverse deck. Separate adjustments seem the only way to ensure good azimuth in both directions of tape play—particularly if you plan to use the deck often and only infrequently trade it in for a new model. So we were dismayed when the lab reported very poor azimuth match to its BASF test tape. And the failing was

A QUICK GUIDE TO TAPE TYPES

Our tape classifications, Types I through 4, are based on the International Electrotechnical Commission measurement standards.

TYPE 1 (IEC Type I) tapes are ferrics requiring "normal" bias and 120-microsecond playback equalization.

TYPE 2 (IEC Type II) tapes are intended for use with 70-microsecond playback EQ and higher recording bias. The first formulations of this sort used chromium dioxide; today they also include chrome-compatible coatings such as the ferricobalts and a few metals.

TYPE 3 (IEC Type III) tapes are dual-layered ferrichromes, implying the 70-microsecond ("chrome") playback EQ. Approaches to their biasing and recording EQ vary somewhat from one deck manufacturer to another, when they are accommodated at all. Formulations of this type are no longer being made.

TYPE 4 (IEC Type IV) tapes are the metal-particle, or "alloy," tapes, requiring the highest bias of all and retaining the 70-microsecond EQ of Type 2.

SOUNDING OFF

It's unlikely that any audio designer alive has more innovations to his credit than Bob Carver, forty-five-year-old president of Carver Corporation, which he founded in 1978. Virtually every product offered by the Lynnwood, Washington, company contains an unusual circuit with an unusual name: The Sonic Holography generator, the Magnetic Field power supply, the Digital Time Lens, and the Asymmetrical Charge-Coupled FM Detector are among the most well known.

Among high-end audiophiles, Carver is as notorious for his two "T-mod" projects as his products. Accounts of his work have appeared in two "underground" publications: *The Audio Critic* and *The Stereophile*. For both projects, Carver modified his own amps to sound like much more expensive high-end models; these were, in the first case, a Mark Levinson ML-2 mono solid-state amp (costing $6,300 a pair at the time of the test) and, in the second, a Conrad-Johnson Premier 5 mono tube amp ($6,000 a pair). In each instance, reviewers admitted they could hear no differences between the modified Carver and the "target" amps, and a null (output-difference) test confirmed the similarity.

Both challenges resulted in commercial products: the M1.5t and M1.0t power amps, which incorporate the modifications developed during the tests. Since then, Carver has designed his own tubed giant, the Silver Seven, selling for $17,500 a stereo pair. He says he has duplicated its sound in the solid-state M4.0t.

An Interview With Bob Carver Of Carver Corporation

By Gordon Brockhouse

GB: *How did the* Audio Critic *and* Stereophile *challenges come about?*
BC: In each case, I was talking with the editor and said I could make my amp sound like any amplifier, regardless of how it's constructed—whether it's made of grass or glass or tubes.
GB: *Is that still your claim?*
BC: Oh, absolutely.
GB: *What did you actually do in these projects?*
BC: First of all, I sat at the lab bench and measured everything about the target amp I could think of, literally hundreds of things. Those measurements can be reduced to an extended mathematical expression that tells me the relationship of the output signal to the input—what is called the transfer function.

Now that I've done it so often, it's almost trivial to replicate all those things in the transistor amplifier. I've done it twice publicly but many times privately. Before the first test, for *Audio Critic*, I had done it once or twice. *The Stereophile* told me they'd be using a vacuum-tube amp, so I T-modded a number of tube amplifiers for practice.

GB: *Specifically, what did you do to the transistor amp to replicate the transfer function of the high-end unit?*
BC: I changed a lot of parameters. I changed the input impedance as a function of frequency. I changed the real and imaginary components of the input impedance. I changed the output impedance of the amplifier and the damping factor as a function of frequency. I changed its gain. I changed its open-loop response and closed-loop response. I modified various bias settings. I changed phase margins and phase shifts. I modified the distortion spectra. In the case of the Conrad-Johnson, I forced the transistor amplifier to generate "large" amounts of benign second-order distortion components.

My job was not to judge what was making the amp sound the way it did, or even to say which parameter causes what subjective quality. My job was simply to identify all of them, put them all in—all at once—and then to check whether the amps indeed sounded the same.
GB: *Given the characteristics of tube-amplifier circuits, some of the changes you made to your amplifi-*

er presumably weren't salutary.
BC: Absolutely. A tube-amp output transformer itself has a negative effect. A large part of the circuitry was devoted to mimicking the transfer characteristics of an output transformer. It took op-amps to do this. I had to come up with a circuit that mimicked a transformer's leakage inductance, its distributed capacitance, and the magnetization associated with low-frequency currents in its output.
GB: *Did these projects result in changes to the production versions of your products?*
BC: With both projects I incorporated the changes I had made—essentially harmless, benign, simple changes—into production-line versions of those amplifiers.
GB: *So you added transformer-induced fat, tubey sound to your amps.*
BC: In the case of the 1.0t, yes. In the case of the 1.5t, no.
GB: *Was that a compromise?*
BC: The deal was "warts and all."
GB: *The deal for the project. What about the deal for the end user? Does the consumer want warts?*
BC: Maybe I shouldn't have done that, but I did. The 1.0t is one of our very best selling amplifiers.
GB: *Have you sold many Silver Sevens?*
BC: I think I've sold a lot—about fourteen. I can't believe the market that exists for them!
GB: *Are you going to duplicate its transfer function in a Magnetic Field Power amp?*
BC: We've done it in our 4.0t.
GB: *Then what's the reason for having a pair of tube amplifiers that sell for $17,500, when an $800 stereo amplifier can sound the same?*
BC: To make a transistor amplifier sound any way I want, I have to have in my possession the transfer function of the target amplifier. So you have to start with something that already exists. What I wanted was the world's greatest transfer function. To get it, I built the Silver Seven. I had come under some criticism for replicating other amps' transfer functions in my products.
GB: *That criticism strikes me as spurious. Surely the purpose of any amplifier is to be the proverbial "straight wire with gain."*
BC: I felt it was spurious. More than that, I felt it was absolutely beside the point, because the projects began more as an intellectual exercise on my part.
GB: *How have the T-mod projects influenced the design of your production equipment?*
BC: They've changed some of the things I would normally do if I hadn't been exposed to the T-mod.
GB: *What was the fallout of the transfer-function experiments? I gather there was some flack in the high-end press and from high-end amplifier manufacturers.*
BC: The people who were upset had a belief system that said this can't be done—it's sacrilegious. People are willing to die for their beliefs. The truth was very upsetting to those belief systems.
GB: *The* Audio Critic *article [which actually is not critical of Carver] implies that the project taught you a lot about high-end sound and the high-end ethos. Is that true?*
BC: It was an educational experience. I learned how people think about audio. Something I have found very interesting is how our subjective impressions are developed in our brains and in our hearts and in our souls. Those subjective impressions may or may not be founded in reality. As a physicist, I feel funny if I don't get a grasp on things, if I can't understand something from a scientific point of view. It has been important for me to determine what things we hear, how we hear them, when we hear them, how we interpret them. Part of that is understanding that we hear things that don't exist, or hear differences when they don't exist, and, other times, don't hear differences that are very real.

That subject came up in a late-night listening session with one of my friends. . . . We were just carried away with the music. I had some Van den Hul silver cables (at $1,000 per meter), but they weren't installed. My friend suggested we install them. We did—and, boy, there was a big difference. We couldn't believe it. The soundstage became wider and deeper. The sound was more lush and more detailed. My friend thought it was great, but I said, "That can't be. That defies all scientific logic." But there I was—I was hearing it. I said, "Bob, I'm imagining it. You're psyching me into it." And he said, "Nope, it's there," and I had to agree. So I suggested, "Let's unplug them and plug the other cables back in." Sure enough, the sound stage collapsed. It was a little flatter, a little harder, not quite as nice to listen to. And yet, we'd been listening to it all evening and thought it just glorious.

The subjective side of me, my heart and soul, was in a giant battle with my mind. Now, Bob wasn't having that problem. He knew *absolutely* that the Van den Huls made a big difference. But I knew better. I thought, "What's going on? I know this can't be true." So we changed the cables back and forth several more times. I began not to hear the difference, the difference that scientifically could not possibly be there. He continued to hear the difference as big as life. I said, "I bet you can't hear it if you don't peek at which one is hooked up." So he closed his eyes, and I hooked up the Van den Hul and he listened. And he closed his eyes again and I hooked up the other cables. Sure enough, he could not tell which one he was listening to.

He was absolutely stunned. He would have bet me a million bucks that he could easily tell the difference. After I had listened to them a couple of times, there was no difference to be heard. Scientifically there wasn't; and subjectively there wasn't.
GB: *So what was right: your first impression or your later impression?*
BC: My later impression was absolutely the right one. The first one was my imagination at work.
GB: *Taking the conversation back to your amplifiers, would you speculate that an audiophile might be more comfortable seeing a great big tube monster than a little transistorized box? And might he let that comfort influence what he hears?*
BC: I think that happens sometimes.

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GB: *But those little vibrations in the air are the same.*

BC: They're the same.

GB: *So it's between the ears where the differences are perceived.*

BC: It's between the ears, but it's real. Look, stereo is an illusion anyway, and that's a real and important part of the experience. So it's legitimate.

GB: *A real illusion.*

BC: It's part of the illusion, it's real. Whatever you need to make the illusion work is legitimate.

GB: *Let's talk about your other products. I don't think you have ever brought out a product without some special feature, like Magnetic Field power supply or Sonic Holography or Digital Time Lens. These aren't just technical innovations, they're a great marketing tool, obviously a great help to dealers selling the products. What comes first, the technology chicken or the marketing egg?*

BC: The technology chicken. We're basically an engineering-driven company.

GB: *I take it that Sonic Holography was the development that put the then-new Carver Corporation on the map. What's the theory behind it?*

BC: One of the reasons a stereo system doesn't sound the same as a live performance is interaural crosstalk. In real life there are two sound arrivals for each sonic event—one in each ear. Your brain uses those two arrivals to create a sense of location by temporal means, comparing the sounds in the two ears. In stereo you have four sound arrivals—two speakers, two ears. As a result, the temporal cues are confused. Your brain has to ignore them and concentrate only on the amplitude cues to build a soundstage in the mind. The soundstage becomes flattened. If you can somehow get rid of the two unwanted sound arrivals, you create something that's more like real life. It has a sense of depth, space, and temporal reality it doesn't have ordinarily.

Imagine someone coming up and whispering in your ear. You can readily tell that someone's whispering in your ear, because the sound is basically in one ear and one ear only. If you made a recording of that sound and played it back through a set of speakers, you'd locate it, very accurately, as coming from the left speaker. Obviously that's a tremendous spatial distortion, because it should have sounded like it was coming from outside your left ear. With Sonic Holography, shortly after the sound is launched by the left speaker, the right speaker launches a sound wave that is phased and timed and spectrally adjusted so that it cancels the sound from the left speaker arriving at the right ear. Now all you hear is the sound in your left ear, and you'll hear the whisper as if it were in your left ear.

Carver's Silver Seven ($17,500 per pair)

GB: *Surely that can be done for only one room location, though?*

BC: If you work out the math, it works as long as the listener-to-speaker distance is the same for both channels. As you move in closer, the time it takes for sound to go around your head increases in the same amount as the angle of displacement is changed. But it starts to break up if the listener moves laterally. As you move off the center axis, the illusion of depth begins gradually to collapse. After a foot, it starts to go away rapidly, back to normal stereo.

GB: *Don't good stereo recordings take interaural crosstalk into account? Aren't you correcting for something that skilled recording engineers consider?*

BC: There's no way that a skilled recording engineer can make the sound cancel at the other ear. What he *can* do is make a recording that exploits all the ambience in the hall: use an amplitude-sensitive center mike with outriggers that pick up timing cues. What the engineer relies on is random cancellations. Just by luck, some of the sonic events and the mike spacing will add in such a way that there will be some partial cancellations. Some of the finest orchestral recordings do that, and they give a lovely sense of acoustic space.

GB: *Have you looked at owners' listening habits? Two years after buying a Carver preamp, is the Sonic Holography button still pushed in?*

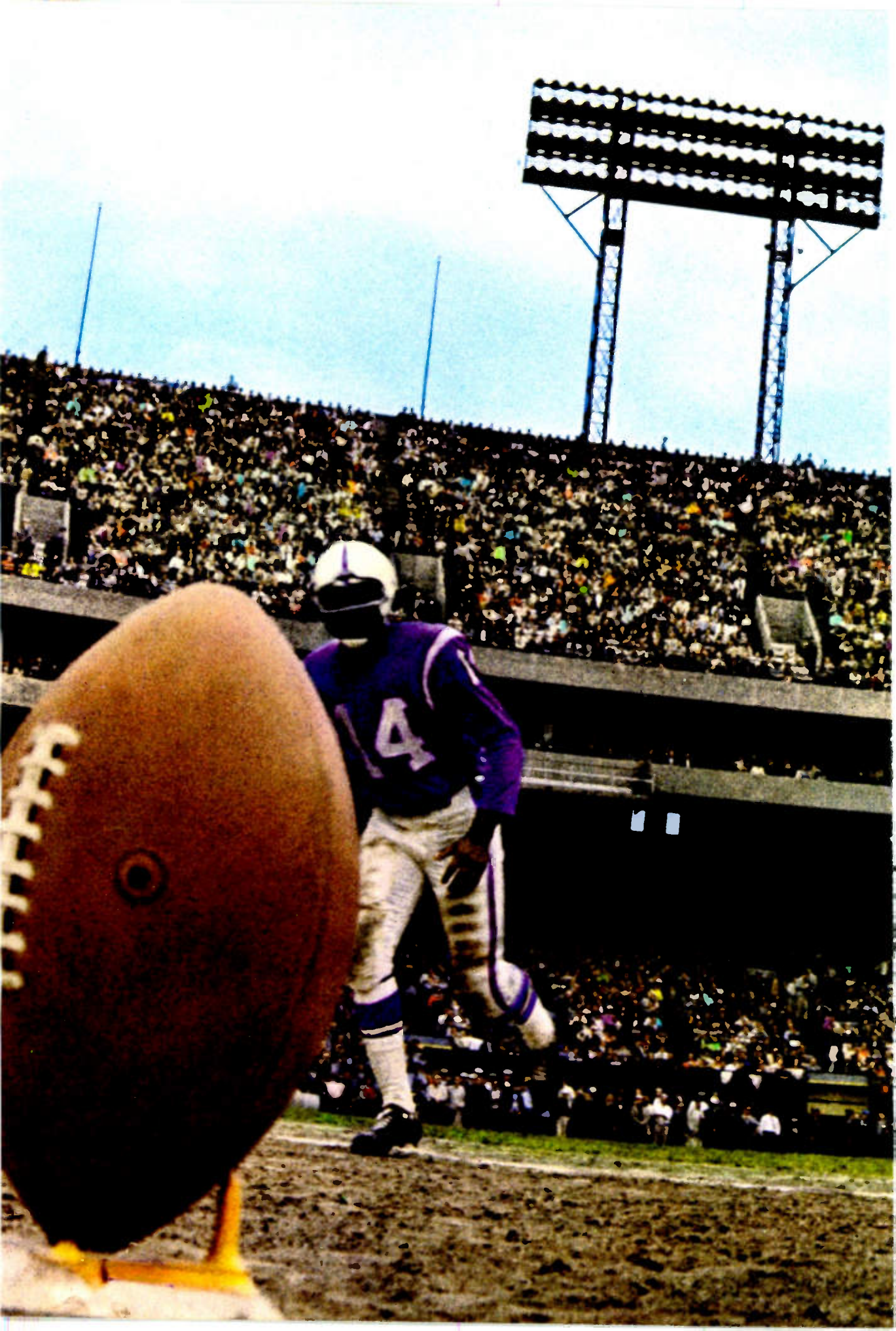
BC: It depends on the person. Some people have a listening setup where they've really gone to the trouble to make the Sonic Hologram work properly. You have to work at it. To make it work best, the room should be dead-end, live-end. The speakers should be pulled away from the back and side walls, because early reflections tend to destroy the Holographic illusion. And you have to sit between the speakers. The rules are no different from those for normal stereo. The difference is that you have to pay strict attention to them.

GB: *Do you need a dentist's chair with a clamp to hold your head in place?*

BC: Oh no, it's not like that at all. I designed it so that you could sit in a chair on the listening axis and have the same freedom of movement as in a chair in a concert hall.

GB: *I gather that your receivers, CD players, and car decks are produced offshore, and the rest in the United States. What has been the effect of fluctuating currencies on your company?*

BC: We've fallen on hard times. Currencies are not the only factor. The company is doing $27 million now, and that's large enough that we have to change from an entrepreneurially



What it feels like watching
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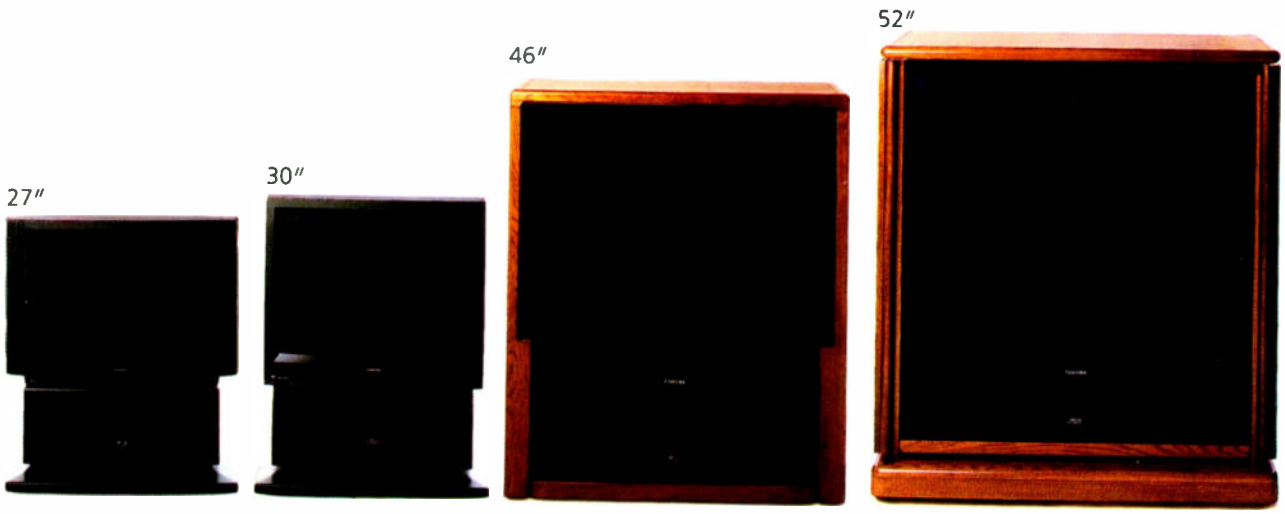
19



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56

What it feels like watching football on a typical television.

managed company to a professionally managed company. That transition is much harder than I thought it would be.

GB: *Do you anticipate moving production of any of your products out of Japan and Germany, back to North America?*

BC: About 35 percent of our equipment (in dollar terms) is made in Japan. Right now we're working with our Japanese partner to build in the United States. They are going to make parts kits for us, and we're going to do final assembly. They're going to teach us how to do it the way the Japanese do it—which is fast and furious. We're going to do CD players, tuners, and preamps. We've just recently moved to the old Phase Linear building, so we have this 35,000-square-foot building in which we happen to make speakers. The other half is going to be this high-speed Japanese-style production line.

GB: *Does the yen situation represent an opportunity for North American manufacturers to grab back some of the business they lost to Asian suppliers?*

BC: I don't think so. First of all, the Asian suppliers have not raised their prices, and in some cases, they've actually lowered them. Unless they raise their prices a lot, we still wouldn't have the ability to be particularly competitive. You have to remember that the United States has lost the infrastructure that supplies consumer-electronics parts. All that's gone. It took us 20 years to lose it, and it would take another 10 or 15 years to build it up again.

Secondly, the Japanese buy their raw materials on the open market in dollars. What happens is that their materials costs go down as the dollar crashes. The net result is that their costs go down—except for labor, which is only a small component. The greatest cost is moving the product into the American market (commissions, etc.). So their costs go down when the dollar crashes. So it doesn't afford us an opportunity.

GB: *What's next for Carver?*

BC: This is really an exciting field. It's why I love audio so much. The stereo systems we listen to today don't present us with a true illusion. Yet this whole industry's working so hard to do that. We have power amplifiers with essentially zero distortion. We have loudspeakers whose distortion at any rational listening level is below the human hearing envelope. The bandwidth of loudspeakers is plenty big. So how come it doesn't sound real?

The reason it doesn't sound real is that we're not presenting the proper cues. There are some really smart people working on that. We've seen Yamaha and Bose do some psychoacoustic work. There's not enough psychoacoustic work done, so I have to tip my hat to anyone doing it. What I want to do next is develop a system that will accurately deliver all the proper cues, so that when we close our eyes we can believe we're in the presence of real, live orchestra.

GB: *Do you think that's do-able? Can you bring the Berlin Philharmonic home?*

BC: It's do-able, with one fundamental limitation: It's not possible to do a facsimile reproduction—meaning exactly the same. If you can forget about facsimile reproduction and concentrate on believable reproduction—so you can close your eyes and say, "That event could have been real," because it *sounds* real—you can do that.

GB: *What do you have to do in the audio chain to make that happen?*

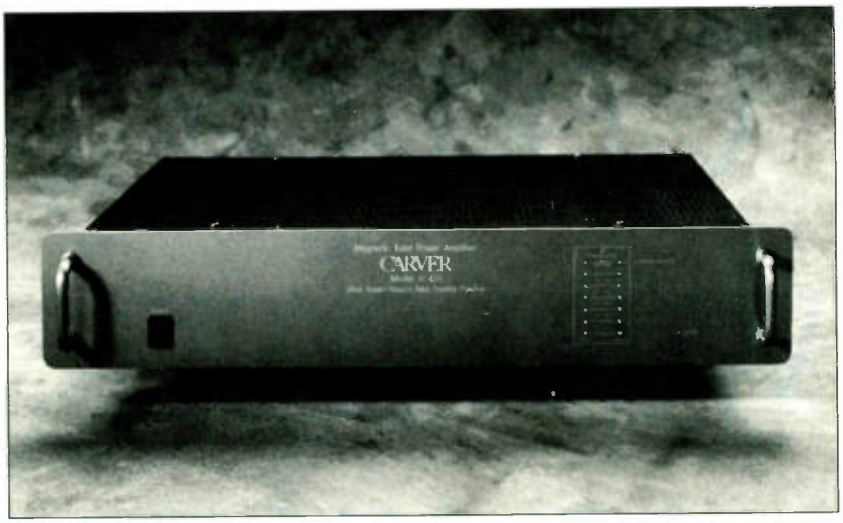
BC: I'm not sure yet, because I'm still working on it. But I've been doing a lot of research and I have a lot of ideas.

GB: *Such as?*

BC: The first thing you have to do is present to your ears the proper timing cues and the proper spectral cues, so that your ear/brain will build this illusion. To do that, you have to get rid of all the wrong cues from your listening room and your speakers.

GB: *How do you get rid of them?*

BC: A live-end dead-end room is a beginning, but only a beginning. I'm not sure how to get rid of them all, but I'm working on it. Cancellation techniques perhaps; perhaps live-end dead-end; perhaps the right amount of spectral directionality associated with loudspeaker waveform launch. After you've gotten rid of all the bad stuff, if you were then to superimpose the proper cues, you could create in the space around your ears a sound field that has what human beings are used to listening to—and it could represent a real, live event. That's do-able with today's technology. That's the beginning. All of this is just the beginning of really explosive research. □



The Carver M4.0t ($800) has the same "transfer function" as the Silver Seven.

Gordon Brockhouse has been an editor of Canadian audio and computer industry trade publications.

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The CDP-707ESD:
Simply stated..."the reference against which to judge" others.—*Len Feldman, Audio Magazine.*

Historically, Sony ES Compact Disc players have been the benchmark for advancing the state-of-the-art. The CDP-707ESD is no exception. As the world's first CD player to incorporate dual 18 bit linear D/A converters, along with a proprietary 8X oversampling digital filter, it brings the listener closer to the theoretical limits of Compact Disc performance. This advanced technology provides greater low level signal resolution and improved linearity, for more faithful reproduction of musical depth and detail.

And there's more to the ES Series than the CDP-707ESD, and its host of sophisticated features. You'll find our advanced 8X oversampling filter technology in the less costly CDP-507ESD, as well as the CDP-C15ESD, which combines 18 bit linear D/A converter performance with 10-disc changer convenience for the very first time.

The STR-GX10ES:
The quality of separate components in a fully integrated design.

Traditionally, few receivers have offered the performance necessary to meet the demands of digital sources. These demands on receiver technology come at a time when the requirements for total audio and video integration have created more compromises than ever before.

To avoid those compromises, Sony created the STR-GX10ES, with 150 watts-per-channel. It, along with our full line of receivers, achieves unsurpassed musicality, thanks to a unique Spontaneous Twin-Drive amplifier stage that eliminates power supply fluctuations, regardless of current demand. Add to this such refinements as discrete outputs and a non-resonating G-Chassis™ design, and you have accurate reproduction of music detail and dynamics even under the most demanding speaker load conditions.

Yet the STR-GX10ES also brings you the convenience of total integration with a supplied Remote Commander™ unit that allows for control of virtually any infrared audio or video component, regardless of brand. And with its special high resolution S-Video circuitry, the STR-GX10ES is compatible with components you might buy in the future.

The TC-WR11ES:
Finally, a level of performance never before achieved in a dual-deck design.

Accurate reproduction of digital source material has placed a heavy burden on the finest analog cassette decks. A burden compounded in dual-well designs, where compromises are often made for operating convenience.

The uncompromising new Sony TC-WR11ES is a magnetic and mechanical accomplishment that rises to the digital challenge by combining superb music reproduction with ultra-sophisticated operations. A unique 210 kHz Super Bias™ circuit extends frequency response, without the beat frequency noise that's typical of high speed dubbing decks. Even at normal speed, the TC-WR11ES, like all ES cassette decks, achieves clean, transparent recordings, plus an astoundingly uniform 20-20,000Hz (+/– 3dB) frequency response. Add to this the patented Laser Amorphous heads and 4-motor transport, and the TC-WR11ES indisputably demonstrates the technical refinement needed to triumph in the digital age.

The Sony ES Commitment.

The Sony ES Series is a skillfully crafted line that not only includes the finest Compact Disc players, but superb analog components as well, all doing full justice to the ES engineers' exceedingly high standards. Further expression of this excellence is reflected in the 3 year limited warranty that backs each and every model (see your authorized Sony ES dealer for details).

For more information on where you can audition the full line of Sony ES components, call **201-930-7156.**

ES SONY®
THE LEADER IN DIGITAL AUDIO™

ULTRA HIGH FIDELITY

Big Picture

The news from Milan is that short skirts are out and Boffi Vidikron's $5,700 front-projection video system is in. The Italian company's high-performance projector is housed in a compact, 46-pound case that can be mounted on the ceiling or placed on the floor or on a table. It is claimed to be the first projection set that can be tilted 20 degrees up or down (to adjust the picture height) without distorting the shape of the image. The array of video inputs includes an S-connector. Vidikron manufactures its own high-gain curved and flat screens, ranging in size from 65 inches to 10 feet (diagonal) and priced from $495 to $695. The remote control can trigger the raising and lowering of a flat screen when the projector is turned on or off. When mounted on the ceiling, using the supplied "invisible" support hardware, the projector extends down just 11 inches.

Besides the screens, other optional accessories are a black-lacquer coffee table designed to conceal the unit (and hold a VCR and tapes) and a satellite/subwoofer speaker system whose satellites can be powered directly by the projector. *Boffi Vidikron U.S.A., 928 Broadway, New York, N.Y. 10010.*

Perpetual Power

Tube amplifiers will always have their adherents, whether the loyalty is nostalgic or based on a preference for a tube amp's supposedly "warmer" sound. Classic Audio's CA-260 dual-mono tube power amp (pictured with its top down) was developed by George Kaye, former chief engineer of New York Audio Labs. The limited-edition, rack-mountable amp is rated at 50 watts (17 dBW) per channel and is said to use unique driver circuits that are clean enough to require just 8 dB of negative feedback. (The application of vast amounts of negative feedback, partly responsible for the ultralow distortion of many amps, is frowned upon by some audiophiles, be they tubists or not.) The CA-260's power supplies are regulated in two stages, and protection is provided against surges and line transients.

The U.S.-made CA-260 retails for $1,665 and is available at dealers or direct from the factory. *Classic Audio Ltd., P.O. Box 176, Walton, N.Y. 13856. Telephone: (607) 865-7200.*

Immaculate Reception?

The Terk Pi, a handsome CD-size circular FM antenna engineered by renowned tuner-designer Larry Schotz, is said to provide as much as 30 dB of gain and to improve, overall, the reception of difficult stations. It is powered from house current and includes a matching transformer for connecting to 75- and 300-ohm antenna inputs. The Pi is available in a white or gray matte finish and lists for $80. *Terk Technologies Corp., 56 Harrison St., New Rochelle, N.Y. 10801.* □

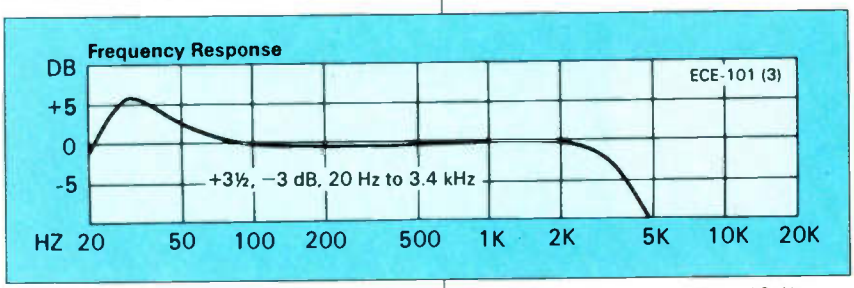
easily audible in the test car. Whereas good equipment (the Eclipse tuner section, for instance) sounds rather hot on the high end without EQ, the tape section required considerable treble boost to sound acceptable.

Fortunately, the data show that this is not a fault inherent in the ECE-101. The exceptional match between the two directions of tape travel, despite the deck/test-tape disparity, speaks well for the design. And Eclipse's own data (submitted with the test sample) show that the company is partial to Teac test tapes, whose azimuth traditionally has disagreed with that of most others. This isn't necessarily to say that Teac is wrong—azimuth is really too knotty a chicken-and-egg proposition for that—but among the azimuth tapes we've used over the years, Teac's appear to have borne the least similarity to the others. I don't know that the difference in test tapes can, quantitatively, account for all of the lab's findings here, but it certainly must be counted as a probable major contributing factor. And the data strongly suggest that excellent azimuth match to any given test tape, used for adjustment by a competent technician, might be achieved in *both* directions for the ECE 101.

Transport speed is somewhat fast, but not to a worrisome degree. More important, speed stability is good both on the bench (the flutter figures) and on the road (as resistance to shock-induced anomalies). The automatic EQ switching (another feature I'd like to see become standard) contributes materially to ease of use, and the presence of both Dolby modes is a decided plus. Inserting a cassette turns on the set automatically; eject is automatic if the ignition is switched off while a tape is playing. Ideally, the tape section's output should be higher, to match that of the tuner, especially since signals through the latter are more likely to be peak-limited. But this is a minor point in the overall scheme of things.

The tone controls are fairly standard for their type and appear to shelve beyond the reference frequencies cited in the data. The loudness compensation is not at all standard, introducing about 1 dB of deep-bass boost and a gradual high-frequency rolloff (−3 dB at 8 kHz) even with the volume at maximum. Reducing volume progressively increases the bass boost (relative to 1-kHz response) and reverses the treble attenuation. By the time the volume has been backed off by 20 dB, loudness compensation is about +10 dB below 100 Hz and +4 dB above 10 kHz.

Four switches on the ECE-101's bottom panel can be used to customize a system. One changes the AM channel width to 9 kHz (the standard in some countries). The other three respectively defeat the tone controls, defeat the fader, and switch from the special DIN CD-player input to the line input. The switching clearly allows for the insertion of an equalizer (or equalizer/amplifier) in the line connection loop and its preemption of the tone controls.



For many users, a more obvious step-up would be the addition of separately powered subwoofers in the car's rear deck. The standard setup anticipates this by feeding the back fader-controlled signals to the line-out connections. The built-in amplifier already supplies a little more than 11.5 watts (Eclipse's rating, at 1 kHz and 3 percent distortion into 4 ohms) in each of its four channels, which should be more than adequate in many installations. But using a separate amp for the subwoofers avoids loading down the rest of the range with the demands of the deep bass.

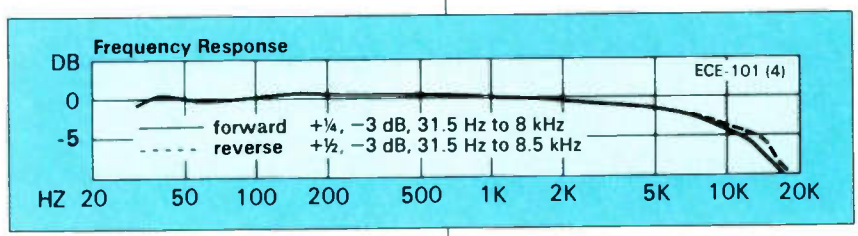
Obviously, there is a great deal to admire in the ECE-101, and I'm not even convinced that its least attractive aspect (the tape azimuth problem) necessarily represents more than a misadjustment of my test sample. That it is remediable (by a service technician) is more than can be said for the azimuth problems we regularly encounter in many other car decks. The control approach and the tuner section are unequivocally excellent. The preamp and amplifier design, while it can never be all things to all users, also seems well above par in both capability and adaptability. I expect we'll be hearing a lot more from Eclipse in the future.

Robert Long

AM Tuner Section

Sensitivity	1.9 µV
Selectivity	44 1/4 dB
AVC Range	69 1/2 dB

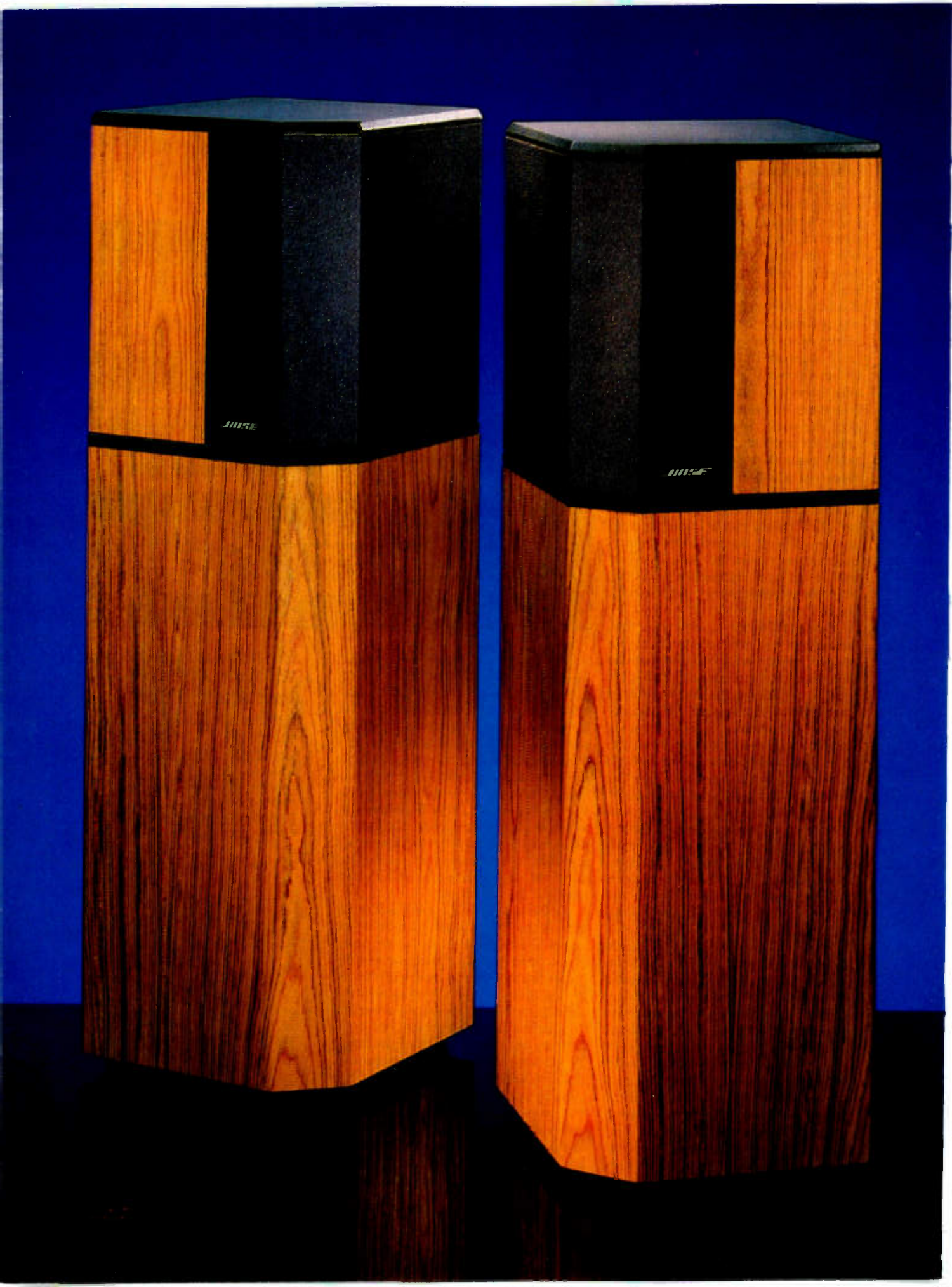
Cassette Transport Section



Wow & Flutter	± ≤ 0.15% average, ± ≤ 0.19% peak
Speed Accuracy (10.4 to 14.4 volts)	≤ 2.2% fast

Preamp/Amplifier Section

Bass Control	±8 3/4 dB at 100 Hz
Treble Control	+8 1/2, −8 3/4 dB at 10 kHz
Line Output Impedance	820 ohms
Maximum Line Output Level	
from FM (100% modulation; at clipping)	1.2 volts
from tape (DIN 0 dB)	0.94 volts
Output (per channel into 4 ohms; at 3% THD+N)	
at 1 kHz	11.7 watts (10.7 dBW)/channel



Introducing the most powerful expression of a new technology:

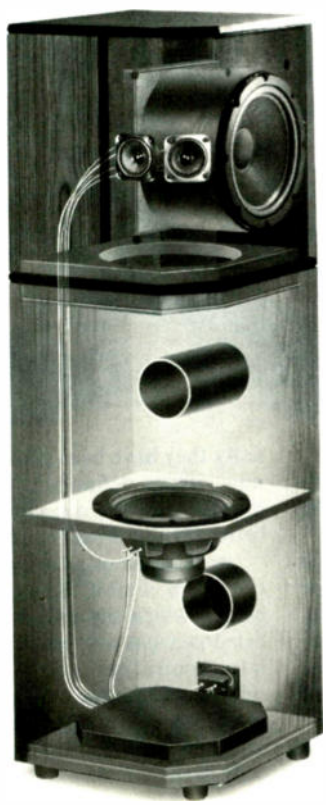
The Bose® 10.2™ Series II Direct/Reflecting® system with Acoustimass® speaker technology.

Inside and out, it's a speaker unlike any other.

The new Bose 10.2 Series II speaker successfully harnesses a *series* of audio technologies to take the listener one step closer toward the goal of all speakers: the realism of live music. The 10.2 Series II speaker combines the most powerful version of Acoustimass speaker design available for the home with the proven, critically-acclaimed benefits of a Bose Direct/Reflecting® system. The result: a musical listening system with *no* compromises —one that's at home in any environment.

Technology in harmony with home aesthetics.

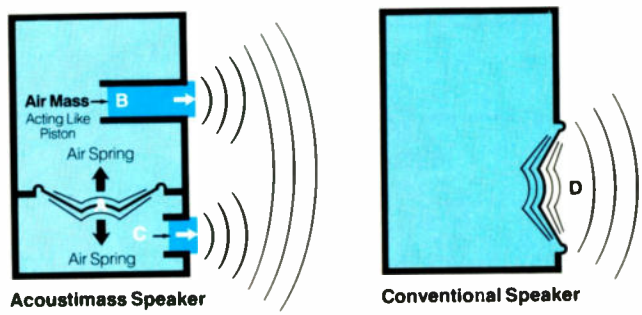
Moreover, the 10.2 Series II system brings lifelike sound into the living environment without overwhelming it. Each speaker's genuine wood veneer, hand-crafted Acoustimass enclosure produces the bass necessary to make even the most demanding music come to life, yet requires just *one square foot* of floor space. The system's Stereo Targeting® arrays precisely shape and control sound, providing listeners—regardless of where they stand or sit—with full, balanced stereo sound from both speakers. Where the speakers look best is also where they *sound* best.



Greater musical realism with any sound source.

Like all Bose Direct/Reflecting® speakers, the 10.2 Series II system is designed to accurately reproduce much of the clarity and spaciousness of live music. This strict attention to sonic detail is carried through to the lowest notes, where Acoustimass speaker technology provides much of the realism and impact normally experienced *only* in the concert hall. The system's purer sound provides the dynamic range and high power capability required for optimum results with any audio or video system and software—especially digital.

How an Acoustimass® speaker works.



Improving speaker performance means first reducing distortion. The design of an Acoustimass® speaker *substantially* reduces distortion (see diagrams and graph). The benefits of this patented speaker technology are purer sound and an increase in the dynamic range of bass performance.

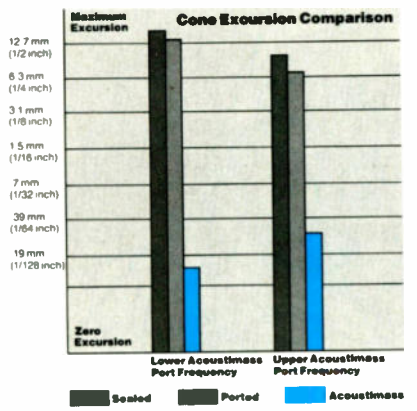
Left: An Acoustimass speaker *launches* sound into the room using two masses of air working like pistons (B&C, darker blue), rather than by a surface vibrating directly into the room. *The sound launched into the room by the Acoustimass speaker's air pistons is the purest sound that can be produced by present technology.*

Right: A vibrating cone radiating directly into the room (D) produces unfiltered sound.

Cone Excursion Comparison.

(lower excursion means lower distortion)

Graph: The distortion produced by any speaker rises dramatically with its cone motion, or *excursion*. At port-tuned frequencies, a typical Acoustimass speaker's cone has less than *1/16* the maximum excursion* of sealed and ported cones. Inside an Acoustimass speaker, the interaction of the air springs with the air masses in the ports produces a very high pressure at the surface of the cone. This greatly reduces the cone's excursion, and therefore reduces distortion. The air springs act with their respective masses to form low-pass filters, removing any small distortion components generated by the cone.



*based on cone travel measurements at 128 watts input

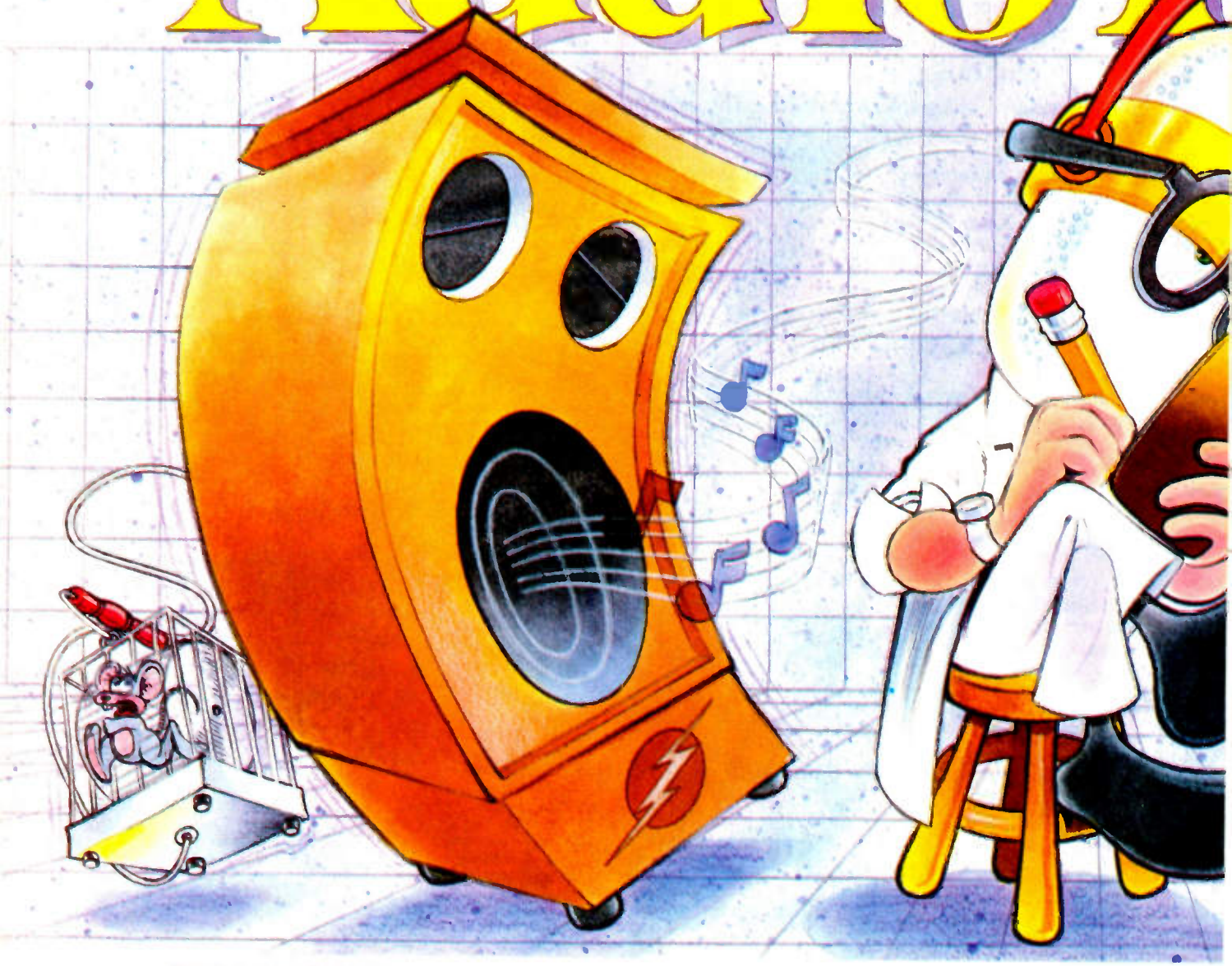
Judge for yourself.

Ask your authorized Bose dealer to demonstrate the new Bose 10.2 system with Acoustimass speaker technology against any other speaker—and hear the difference for yourself. For more information, call Bose Corporation toll-free at 1-800-444-2673 between 9 a.m. and 5 p.m. EST.

BOSE®

Better sound through research.

Audio F



TRUE STORY NO. 1

Date: *the fall of 1978.* **Place:** *a state-of-the-art audio research laboratory at a major East Coast technical institution. (Hint: There is only one.)*

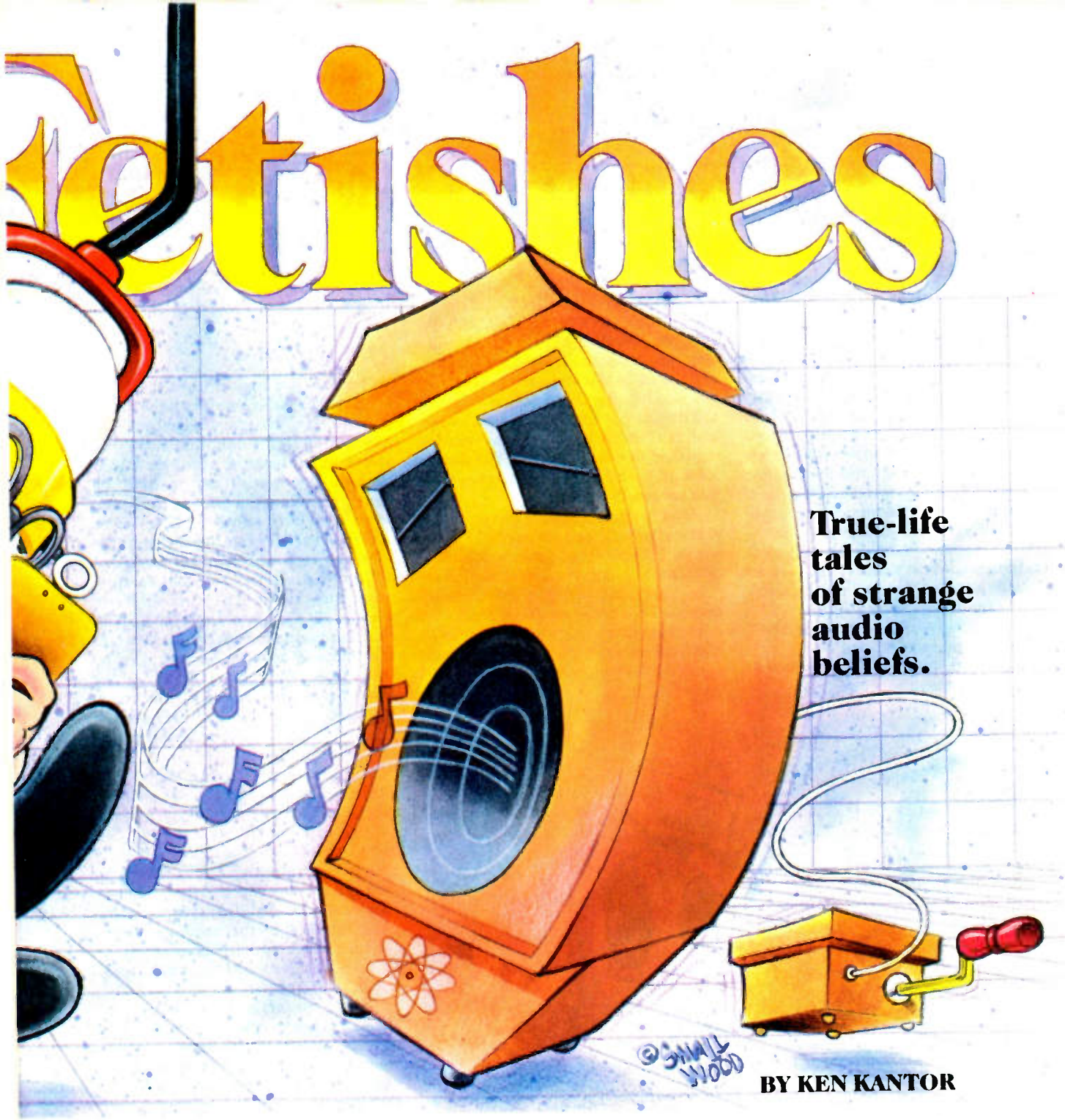
An awesome collection of eminent audio professionals has been assembled as test subjects for a definitive listening experiment. The procedures have been defined and refined, the equipment checked and double-checked. No reservations remain concerning the hardware, the software, or the experimental method. Attention is focused on a group of audio critics, writers, and engineers—all reputed to be among the most astute and demanding "golden ears" on earth. They are a confident bunch. They believe that finally they have been given their proper chance. They can now answer definitively one of the great, burning audio questions of the decade: Do discrete transistors sound better than integrated circuits?

As months of anticipation, speculation, and planning come to a climax, the appointed leader is handed a small box on which sits a silver toggle switch with positions labeled TRANSISTOR and IC. A wire from the box disappears into a control system in the wall. Never in history has more effort gone into the creation of a noiseless, seamless, absolutely pure and undetectable audio-switching system. With notebooks in hand, the experts disappear into the acoustically prepared room for the beginning of two full days' un-

ILLUSTRATIONS BY STEVE SMALLWOOD

Fetishes

True-life tales of strange audio beliefs.



BY KEN KANTOR

disturbed music listening. Their only mission: to choose which of the two switch positions offers the better sound.

At first the golden ears seem distraught, but they are only warming up. As the hours roll on, spirits lift and a consensus begins to emerge. In due time the consensus becomes a treatise of two dozen pages, rich with the language of the engineer and of the poet. It is unanimous: Transistors have won. The poker-faced scientist who graciously accepts the report is afraid to tell the assembled golden ears the truth: that the box contained nothing more than a switch and a lump of clay to add a convincing heft. *It was not connected to anything!*

What is the moral here? Are we foolish to trust our ears? Are "golden ears" all fakes? Does all audio equipment sound the same? All of the above? No, the moral is definitely: None of the above. The lesson is simply that humans can be fooled, by themselves and by each other—not all the people all the time, but enough to merit taking a closer look at some of the ways mistakes can occur. Audiophiles invest a lot of passion in their beliefs about the various techniques, philosophies, and, most of all, equipment associated with sound reproduction. Fetish, while a strong word, is an appropriate one describing many audiophile beliefs: as one dictionary has it,"an object regarded as having magical power; any object or idea eliciting unquestioning reverence or devotion." ▶

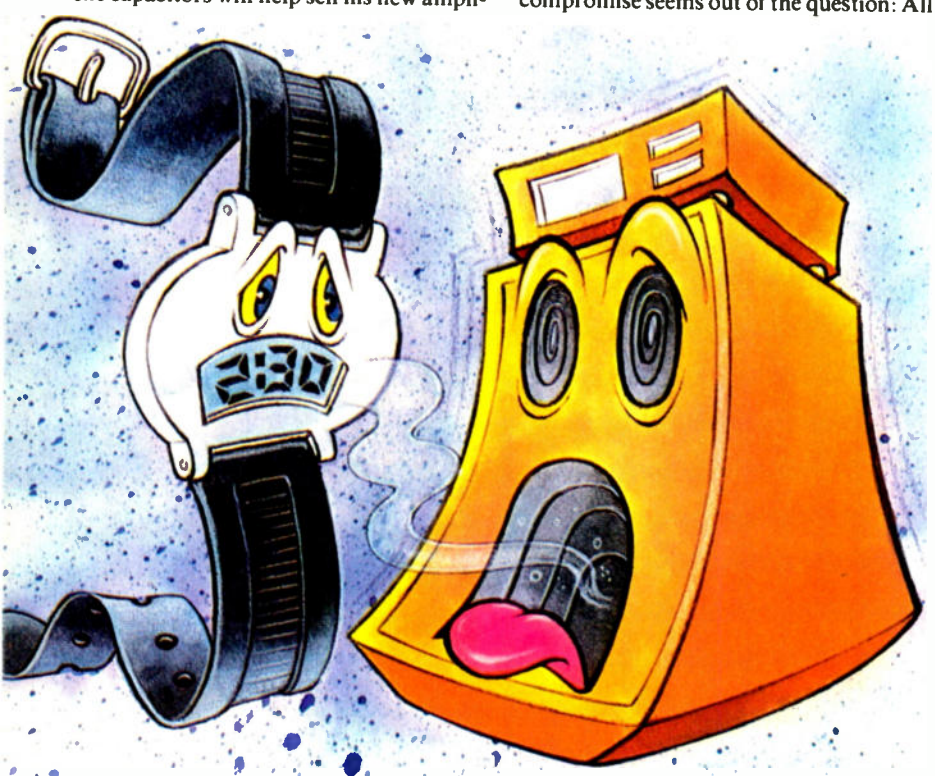
Audio Fetishes

Audio fetishes evolve in a basically logical way. A clever hobbyist wakes up with a revelation about how to improve his stereo system. Such ideas are usually inspired by perceived technical deficiencies, real or imagined. For example, the hobbyist, dissatisfied with the sound of his system, might begin to wonder whether the tediously slow chemical reactions occuring in the electrolytic capacitors in his amplifier might be blurring musical transients. A fix using high-grade and expensive polypropylene capacitors is planned and executed.

Naturally, the proud and excited audiophile expects to hear a vast improvement. Providing that no damage has been done to the operating circuitry, it is a pretty good bet that the sound will indeed *seem* much better. A five-minute demonstration to admiring friends and relations, some of whom never heard the unmodified amplifier, reinforces that perception. The hypothesis is proven. A fetish is born. One of his friends knows a writer for an "underground" audio publication, which uncritically promulgates the idea worldwide. An engineer in Japan reads about it and convinces his management that polypropylene capacitors will help sell his new amplifier in the tough American market. The full-color cross-Pacific polypropylene-amplifier promotional barrage begins—even in the pages of HIGH FIDELITY.

The truth is that our hobbyist has no real way of knowing what he has wrought, be it better, worse, or indifferent. The original capacitors may have been doing a splendid job all along, and no real change has been effected. Surely nobody familiar with controlled listening tests and the duration of auditory memory would trust the hobbyist's listening-test results, even disregarding his possible bias in the matter. Perhaps the amplifier had originally been designed for a particular type of capacitor and the new one actually produces a rising high end, which, in turn, is interpreted as improved transient response. The listener is happy, but his amplifier is now less accurate and possibly unstable.

Over the years, many similar mystical notions have floated through the audio world. Proponents of these beliefs often cite some technical or pseudotechnical rationale in support of their position. Rarely does any hard experimental evidence exist of the kind that would eliminate personal bias from the equation. And open-minded compromise seems out of the question: All too often, champions of the measure-up-or-shut-up approach dismiss subjective listeners as, at best, self-deceiving flakes or, at worst, self-serving charlatans. The ears-*über-alles* types, on the other hand, usually consider the loyal opposition deaf and insecure. Some go so far as to deny the ability of any conceivable experiment to convinicingly prove or disprove their claims. Thus, the rest of us either hear what they hear, or we are, by definition, wrong.



Digital watch fetish: It's been suggested that these silent timekeepers degrade audio performance when placed in your listening room. Could this be a Swiss movement?

THE ACID TESTS

So, how can you know what or who to believe? After all, there must be some degree of truth behind even the strangest audio fetishes, even if it is only that somebody somewhere *thought* he heard the effects claimed. It is logical that any time you change something—a piece of equipment or merely a piece of wire or cable—some kind of an audible effect should result. The trick is to know whether that effect is real or can be explained by other factors; whether it is big enough to hear at all; and whether it is actually a step in the right direction (toward accuracy or whatever other criterion of sonic quality you may desire). While there are never definitive answers to these questions, there are three meaningful parameters by which you can judge whether an audio fetish has some basis in reality:

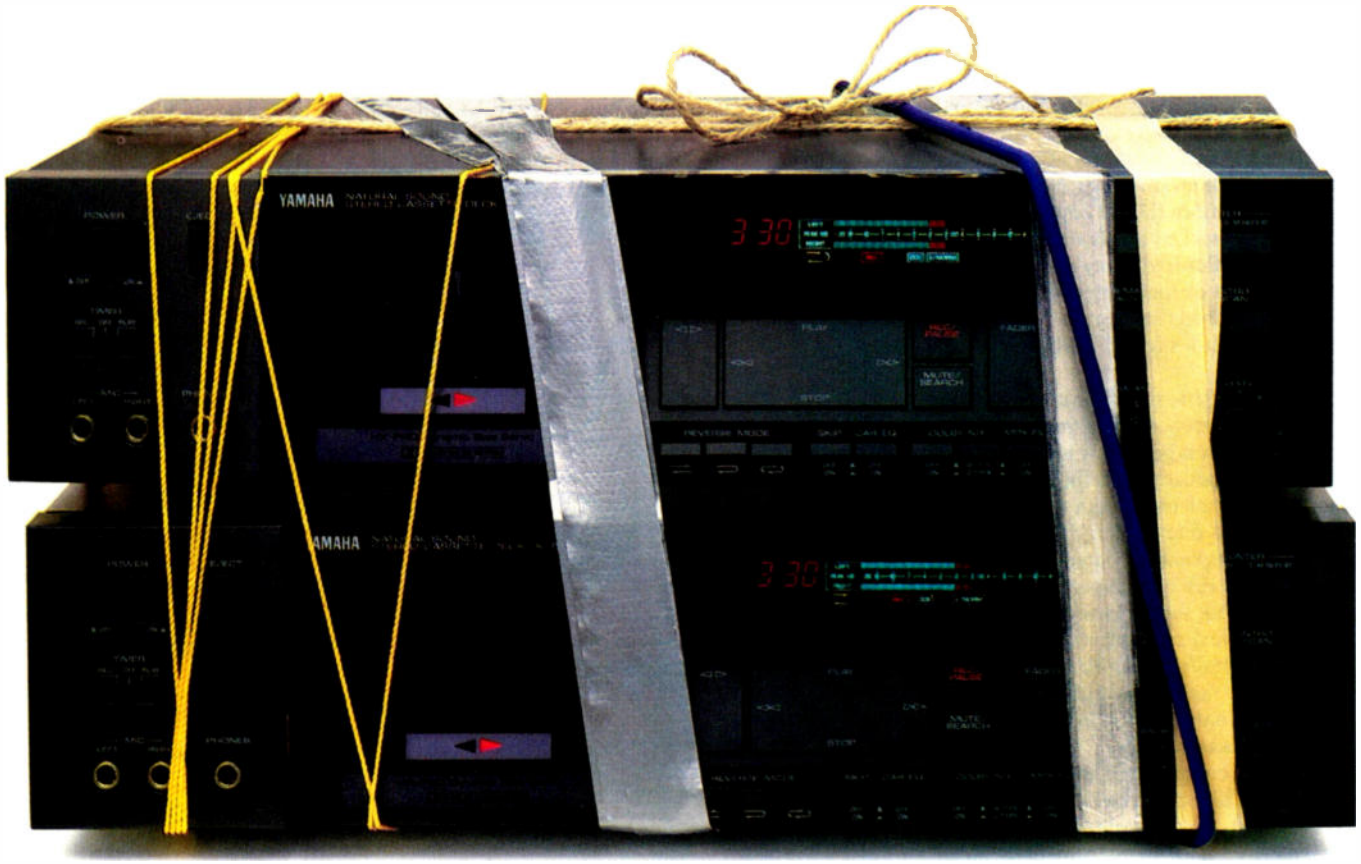
Mechanism. How is the effect supposed to alter the electrical or acoustical signal?

Magnitude. If there is an effect, is it big enough to be heard according to the known capabilities of the human hearing system and big enough not to be overwhelmed by other effects in the chain?

Evidence. Is the evidence in support of the effect reliable and experimentally derived (whether from controlled listening tests or through lab measurement), or is it purely anecdotal and entirely subjective?

Whole clusters of audio fetishes become suspect when the mechanism criterion is applied to them. It's like astrology: It seems, somehow, reasonable that astronomical processes might exert influence on our lives—until you really ask how. Which of the known physical forces or laws are coming into play? Is there a previously unknown force? If so, what is its nature? It's the same as when people tell you that a digital watch or a telephone in the listening room can ruin the sound of a stereo system. Sure, but how?

The second test to apply is to relate claimed performance improvements to the known performance limits of the human hearing system and to other limitations of the sound-reproduction chain. While many (though not all) alterations to a stereo system will produce small measurable



Until now, this was the only way to get a high-performance dubbing deck.

Let's face it.

Performance in dubbing decks has traditionally left the purist...well, fit to be tied.

If you wanted high-performance dubbing, you were forced to cough up the price of two separate, superbly-speced decks.

Which happens to lead us directly to the Yamaha KX-W900U twin deck.

Two independent decks in one cabinet, each boasting specs and features that put most single decks to shame.

Frequency response with metal tape is a full 20-20,000Hz ±3dB.

Signal-to-noise ratio is better than 66dB with Dolby B, better than 74dB with Dolby C.

Use the 44-key wireless remote, or use a Yamaha RS integrated amp, preamp or receiver remote.

Wow and flutter (WRMS) is no more than 0.05%.

The KX-W900U's separate meters and controls let you record two sources at once. While auto reverse and relay record let you record up to three continuous hours from one source.

We've doubled the normal recording bias frequency to ensure high-quality recordings, even in the high-speed dubbing mode.

Dolby HX Pro continually adjusts bias to match signal output, extending headroom to handle the most demanding CD dynamic ranges.

And that's just the beginning.

To hear the rest, see your nearest Yamaha dealer today.

He'll show you why our KX-W900U twin deck is a superb new dubbing deck even the purist will appreciate.

Over and over again.

YAMAHA®

changes, such changes often fall far outside the scientifically defined limitations of the ears' ability to hear. Or the alterations may be swamped by changes introduced by a more flawed component. It is hard to get worked up about the tiny deviations from flat frequency response found in CD-player output filters, when they are ten or a hundred times smaller than the response variations found in the best monitor speakers.

As a soft little real-time spectrum analyzer, the human ear is a pretty remarkable piece of test gear. Our hearing system is capable of processing information over a power range of more than a million million (10^{12}) to one. It can distinguish and track a multiplicity of interwoven signals better than the best supercomputers. It can determine sound location and details of the physical environment from a brief listen to a totally unfamiliar sound source. And it can make very subtle judgments about tonal balance even in the presence of high-level noise.

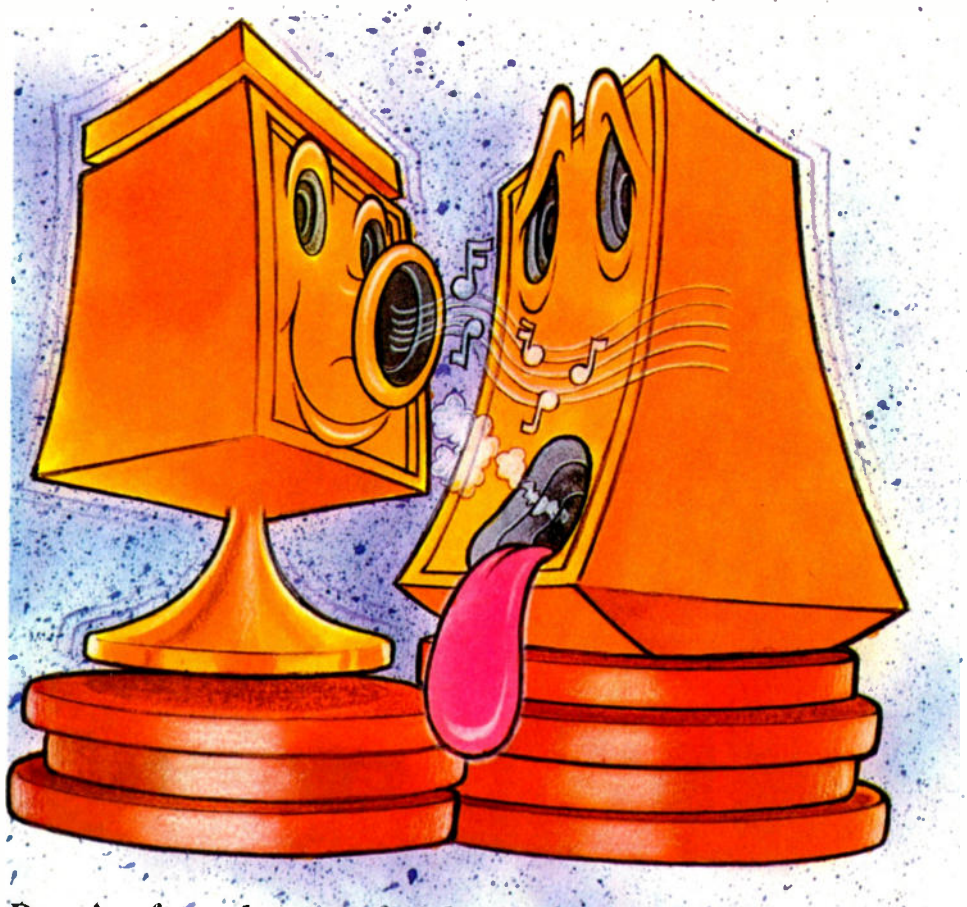
But we cannot hear everything. Human ears, like their electronic-measurement counterparts, are not infallible. Just as it is difficult for an instrument to "hear" dynamic range, the ear is not particularly good at judging phase shifts or even harmonic distortion. Even with the most revealing signals known, the ear can't detect an *intra*channel phase delay of less than about two milliseconds. This is so far greater than anything found in amplifiers, cables, CD-player output filters—and even so much greater than non-"time-aligned" loudspeakers—that it appears safe to ignore claims related to it. *Inter*channel phase errors can affect imaging; but that is really a different issue. In a similar way, any claims for audible performance improvement directly attributed to distortion below 0.1 percent is misplaced. The ear ignores it.

The third, and most difficult, way to assess a fetish is to consider exactly what kind of evidence exists to support it. Just as the power of the brain gives the ear its unique abilities, it is the complexity of the brain that can color data with sensory distractions and psychological influences. From an equipment designer's point of view, this is a very frustrating situation. On one hand, the ear is the best all-around instrument available for audio testing; it is often the only instrument capable of making some necessary tests. On the other hand, ears are usually attached to listeners, and listeners are very subjective, are easily fooled, and can make mistakes.

Even though it is very easy to hear what one expects to hear, regardless of the sound waves hitting the eardrums, subjective listening is still a very valuable process, especially when choosing, for instance, which loudspeaker does the most convincing job playing back a certain recording. Perceptions and opinions are a perfectly valid basis for making purchasing decisions or for writing equipment reviews. Furthermore, subjective impressions often clue engineers about the existence of real, measurable phenomena previously unknown, disregarded or otherwise dismissed.

Where subjectivity is less desirable is when one attempts to develop a scientific understanding of a given phenomenon in order to eliminate it, reproduce it, or even increase it, depending on whether it is deemed desirable or not. Plain listening can, at best, reveal only the audible aspects of a phenomenon; it is the job of experiments to uncover the underlying causes. For example, a researcher may be trying to determine which of two amplifiers delivers a flatter frequency response under a certain set of conditions. This researcher is not, for the moment, interested in whether all amplifiers sound alike, which amplifiers sound better, or even whether flat-response amplifiers sound better in general. Those valid questions may arise later, but for now it is only important to know whether a new circuit design produces a desired result.

In this kind of "yes or no" situation, subjectivity complicates matters tremendously. Imagine the difficulty in answering this simple, straightforward question with a listening panel! While expert listeners can make complex overall judgments about sound quality, the answers to simpler questions are often more useful to people trying to improve the design of audio products. If one knows only that an amplifier sounds better, and not exactly why, it may be very hard to duplicate the sound in future products, or to lower costs while maintaining the best possible fidelity. (For examples of the mechanism, magnitude, and evidence criteria in action, see "Classic Case Histories," p. 58.)

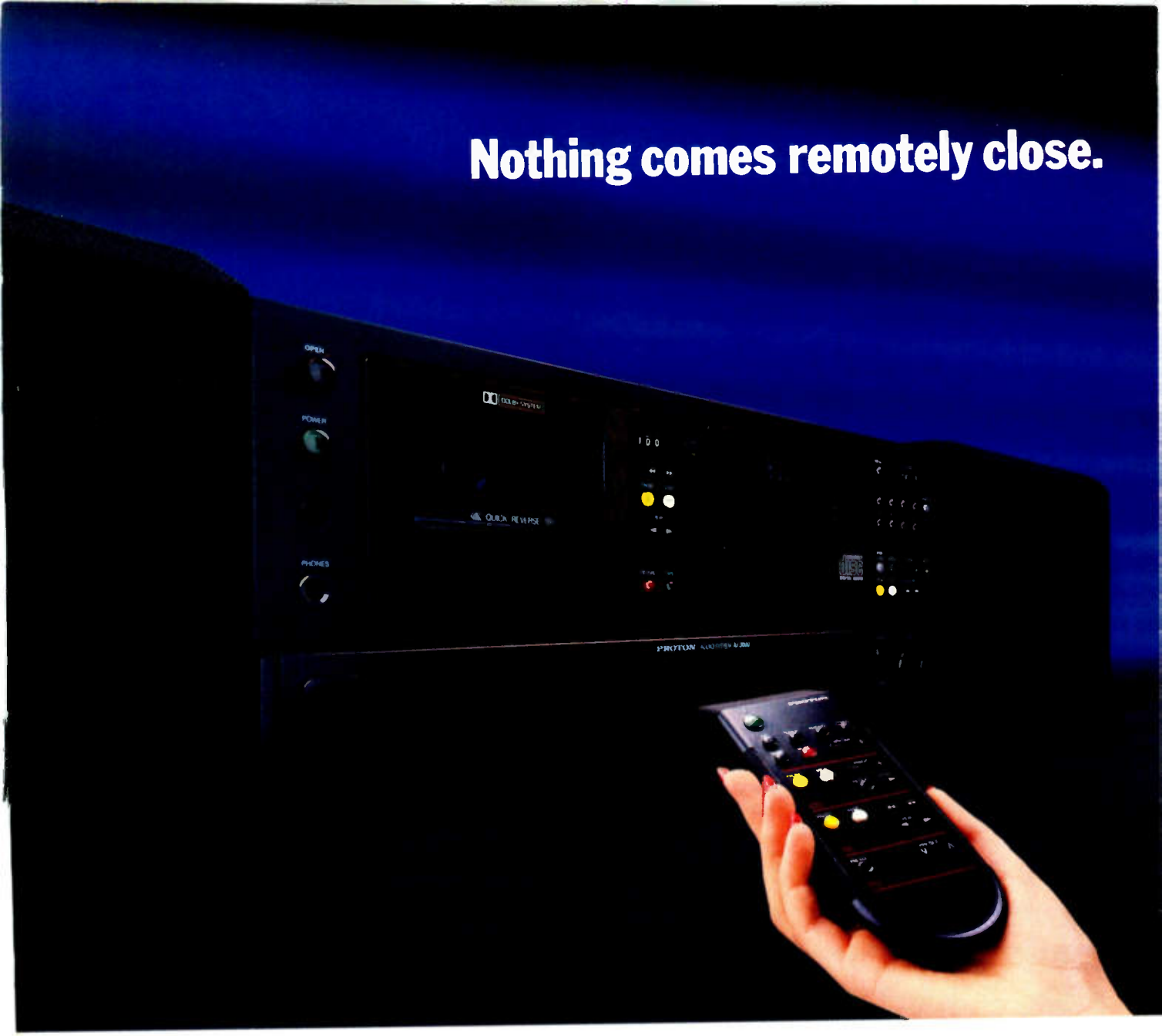


Pennies from heaven fetish: Some say sound is improved when speakers are placed on stacks of three (not four) copper discs. Are they making cents?

TRUE STORY NO. 2

Date: *the early 1950s, even before stereo. Names like G.E., Pickering, and Fairchild dominate the "high-end" phono-cartridge market. Over the mundane sapphire styli more commonly supplied, discerning audiophiles develop a preference for the sonic virtues of diamond. Major manufacturers begin to sell premium diamond versions of their cartridges, and one enterprising small*

Nothing comes remotely close.



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Classic Case Histories

The following case histories all revolve around true audio fetishes: The beliefs involved have appeared in print as serious propositions. But each one can be seriously questioned using at least one of the three criteria for judging the plausibility of an audio fetish (mechanism, magnitude, or evidence).

FETISH: Stereo systems sound better when they are powered from AC produced by hydroelectric generators than when powered by AC from nuclear generators.
Rationale: The nuclear-fission reactions are somehow imposed on the waveform structure of the AC power. This causes deterioration of the signals in amps and preamps.
Rebuttal: Why can't the effect on the AC be measured or seen in any way? How does it manage to pass through the myriad transformers between the power station and the home, and then through the amplifier's power supply? And, since power companies mix and match power from numerous generating stations of different types, how do you even know what kind of AC you are "hearing"?
FETISH: Reproduced music that was digitized at any stage of the recording process can cause neurological damage when heard.
Rationale: The human hearing system is essentially analog, and is thus incompatible with the step-wise nature of digital audio.
Rebuttal: It is straightforward to prove mathematically, from the work of Fourier and others, that the correctly filtered output of a digital sampling system such as that used in the CD or DAT systems has absolutely no residual step-wise behavior—it is analog. Besides, the hearing system, being based on nerve impulses, is actually somewhat "digital" in nature.
FETISH: A component's frequency response in the upper ultrasonic range can influence the audible harmonic structure of reproduced music.
Rationale: The perception of harmonics in the audible frequency range is very dependent on the presence of harmonics in the ultrasonic range. Also, ultrasonic sounds can be "modulated" down to audibility by reflection.
Rebuttal: The ear *cannot* hear, and is not affected by, sounds above 20 or 25 kHz, at most. Period. Recorded music doesn't generally have energy much above 20 kHz, so there is nothing ultrasonic to reproduce. And ultrasonic energy cannot become audible through reflection.
FETISH: Flat frequency response alone guarantees accurate sound reproduction.
Rationale: Spectral response dominates audio perception; thus a flat spectrum means accurate perception.
Rebuttal: While it is true that spectral factors dominate hearing, the belief assumes a procedure for measuring frequency response that is representative of what the ear hears as "frequency response"—not a good assumption for loudspeakers or ambience-enhancement systems. It also assumes that the measurement conditions are representative of listening conditions—not always true with amplifiers. This belief also ignores the effects of noise, distortion, and those, admittedly second-order, of time response.
FETISH: The interchannel delay of a few microseconds present on some types of CD players can seriously disturb stereo imaging.
Rationale: Stereo imaging is dependent on inter-ear signal timings as short as a few microseconds.
Rebuttal: The interchannel delay imposed by this type of CD player is equivalent to one speaker being about ¼ inch closer to the listener. Provided that the preamp is not switched to mono (which would cause a tiny drop in high-frequency response), the delay is thus a minor effect at best.
FETISH: Distortion less than 0.1 percent is audible (a common belief of amplifier manufacturers, especially those touting components with distortion less than 0.1 percent).
Rationale: Distortion less than 0.1 percent is audible.
Rebuttal: Distortion less than 0.1 is never audible (it has never been shown to be so in scientifically controlled listening tests).
FETISH: Speaker wires of differing construction can result in different speaker sound, even if their resistance, capacitance, and inductance are close to identical.
Rationale: Different wires have different transient and phase responses.
Rebuttal: To an electrical engineer, identical resistance, capacitance, and inductance mean identical transient and phase response. Anyway, the ear isn't very sensitive to phase. *K.K.*

company runs a classified ad offering a diamond upgrade to existing equipment by mail.

When Tom (not his real name) saw this ad, he knew it was the answer to his prayers. He had become dissatisfied with his hi-fi system of late and had the intuitive sense that his cartridge was to blame. True, $10 was a lot of money, but it was still somewhat less than one of those new diamond rigs. And if the results proved even close to the "smoothness," "vividness," and "transient response" promised in the ads, his hi-fi would surely sound perfect again. He answered the ad and in a few weeks received, as promised, a carefully packed diamond-stylus assembly.

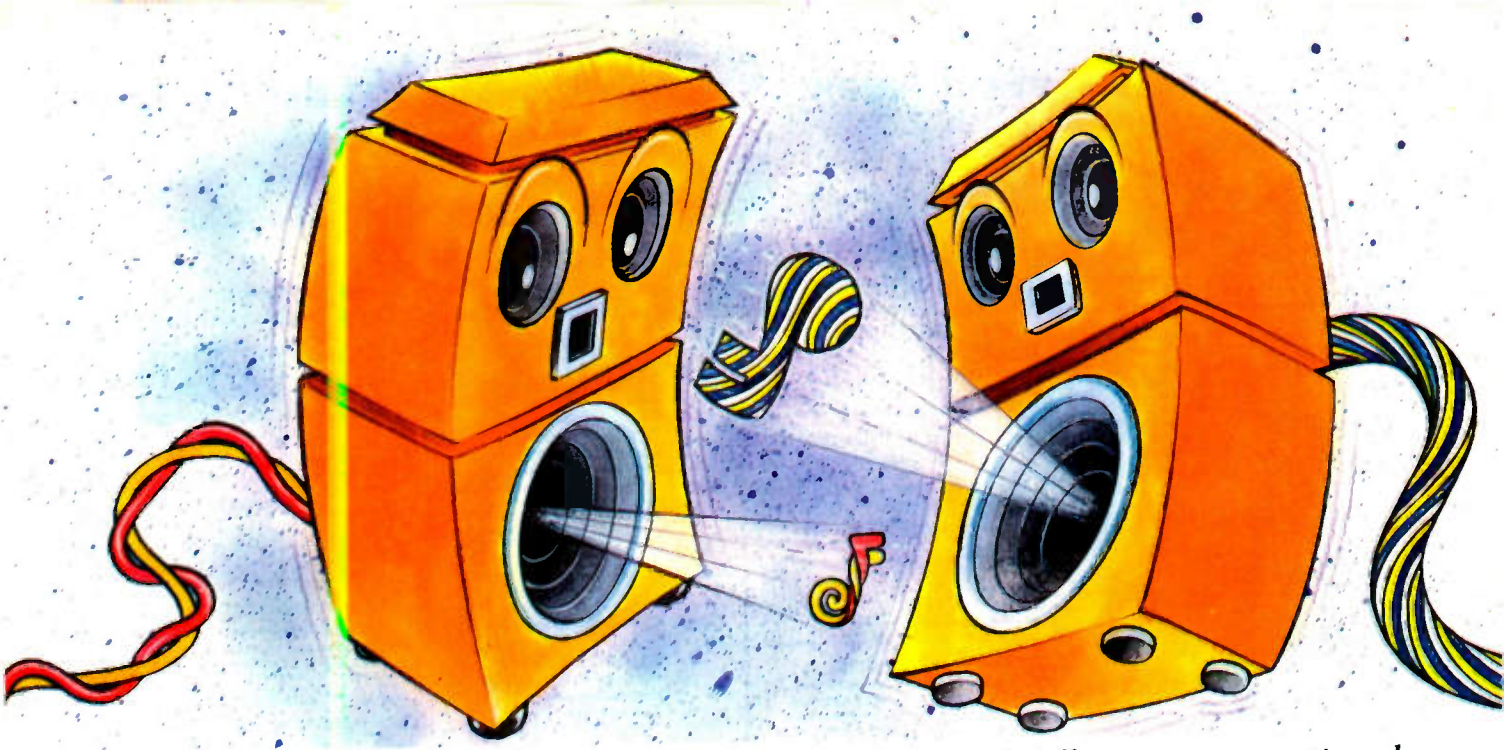
Now, Tom was a scientist—an entomologist (insect scientist) by training—but he was not an audio engineer. As buglike as the stylus appeared, he still did not want to risk the possibility of damage or degraded performance from improper installation. So he called on the services of his friend Bill, who was a bright young engineer for a local audio manufacturer. Bill and his assistant arrived one Saturday to perform the necessary operation.

Unfortunately for Tom, Bill also fancied himself something of a scientist, and he decided to perform a devious experiment. Though appearing to labor closely over the cartridge, he did not remove the old sapphire needle. After a time, he announced that all was ready to hear. Tom went to his record collection and selected his most critical evaluation disc. As the music blossomed forth from the lone loudspeaker (mono, remember?), a smile Bill described as "beatific" blossomed forth on Tom's face. "This is what I have missed for years," he exclaimed. "It's heaven!"

But Bill was not finished. "Just for the sake of science," he said, "let's put the old needle on for comparison." Of course, Bill now put on the diamond stylus, and Tom was aghast at how he could have ever considered such cacophony to be hi-fi. Eventually, Bill had to 'fess up. And although he had expected annoyed amusement, he found himself faced with almost violent anger. His friend (former friend?) was not enlightened one bit. He wasn't angry at himself or the mail-order firm. He was angry at Bill for tricking him in such a devious way—perhaps knowing that now his hi-fi just would never sound the same again.

TRUE CONFESSIONS

Now that the cynical side of the coin has been examined, I have to say that I really think fetishes and mysteries are a big part of what makes audio so much fun. Bill, in the preceding drama, certainly had a good time, even if Tom did not. Music just isn't



Fancy cable fetish: Many believe that speaker cables of different construction do not sound alike even if their electrical properties are nearly identical. Do these believers have their signals crossed?

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The rules are simple: Briefly describe your fetish, including both the phenomenon and a supposed explanation. Please try to hold this to a few sentences, clearly written or (preferably) typed on a single sheet of paper along with your name and address. Mail it to: HIGH FIDELITY, Dept. AF, 825 7th Avenue, New York, N.Y. 10019. The fetish itself can be something you've heard or read about or even something you've made up. Entries will be judged by the editors of the magazine, largely on the basis of what makes us laugh hardest.

Entries must be postmarked no later than October 30, 1988, and become the property of HIGH FIDELITY magazine. Winners will be notified by mail. Employees of ABC Publishing, NHT, and Product Design and Evaluation Services—as well as their families, friends, and therapists—are not eligible. Which is too bad, because I know a real dilly.

Michael Riggs

the whole motivation for becoming an audiophile, any more than transportation is the whole appeal of a sports car. Audio lovers listen to music; and, admit it or not, they listen to equipment too. They enjoy fussing with their systems. And, once in a while, a wacky idea turns out to be dead right.

Every true audiophile—including the most scientific of them—has a few secret fetishes, and even blatant lapses of logic. Like the time, at age seven, I totally destroyed my father's new power amplifier a few days after he explained to me that its job was to "make the electrical signals larger." You see, I already knew that resistors sort of blocked electrical flow, and I figured that if I removed them all, the amp would work much better.

Too bad my father didn't see it that way. It only goes to show that you can't always trust your calculations in these matters. And just recently I've developed a secret technique in which I spend a minute or two walking slowly around a room, sensing in my mind exactly how a new pair of speakers should be placed for best sound—even if I have never heard them. I can't explain why, but it seems I am always right. Always. So don't try and tell me I'm not! □

Ken Kantor is a cofounder of Now Hear This, a California speaker manufacturer. He also serves as president of Product Design and Evaluation Services, an audio consulting company.

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Digital Output Filters in CD Players Have Been Misleadingly Overpromoted.

The Overselling of Oversampling

BY DAVID RANADA

ILLUSTRATION BY ALEXANDER MURADAS

No single component feature in the recent history of audio has been the subject of so much hyperbole as the oversampling digital output filters used in Compact Disc players and other digital-audio devices. Although they were originally introduced to make up for the unwillingness, or inability, of a certain manufacturer to make 16-bit digital-to-analog converter (DAC) chips, it now seems that digital output filters are absolutely de rigueur in any new CD player. Even well-read and conscientious audiophiles believe that the higher the oversampling rate, the better. These attitudes grow out of CD-player ads and promotional materials that are misleading in content and presentation. But before I get to the pictures that aren't worth a thousand words, the answer to a fundamental question: Why output filters?

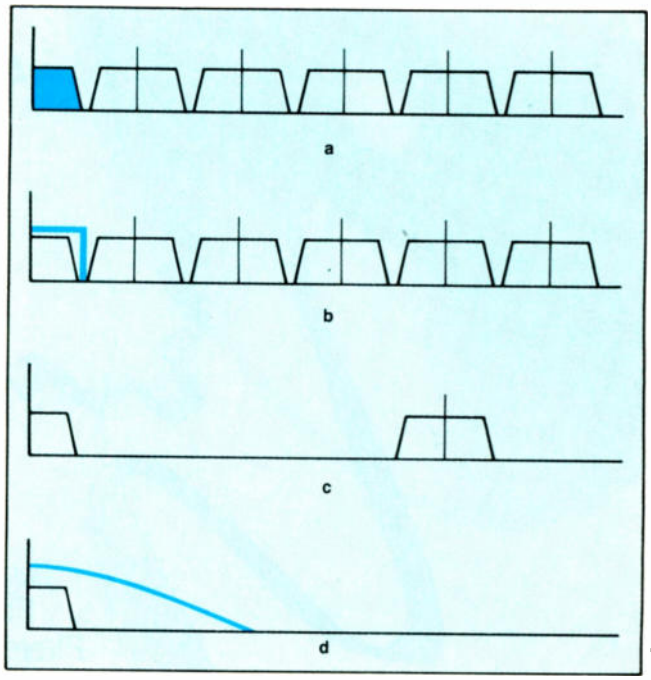
Any digital-audio component that converts data into an audio signal also simultaneously produces in that signal a host of ultrasonic "images." As shown in Figure 1a, a sampled audio signal, such as that contained on a CD, when directly reproduced by a DAC contains not only the baseband audio signal, extending up to 20 kHz (tinted area), but also images of the signal centered around multiples of the original sampling frequency. These spectral images are responsible for the evenly stepped appearance of a digital-audio signal along an oscilloscope's horizontal time axis (Fig. 2a). (The vertically stepped appearance results from quantization and is a separate issue.) Theoretically, the images extend infinitely upward in frequency, but, for a variety of reasons, their level eventually rolls off in practice. The purpose of a digital or analog output filter is to suppress the high-frequency images.

But the images are all above 20 kHz and are thus ultrasonic—they are, therefore, *inaudible*. The truth is, you don't even need output filters. You could feed a converted digital-audio signal directly from a DAC into a stereo system—images and all—and if it were accurately reproduced by that system, it would sound fine: You would hear music just as if the filter were present. (Actually,

a little filtering might be necessary to provide a baseband-response-flattening "aperture correction.") However, to quote the *Philips Technical Review* (Vol. 40, No. 6): "Even though the frequencies above 20 kHz are inaudible, they would overload the amplifier and set up intermodulation products with the baseband frequencies or possibly with the high-frequency bias current of a[n analog] tape recorder. Therefore all signals at frequencies above the baseband should be attenuated by at least 50 dB." The called-for attenuation can be achieved in only one way: a sharp-cutoff low-pass (high-cut) filter. (The concern expressed over taping is interesting. Philips, which has been of late working on various antitaping systems for DAT, seems to have considered dubbing a legitimate activity, at least back in 1982.)

Why a digital filter?

The filters used in all first-generation CD players—except those units originating from Philips—were analog. They used resistors, capacitors, inductors, and op-amps to achieve the required "brick wall" response characteristic: as flat as possible up to a certain frequency (20 kHz) and then plummeting downward in a very steep rolloff, as if the frequency-response curve had hit a brick wall (Fig. 1b). Such analog filters can have problems. Either the many parts in each filter must be carefully chosen, or they have to be trimmed for best response. The circuit elements can drift in value, as can the trimmer settings, throwing off the filter's behavior. Analog filters can be noisy and can suffer from sub-stage overload, but, correctly designed and built, an analog output filter can also be audibly benign. Noise can be made lower than the minimum CD noise level; frequency-response ripples and distortion can be reduced to inaudibly low values; and filter characteristics can be made stable by judicious choice of parts. The phase



ALICE TOPF

Figure 1. A 44.1-kHz DAC output spectrum (a), in addition to baseband audio information (color), contains ultrasonic images that have to be eliminated by filtering. Either an analog (b) or digital (c) filter can be used. Most digitally filtered CD players have a supplementary, slow-rolloff analog filter (d) that attenuates any remaining images.

Are filter phase shifts audible?

Judging by the constant attention given the subject in CD-player advertising and other uninformed commentary, various attempts by this magazine and others to quell the continuing exaggeration of the importance of high-frequency phase response have obviously failed. Nonetheless, I'll try again.

Stated as simply as possible, the amount of phase nonlinearity introduced by a typical analog CD-player low-pass filter is inaudible. Analog low-pass filters may indeed have some audible problems (such as slight ripples in frequency response), but phase nonlinearity is not one of them. This has been well established since at least 1984. In "Perception of Phase Distortion in Anti-Alias Filters," published in the November issue of *Journal of the Audio Engineering Society* for that year, Douglas Preis and P. J. Bloom report the results of tests for audible differences between linear-phase filters and "minimum-phase" steep-rolloff filters (which are, for purposes of this article, identical to analog CD-player output filters) of equivalent frequency response. They found that a cascade of *eight* identical 15-kHz low-pass filters "introduced no perceptible effects." You get only *one* of these filters per channel in a CD player, and its turnover frequency is an even more difficult-to-hear 20 kHz or higher.

Still not satisfied? Psychoacoustical experiments have shown, well before the Preis/Bloom tests, that the ear is insensitive to group delays (differential phase shifts according to frequency, measured in seconds rather than degrees) of less than about five to ten milliseconds at the higher audible frequencies. Therefore, at a CD-player output-filter frequency of 20 kHz, an analog filter could have five milliseconds of group delay—equivalent to 36,000 degrees of phase shift (!)—before that phase nonlinearity could approach audible thresholds. This is far more phase shift than is produced by any reasonable analog output filter: An eleventh-order, 20-kHz analog filter would generate at most only 1,980 degrees of phase shift (0.275 milliseconds of group delay), and that happens only very near the cutoff frequency. The eight series-connected filters in the Preis/Bloom tests had a *total* maximum group delay of between five and six milliseconds.

There are biological reasons for the ear's insensitivity to phase effects at high frequencies. A nerve cell, such as those found in sound-transducing portions of the inner ear, can "fire" electrochemical impulses no faster than about once per millisecond. At 20 kHz, one millisecond is 20 cycles (7,200 degrees) of phase shift. The brain itself has to see a few neuron firings before it realizes something is happening. That will produce several more thousand degrees of allowable phase shift at 20 kHz.

To sense a group delay on a single audio channel, the brain has to compare sound arrivals of different portions of the audible spectrum. Although the brain does have the required network to look across the entire spectral-data output of the ear simultaneously, it is composed of many nerve cells, each one of which contributes its own share of timing "slop" to the process. Simply because of the way it is wired, the brain is not

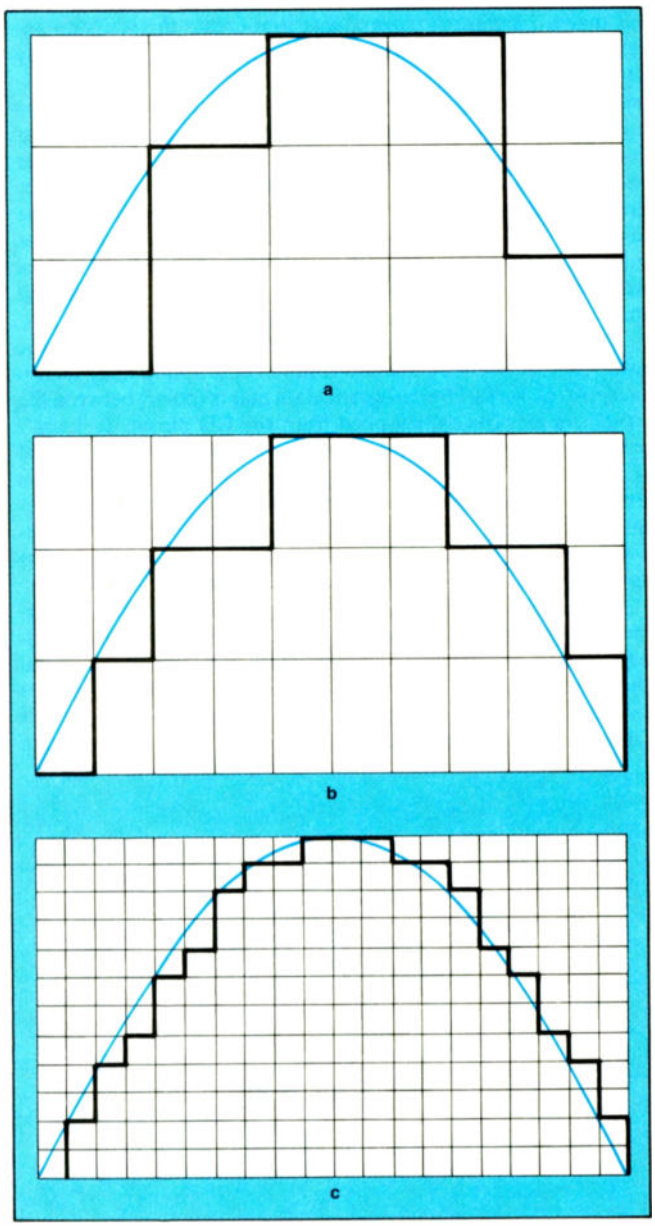
nonlinearity introduced by analog output filters has *never* been an audible problem (see "Are filter phase shifts audible?", p. 62).

Philips went its own way back in 1982. The first Philips CD players used a digital filter, which performs mathematical manipulations on the audio while it is still in digital form. It is instructive to examine Philips's rationale for using a digital filter. The 1982 *Philips Technical Review* article continues: "An analog filter after the digital-to-analog converter will inevitably have to contain a large number of elements and require trimming. In addition a linear phase characteristic is required in the passband so that the *waveform* of pulsed sound effects will not be impaired [italics added]." Note the nascent fixation—now fully developed by many CD-player manufacturers but, ironically and thankfully, still rather muted at Philips—on preserving the shape of the audio signal (its waveform), not on any audible factors.

The first Philips CD-player digital filter was a four-times oversampling device; that is, it used data processing to attenuate all the ultrasonic images between the baseband and the one centered around 176.4 kHz (four times the sampling rate). Remember that the images are a result of the original 44.1-kHz sampling process and are present in the data on a CD. A digital filter, since it essentially resamples the original data at a higher rate, also generates images, but these are spaced farther apart, according to the resampling (oversampling) rate (Fig. 1c, showing the effect of a four-times resampling filter). The "space" created by the spreading of spectral images from a digital filter permits the use of a slow-rolloff, low-phase-shift analog filter to remove the remaining images (Fig. 1d). Philips originally used a third-order Bessel filter with a −3-dB point at 30 kHz. The company explained: "The Bessel type of filter has been selected because of its linear phase characteristic in the passband. This filter is simple and requires no highly accurate elements."

That last sentence points to one of the most important reasons Philips used digital filters and why other manufacturers are switching to them: They can make a CD player less expensive to produce by simplifying the design and part-quality requirements of the remaining analog output filter. (The first Philips digital filter contained processing that even enabled the use of 14-bit DACs, as opposed to more expensive 16-bit units.) And since, by now, digital filters are perceived by the consumer—rightly or wrongly—as a definite plus, more CD players will be sold. Profit!

It is difficult not to fall into a disgusted cynicism here. But the ads, product brochures, and engineering white papers keep coming out with the same tired figures and diagrams in support of



ALICE TOPP

Figure 2. Although the outputs of two-times (b) and four-times (c) oversampled digital filters look closer to the original waveform (color), analog filtering of 44.1-kHz samples (a) will also produce a smooth curve.

good at detecting small *intra*channel group delays. *Inter*channel phase shifts (below about 1.5 kHz) are used extensively by the ear/brain system to determine sound-source location, and the nerve-cell pathways between the two ears and the interaural-comparison area of the brain are, accordingly, extremely simple and rapid. So we are relatively sensitive to phase shifts *between* stereo channels (when they occur at low or middle frequencies), but not to phase shifts within one channel.

The argument so far has ignored the properties of music signals. So what if the ear/brain system *could* hear the relatively slight phase shifts at 20 kHz introduced by an analog output filter? Is there anything up there to get phase-shifted in the first place? Not much. At the extreme top of the audio spectrum, typical music signals have levels at least 20 dB below the maximum-level region around 500 Hz, and lower-frequency information usually will mask any phase anomalies at the high end.

All of the preceding assumes that one is actually capable of hearing frequencies up near 20 kHz. But the typical reader of this magazine cannot, because his high-frequency hearing has already deteriorated, rather early in life. If you can't hear the horizontal scanning frequency generated when you turn on your TV, then either your TV's horizontal flyback transformer has an atypically low acoustical output or you have lost the ability to hear 15.734 kHz and above—in which case you can even more blissfully ignore any and all references to the presence or absence of CD-player output-filter phase shifts. *D.R.*

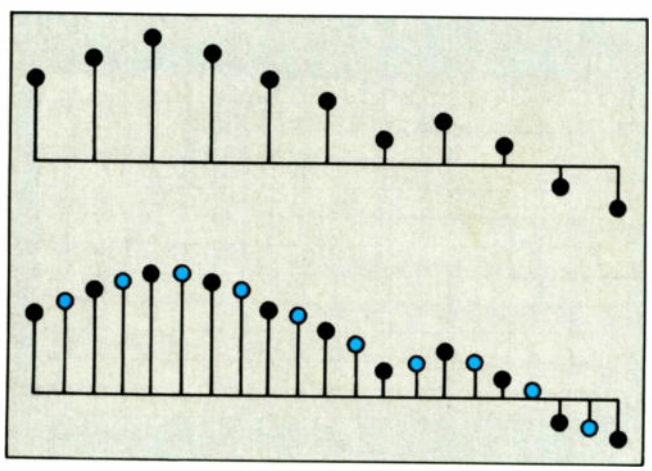
"higher resolution" digital filters and ever-increasing oversampling rates. I can't help wondering whether such free use of hyperbole will not eventually dilute the impact and lessen the influence of truly legitimate, audibly significant product claims and engineering developments. Meanwhile, gauge for yourself whether the familiar digital-filter claims are valid.

What's wrong with these pictures?

Figure 2 purportedly shows how two-times oversampling (b) is closer to the original curved, analog waveform (in color) than regular 44.1-kHz sampling (a), and how 18-bit, four-times oversampling gets even closer (c). One could continue in this vein, using eight-, 16-, 32-, 64-, and 128-times (etc.) oversampling, with increasingly good-looking stairstep waveforms each time. But recall that the sampling by-products that create the stairstep appearance of these waveforms in the first place are entirely ultrasonic. Remove the ultrasonics—by digital or analog filters—and *all* these waveforms will revert to the same graceful analog curve. Don't remove the ultrasonics, and your ears will still hear that analog curve, as long as the spurious signals don't distort or intermodulate in the rest of your audio system. On the other hand, the added amplitude (vertical) resolution provided by the 18-bit conversion in Figure 2c may be beneficial insofar as it helps assure linear, low-distortion decoding of low-level information, even though it cannot get more out of a CD than was recorded onto it (see my "Golden Rulers," May).

There is more. Figure 3 shows how digital filters operate in the time domain. In effect, the two-times oversampling filter shown interpolates, via its filter program, data points (color) between the actual samples (black) supplied from the CD player. It doesn't generate greater waveform accuracy by this process. The original 44.1-kHz data samples themselves contain all the information necessary for a complete reconstruction of the original audio signal. Digital interpolations are stairstep expressions of what an analog filter does on a continuous, nonquantized, nonresampled basis—analog filters inherently produce smooth waveforms.

In Figure 3 you can also sense the closeness-to-the-lurking-analog-waveform syndrome that is characteristic of the preceding diagram. But there is something new implied: that a digital filter is so benign as to leave the original data unaltered—that it just fills in the gaps. Ideally, a filter could be designed so that this happens, but the requirements for real-world filters (finite-length impulse responses, flat passband responses, etc.) make that impossible. A digital filter recalculates *every* sample, old or new. Though I haven't checked all digital filters, I believe that none of them allows the original data to escape unscathed.



ALICE TOPF

Figure 3. These two diagrams imply that a digital filter (bottom) simply fills in the gaps between the original samples (top), but practical design limitations may force even the original samples to be slightly altered.

The waveform comparisons in Figure 4—now becoming obsolete with the pervasiveness of digital filters—are also misleading (which is why HIGH FIDELITY is no longer running them). The "ringing" of a brick-wall analog filter is clearly visible at left, in a scope photo that seems far from the original waveform (a tall, rectangular, 22-microsecond pulse). The symmetrical pulse to the right looks much nicer, but it sounds precisely the same. The ringing in the first is a consequence of the analog filter's nonlinear phase shift. The symmetrical "preringing" and "postringing" visible in the second are what a sharp-cutoff linear-phase filter does to the same signal. Both analog and linear-phase digital filters smear out frequency components to create waveform ringing. As long as the ringing in either case does not exceed perceptual thresholds, it will not be audible. It is theoretically possible to have very long pre- and postringing in a digital filter—which, if it were to exceed phase-audibility thresholds, would make it sound as bad as an analog filter with the same amount of ringing.

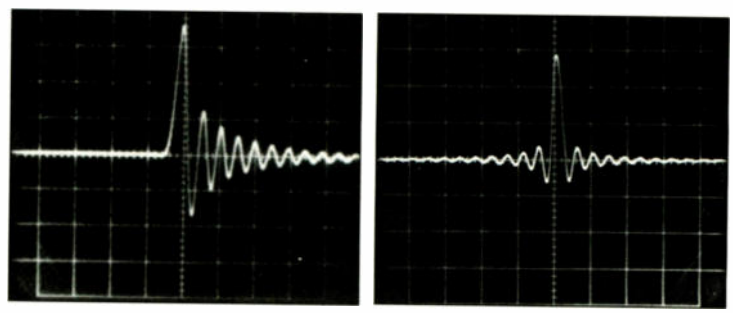


Figure 4. The ringing from both analog (left) and digital (right) filters is not audible unless its duration exceeds perceptual thresholds. This does not occur with CD-player output filters of either variety.

The "visuals" in Figures 2–4 are so seductively persuasive that the point I am trying to make bears repetition: No amount of connect-the-dots, fill-in-the-blanks processing—call it resampling, oversampling, interpolation, curve fitting, or whatever—whose purpose is to remove already-inaudible spectral images will produce audibly superior results just because it is done digitally. In fact, audible degradation can occur with digital processing, if it is done poorly (the math done wrong, which has happened, or the arithmetical problems of rounding off and truncation solved incorrectly) or if the attached high-speed DACs are severely nonlinear or otherwise inferior.

Now, don't get me wrong. I have nothing against a well-designed and well-executed digital filter. Most of my favorite CD players use them. But I take strong exception to the continued use of quasi- and pseudoscientific concepts and misleading artwork to promote virtues for digital output filters that are, at best, audibly suspect. Some of those favorite players have received this treatment—which does nothing to increase my valuation of the technical competence of the respective manufacturers, or at least of their public relations departments. Just remember this simple advice: Pay no attention to any claims of enhanced CD sound quality through the use of linear-phase digital operations on either ultrasonic signals or on high-frequency waveforms. You can't hear the former at all, and the circuitry of your ear/brain system conspires to keep you from perceiving the "improvements" in the latter. □

Edited by Ted Libbey and Ken Richardson

The French Grapevine

Not that I intend to reveal which records won the 21st annual International Record Critics Awards (IRCA), which HIGH FIDELITY sponsors and about which I shall be writing at feature length in next month's issue . . . but I couldn't help picking up a few items of interest to discophiles at this year's meeting in the South of France.

At the top of the list, I suppose, is the welcome news that Pathé Marconi, EMI's French subsidiary, has recorded Rossini's *Armida* in conjunction with the Festival d'Aix-en-Provence, where the rarely performed opera-not-so-seria received a new production this summer. Based on a segment of Tasso's *Gerusalemme liberata*, the work was written for the Teatro San Carlo; at the premiere in 1817, Isabella Colbran sang the title role. The Aix performances featured two Americans in the principal roles: soprano June Anderson as Armida and tenor Rockwell Blake as Rinaldo. It was Maria Callas who, in 1952 at the Maggio Musicale Fiorentino, rescued *Armida* from certain oblivion, and, until Anderson, only two other sopranos had tackled the part in this century: Cristina Deutekom in 1970 and 1973 and Katia Ricciarelli in 1985 and 1986. But the role of Armida is not the only problematic thing about casting Rossini's *melodramma*—the piece requires two tenors in addition to the one who sings the part of Rinaldo, and each of them must sing two roles. Imagine, *five* tenor roles in one opera.

Fortunately, in the persons of Yoshihisa Yamaji and Raúl Giménez (who recently made his debut recording, of Rossini arias, with Nimbus), Aix had the manpower to get the job done. But even before the curtain had gone up on the premiere, reports had spread that the conductor, Gianfranco Masini, was far from being in control of the situation, and the performance I attended certainly bore that out. It remains to be seen what Pathé can salvage of the affair. For the singing of Anderson and Blake, if not for several of its other aspects, the production was well worth preserving.

Keeping pace with its neighborly competitor in the obscure-opera department, Erato has set about recording *Oedipe*, the only opera by Romanian composer George Enescu. Considered by many to be Enescu's masterpiece, *Oedipe* was composed mostly between 1921 and 1931, although sketches date back as far as 1910. Since the premiere in 1936 at the Paris Opéra, the work has received scant attention outside Romania, at least until now. I was unable to get further details, but will be looking forward to the record's release sometime next year, all the while keeping my fingers crossed that Erato avoids the scruffy production shortcuts that have marred a number of its recent operatic efforts.

Ted Libbey

Gaining CD, Losing 45

It all began when I heard about the amazing clarity of the Compact Disc. "A revolution in sound," they said. "It'll make vinyl obsolete." I first auditioned a CD while working on-air at a local radio station. After starting up an Amy Grant LP for broadcast, I switched over to the station's new CD player and listened to a Doobie Brothers disc through my headphones. The crystal-clear cymbals and the deep, echoing bass were marvels. When I slipped off the headphones to check what was going over the airwaves, I found the analog Amy Grant singing, "Everywhere I go (skip) Everywhere I go (skip) Everywhere I go."

The horrors of vinyl followed me to the nightclub where I deejayed evenings, because we still couldn't afford to buy a CD player. Scratches actually were popular with the dance crowd—and I don't mean rap "scratching," I mean scratched records. Each amplified error got hearty applause. But to me, they were as bad as the fiasco at the station. I knew I needed the reliability of a Compact Disc player and vowed to get one for myself.

I went home and hung my old 45s on my wall, a profound statement that I had become high-tech. And finally, I bought my prized CD player. I placed it in just the proper location, carefully hooked it up, and gently pushed OPEN. Silently, the drawer slid out to accept the disc I had ready. I pushed CLOSE and then PLAY, and off it went, spinning out stunning sound.

But something felt very wrong. I couldn't see the disc inside the machine. I couldn't gaze admiringly at the visual personality of the music, the way I did when I triumphantly brought home a new 45. I couldn't look at the individual characteristics of each disc, like the chicken scratchings on the runout area of an LP. I couldn't identify a particular section of a song by noting that "the good part starts near the blue line on the label." The old quirks of vinyl tugged at my heart.

Reaching out to grab one of my 45s, I recalled that my high-tech alter ego had chosen to decorate with them. As I looked up at them forlornly, surrounded by that brilliant, sterile CD sound, I realized I had fulfilled my dream but lost an old friend in the process.

Meredith J. Tupper

Miss Tupper, one of our readers, lives in Grand Rapids, Michigan.

Readers are reminded that this portion of "Medley" is open to contributions. Send your 400-word article to Ken Richardson, Popular Music Editor, HIGH FIDELITY, 825 Seventh Ave., 8th floor, New York, N.Y. 10019. Keep a copy; original manuscripts will not be returned. We pay $100 for each published article.

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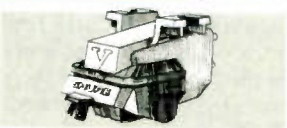

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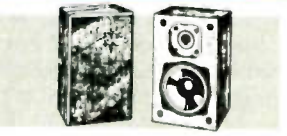

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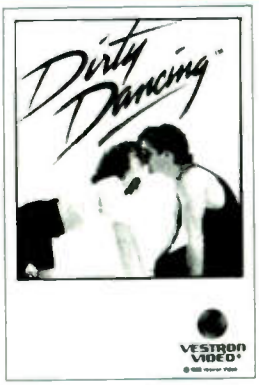

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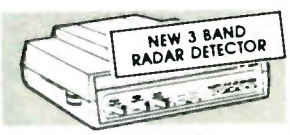

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J&R MUSIC WORLD

VictorVictorious

BY THOR ECKERT, JR.

The first midprice opera CDs from RCA rekindle memories of yesteryear.

It was just a matter of time before one of the major recording companies raided its rich back catalog for a new midprice line of opera CDs. And how fitting that RCA should be the first. RCA Victor always seemed to *define* opera in the opening decade of the LP era. The company's legacy is particularly rich, reflecting the best casting traditions of the Metropolitan Opera (with which it had a brief direct affiliation). RCA also made a serious stab at recording operas domestically, and several of those sets are of legendary status, the rest being at least interesting.

Of the first ten releases in the Victor Opera Series, nine give a good sense of the strengths and weaknesses of the Victor catalog right through to the middle years of stereo. The tenth, *Die Zauberflöte*, is new to this country, though the Eurodisc production dates from the year 1970. Three recordings were produced on these shores (*Cavalleria rusticana*, *Macbeth*, and *Il barbiere di Siviglia*—the latter two from the Metropolitan Opera), two were taped in Rome (*Tosca* and *La Bohème*), three in the RCA Italiana studios (*Rigoletto*, *Ernani*, and *Lucia di Lammermoor*), and one in London (*Norma*).

The history of RCA opera recordings for LP began with Verdi's *Rigoletto* at the Manhattan Center in 1950 and ended, as things turned out, at Walthamstow Hall, London, in 1978 with a *Cavalleria* featuring Renata Scotto and Placido Domingo. The *Cavalleria* is already out on full-priced CD, and the above-mentioned *Rigoletto* deserves to be digitally rejuvenated as a document of both a historic first and of Leonard Warren's titanic vocalization of the title role.

The constant factor in just about every operatic recording at RCA (not to mention a large quantity of nonoperatic ventures as well) has been Richard Mohr, today the producer of the weekly Texaco/Metropolitan Opera radio broadcast intermission features. What is clear from the nine sets he produced in this release is his discretion. There is nothing in his work that screams "Mohr" in the manner of the ultra-theatrical John Culshaw. The producer clearly felt that his task was to create as honest as possible a sound document of the patchwork performance at hand. This does not mean that Mohr neglected stereo byplay. In his *Bohème* production, the end of Act II has some of the best motion effects I have ever heard.

In listening to some of the earlier stereo undertakings, one can sense a certain confusion as to what to do about the novel new medium. This most affects the *Macbeth*, where important arias are sung from one speaker or the other. And now that these sets have been digitally cleaned up, we can actually sense just how traumatic the sessions must have been, because the splices are just that much more audible and the flaws they are meant to cover just that much more evident. A phone rings in *Barbiere*; all sorts of changes in ambient sound occur at splice points; distortion is now perceptible that once was hidden by vinyl noise. But I find these sorts of flaws rather endearing, and somehow they are really just flaws, not gaffs on the order of some rival companies' efforts on brand-new all-digital productions.

It must be remembered that many of these sets were recorded in the era of exclusive contracts, and RCA had its share of stunning stars. Look at the lineup of sopranos on these discs: Zinka Milanov, Leonie Rysanek, Roberta Peters, Anna Moffo, Leontyne Price, Montserrat Caballé—all, save Rysanek, mainstays of the RCA image. Jussi Björling, Leonard Warren, Robert Merrill, and Giorgio Tozzi were all fixtures at RCA. Carlo Bergonzi's first complete opera recording was this *Macbeth*. When Richard Tucker came in-

The stuff of RCA opera (from top left): Zinka Milanov as Tosca; Leonie Rysanek's inimitable Lady Macbeth; Jussi Björling as Cavaradossi; Anna Moffo and Robert Merrill rehearse "Rigoletto"; and Merrill, at left, as Figaro

to the RCA fold, it was with an asterisk: "Courtesy of Columbia Records." Curiously, these exclusives never really hampered RCA the way similar restraints did Decca/London: Imagine if Nicolai Gedda had been available to the English label for the pre-Pavarotti Sutherland sets.

Of the ten albums under consideration, I regard only *Macbeth* as indispensable. But I'd have said the same thing had it been reissued at full price. Because this line is sold at midprice, at least five more sets are worth owning: *Cavalleria*, *Tosca*, *La Bohème*, *Barbiere*, and *Rigoletto*.

The 1959 *Macbeth* features the sort of high-powered cast that was quite normal at the Met in those days. Because it was recorded during the historic run of the opera—a Met premiere, and Rysanek's debut—it possesses an interactive vitality that too often eludes the standard recorded opera. And it captures all the principals in peak form. It is a singers' *Macbeth*, and as such it remains the best performance on records. The only real weakness is Erich Leinsdorf's matter-of-fact way with the score. Otherwise, this RCA set has always been the *Macbeth* for these ears because the singing is so spectacular.

The sheer massiveness of Warren's tone, in the title role, the authoritative way he used his instrument, even the odd troubles he had taming that instrument to cope with a long Verdian line, fuse together in a unique interpretation. The freshness of Bergonzi's baritone-turned-tenor, along with his lifelong caring for words and nuance, makes his one of the best recorded performances of Macduff's "*Ah, la paterna mano.*" Jerome Hines's bass may not have had the sheer velvet of some of his Slavic counterparts, but he makes a major impression with his Banquo. And yet it is Rysanek who puts this set over the top. By the time of her Met debut, she was already established as a blazing star and was an extraordinary Lady Macbeth. On these shores, she had sung the role in San Francisco in 1957, along with Turandot, Ariadne, Aida, and, at the last minute, Amelia in *Un ballo in maschera*—the latter in *German!* So when Sir Rudolf Bing canceled Maria Callas's contract and engaged Rysanek, he was not exactly hiring an unknown commodity.

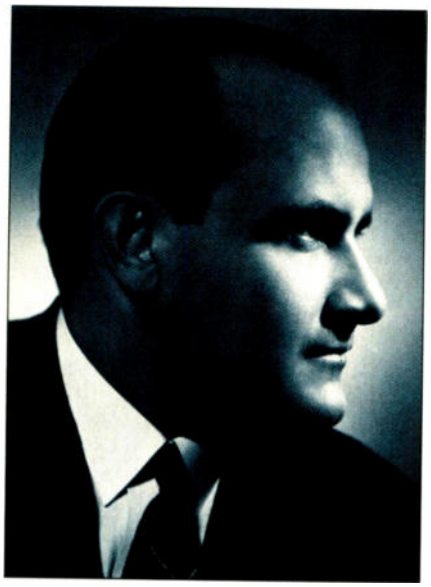
Those who were susceptible to the unique timbre of Rysanek's voice and her

compulsively compelling performance style—and there are some who have always refused to get the message—had no trouble acclaiming her the most exciting diva of the day. And they still do, as was evident last March at both her thrilling final Met Sieglinde and her terrifyingly brilliant Kostelnička in a concert performance of Janáček's *Jenůfa*, where the ovations were both huge and prolonged.

Microphones are usually cruel to voices this large, but somehow Mohr and his engineers managed to handle the instrument, so that the opulent, vivid high notes have all the presence one remembers from her performances. And the sense of her profound communication with the part is telegraphed with much the same urgency one experiences in the theater. One senses, however, less-than-ideal working conditions in this production. Warren abruptly changes channels in midscene, certain blemishes that might have been corrected were not, and the pervading sense that all involved were stereo pioneers does not help matters in terms of soundstage imaging and theatrical verisimilitude. Still, these flaws are rarely intrusive.

The aroma of Golden Age that hovers over the *Macbeth* also hovers over the Milanov/Björling operas, though the promise is rarely fulfilled. Perhaps it is because the *Trovatore* and *Aida* (both recently released in the second wave of RCA CD reissues) are so exceptional that one expects too much of both this *Cavalleria* and this *Tosca*. The Mascagni opera was recorded in 1953 at the Manhattan Center in New York. It features rather drab mono sound, some ragged playing by the RCA Victor Orchestra under Renato Cellini, vivid choral work by the Robert Shaw Chorale, and exceptional singing in the roles of Turiddu and Alfio from Björling and Merrill, respectively. Unfortunately, Santuzza does not show Milanov off to best advantage: Though the vocal equipment is impressive, there is more a sense of a great diva attempting to be a peasant than of a fiery woman in the throes of jealous rage.

While *Tosca*, taped in 1957, found Milanov in uneven voice, there was still a vivid sense of the instrument itself—lustrous, beautiful, equipped with a weighty lower end, and, when all else failed, those silvery, legendary pianissimos. Björling is in spectacular form, and his contributions in particular benefit from CD refurbishment. This is a model Cavaradossi: ardent, eloquent, impassioned, and superbly vocalized. Warren is a suitably domineering Scarpia, and his singing of the Te Deum sequence is as handsome and majestic as can be. Aside from that, and remembering that his treatment of the role was said to be impressive in the theater, he comes off here as rather cautious and too self-conscious of enunciation. Fernando Corena, in his second of four recorded Sacristans, is expectedly endearing. Leinsdorf is rather objectivist, but he gets the Rome Opera forces to play well, and there is a majestic quality to his reading. The CD redo is commendable.



JAMES ABRESCH

Leonard Warren

Leinsdorf might seem an odd choice to conduct *La Bohème*, and yet his nonsentimental way with the score actually makes it all the more affecting and effective. By his overt fascination with Puccinian orchestration, and his attention to detail and balance, the music flows quite effortlessly, and he is ever the attentive, alert accompanist. The cast is well matched, with American singers in the six major roles, and they all radiate a sense of the pleasure of performing, as well as the particular joys of performing together. Anna Moffo more than suggests Mimì's vulnerable femininity, and she sings the role with sweetness, assurance, and sensitivity.

Tucker's resonant and ringing tenor was not always effectively picked up by microphones, but here it is well served indeed (credit, once again, to Mohr's ear for giving a realistic sense of the voices he was recording); this Rodolfo is tastefully sung, and one senses throughout this performance an artist in whom the sheer joy of singing can never be stifled. Mary Costa is a warm, ebullient Musetta, Merrill a luxurious-voiced Marcello. It is a first-rate stereo production, with sparkling-fresh sound and a fine stereo spread. The CD version does it justice, in spite of hints of distortion—particularly around Moffo's voice—that sounds as if it had been generated by remastering techniques rather

BELLINI: Norma.
Caballé, Cossotto, Domingo, Raimondi; London Philharmonic Orchestra, Ambrosian Opera Chorus, Cillario. Richard Mohr, prod. RCA 6502-2 (A, 3). Playing time: 157:09.

DONIZETTI: Lucia di Lammermoor.
Moffo, Bergonzi, Sereni, Flagello; RCA Italiana Opera Orchestra and Chorus, Prêtre. Richard Mohr, prod. RCA 6504-2 (A, 2). Playing time: 137:23.

MASCAGNI: Cavalleria rusticana.
Milanov, Björling, Merrill, Roggero; RCA Victor Orchestra, Robert Shaw Chorale, Cellini. Richard Mohr, prod. RCA 6510-2 (A). Playing time: 71:08.

MOZART: Die Zauberflöte.
Adam, Schreier, Geszty, Donath, Leib; Dresden State Orchestra, Leipzig Radio Chorus, Suitner. RCA 6511-2 (A, 3). Playing time: 150:13.

PUCCINI: La Bohème.
Moffo, Tucker, Merrill, Costa, Tozzi; Rome Opera Orchestra and Chorus, Leinsdorf. Richard Mohr, prod. RCA 3969-2 (A, 2). Playing time: 100:12.

PUCCINI: Tosca.
Milanov, Björling, Warren, Corena; Rome Opera Orchestra and Chorus, Leinsdorf. Richard Mohr, prod. RCA 4514-2 (A, 2). Playing time: 112:12.

ROSSINI: Il barbiere di Siviglia.
Merrill, Peters, Valletti, Tozzi, Corena; Metropolitan Opera Orchestra and Chorus, Leinsdorf. Richard Mohr, prod. RCA 6505-2 (A, 3). Playing time: 159:45

VERDI: Ernani.
Bergonzi, Price, Sereni, Flagello; RCA Italiana Opera Orchestra and Chorus, Schippers. Richard Mohr, prod. RCA 6503-2 (A, 2). Playing time: 130:07.

VERDI: Macbeth.
Warren, Rysanek, Hines, Bergonzi; Metropolitan Opera Orchestra and Chorus, Leinsdorf. Richard Mohr, prod. RCA 4516-2 (A, 2). Playing time: 130:16.

VERDI: Rigoletto.
Merrill, Moffo, Kraus, Elias, Flagello; RCA Italiana Opera Orchestra and Chorus, Solti. Richard Mohr, prod. RCA 6506-2 (A, 2). Playing time: 113:12.

than picked up from the master tape itself.

RCA's *Il barbiere di Siviglia* has always been talked about with respect and admiration. Curiously, this was my first encounter with the set, and it struck me as a remarkable document of the Metropolitan Opera's style of performance, sharing with the *Macbeth* the éclat of a stage performance with the sonic advantages of studio recording technique. Leinsdorf is truly in his musicological element here, trying to make the Met orchestra sound more period than modern at a time when such things were just beginning to be bruited about. The performance is uncut, and the singing is often splendid, always committed.

Merrill's is a very American but very engaging Figaro, and the voice is especially impressive. Cesare Valletti, heard here as Count Almaviva, was the Met's house Rossini/Mozart tenor, and though the timbre of his voice is, at best, controversial, his phrasing and breath control are beyond cavil. Roberta Peters was still in peak form for this Rosina, and while the upper extension always tended to thinness, there is a feisty brio that reminds us why she was such a favorite at the house. And then there are the antics of Fernando Corena (Bartolo) and Giorgio Tozzi (Basilio) that leap out from the speakers.

The *Rigoletto* gets off to a dazzling start under Georg Solti's baton—clearly this is a conductor's performance. But because this conductor has such an impressive cast, he does not become the sole motivating force in the performance but rather a noble and forceful partner. Merrill, in his second recording of the title role, lacks the dramatic bite to bring the jester emphatically to life, but he sings the music very well indeed. Moffo's Gilda is captured at virtually peak form, with only occasional touches of that croony mannerism that was eventually to dominate her singing onstage and in the studio. Alfredo Kraus had made the Duke his calling card in the 1960s, and his performance here is predictably fine in terms of range (the high D at the end of the cabaletta to "*Parmi veder le lagrime*" is no problem) and stylish interpretation. (It is remarkable to note how fundamentally unchanged the voice is today, some 25 years later.) Rosalind Elias is a competent Maddalena, Ezio Flagello a not-so-good Sparafucile.

Flagello is the common denominator in both the *Lucia di Lammermoor* and the *Ernani* and, sad to say, he is no asset. In fact, with the exception of Bergonzi's exemplary portrayal of the title role, the *Ernani* has little to recommend it. Leontyne Price, as Elvira, is considerably off-form, Mario Sereni is a disastrous Carlo, and Thomas Schippers is only intermittently effective conducting the RCA Italiana Opera Orchestra and Chorus. The *Lucia* at least manages to suggest a performance, and the principals are all in representative form. Once again, Bergonzi is a glorious asset as Edgardo, Sereni is really not so bad as Enrico, and Flagello is an acceptable Raimondo.

Finally, if Moffo's Lucia is not the stuff of legends, she at least never stints on beautiful tones, shimmering and rounded high notes, and an all-pervasive sense of vulnerability. In other words, she is no hardship on the ears, and in the role of Lucia, that's more than could be said for Callas in either of her commercial recordings. The uncut performance includes the Tower Scene confrontation between Edgardo and Enrico. Georges Prêtre keeps things moving at a constant clip, giving the entire performance an impressively theatrical vitality.

On paper, the RCA *Norma* looks good. In reality, it's quite a mess. Caballé is in poor voice and doesn't really come into her own until the final scene—by which time it is far too late. Domingo might just as well have taped his contributions in the various dressing rooms of the world's opera houses, so uninvolved and tired-sounding is his Pollione. Fiorenza Cossotto is a formidable Adalgisa, and on this occasion that becomes both compliment and complaint. And though I am no fan of Ruggero Raimondi, I must say that I can think of no recording on which he sounds worse than here, as Oroveso. The London Philharmonic Orchestra is under the baton of the faceless Carlo Felice Cillario. The CD transfer casts a hard aura on all the voices, but the original LPs were not especially impressive either.

The *Zauberflöte* is an earnest, Central European account of the work. It is distinguished by Helen Donath's ravishing Pamina and Peter Schreier's musicianly Tamino. Theo Adam's artistically noble, but vocally woolly, Sarastro and Sylvia Geszty's accurate though rather squeaky Queen of the Night do not lend the set any particular distinction. And the Three Ladies—Hannelore Kuhse, Gisela Schröter, and Annelies Burmeister—are rather long-in-the-tooth vocally. The Dresden Staatskapelle is under the able direction of Otmar Suitner. Though this *Zauberflöte* is not competitive with the various illustrious sets on full-price CDs, it may have its temptations at midprice.

The packaging for the RCA Victor Opera Series features the standard two- to four-CD jewel box in clear and blue plastic, with a handsome tailored-looking logo, good artwork, and a flimsy outer box that tends to come unglued on the third or fourth use. The booklets are bare bones: synopsis, banding scheme, libretto only. How nice it would have been to have a word or two as to why the set is either historic or of interest. There are numerous spelling errors on various covers.

Then, too, there is the matter of banding, which remains the major bugaboo of all the record companies today. In all these sets the banding is rather erratic, with some unexpected gaffs. In *Macbeth*, for example, there is no band for the beginning of Act II, Scene 2; in *Bohème*, Mimì's third-act aria is banded halfway through (at the wrong "*Addio*," it would seem); in *Tosca* we get a band at Cavaradossi's "*Dammi i colori*" but not at "*Recondita armonia*"; the *Cavalleria* "*Inneggiamo*" chorus is banded many bars too early; in *Zauberflöte*, it seems we should be able to program out the dialogue, except that the banding does not always offset that dialogue, and, because of a printing error in the libretto, italics meant to indicate dialogue spill over into the musical indications as well.

HIGH FIDELITY ARCHIVES

Giorgio Tozzi (left) and Jussi Björling

I mention these only because they are slight blemishes on an otherwise laudable series and ought to be corrected in future projects. In every case, the RCA engineers have done a good-to-handsome job giving these often-valuable performances a new lease on life—and at an affordable price.

[*And there's more to come: By this fall, there will be ten new RCA Victor Opera Series reissues in the stores. They will include the Moffo/Bergonzi/MacNeil* Luisa Miller, *the Price/Corelli/Freni/Merrill* Carmen *(Karajan conducting), and the Vickers/Rysanek/Gobbi* Otello *(under Tullio Serafin).—Ed.*] □

THE CD SPREAD

MINI-REVIEWS OF THE LATEST COMPACT DISCS

By David Hurwitz, Robert R. Reilly, Christopher Rothko, K. Robert Schwarz, and Terry Teachout

AQUITAINE POLYPHONY: ENSEMBLE ORGANUM, PÉRÈS

I shall not mince words about this issue: It is one of the finest discs of chant you will ever encounter. The School of St. Martial de Limoges flourished in 12th-century France (predating the more famous Notre Dame School) and produced some of the earliest surviving examples of polyphonic chant. In these pieces, the familiar Gregorian chant is joined by one or sometimes multiple lines, which embellish the plainchant to hauntingly beautiful effect. The lower lines usually become a type of drone, slowly speaking the words of the text, while an upper voice soars above them in florid decoration of the chant melody, passing through bracing dissonances that colorfully drive the voices back to unison. In other cases, two voices move closely together, adding an extra richness to the texture of the chant.

The Ensemble Organum gives wonderfully fluid and atmospheric performances that lend the music a real sense of mysticism without allowing it to become weighty or ominous. All the works are sung with one or two voices to a part and near-faultless technique, carving a nice path between the quavering voices of old monks and the excessive polish of some consorts. The sound is appropriately resonant, with just a trace of tape hiss. Highly recommended for the slightly adventurous. Playing time: 52:42. (Harmonia Mundi HMC 901134. Distributed by Harmonia Mundi, U.S.A.) *C.R.*

PROKOFIEV SYMPHONIES: BERLIN, KARAJAN

Herbert von Karajan's account of Prokofiev's Fifth Symphony on Deutsche Grammophon has long been considered one of his most successful recorded performances. When it appeared in 1969, it came as a revelation, so beautiful yet intense was the playing of the Berlin Philharmonic. Karajan's interpretation was refined without sacrificing weight and excitement—indeed, he enhanced these qualities through sheer musicality, with expressive phrasing, buoyant rhythms, and exquisite balance. The recording remains a little bass-shy in this CD reissue, but the sonorous playing amply compensates. As the coupling, Karajan's more recent traversal of Prokofiev's First, the *Classical* Symphony, lacks something in lightness and charm but is acceptable, and his Fifth is indispensable. Hearing it again confirms the impression that this conductor's most valuable recorded legacy lies apart from the German standard repertory. Playing time: 57:45. (Deutsche Grammophon 423 216-2.) *D.H.*

CARLOS BONELL: MODERN GUITAR MUSIC

A sensible coupling of four important 20th-century guitar works: Sir William Walton's Five Bagatelles, Manuel de Falla's *Homenaje: Pour le Tombeau de Claude Debussy*, Alberto Ginastera's Sonata, and Benjamin Britten's *Nocturnal After John Dowland.* Carlos Bonell's performances are accomplished and characterful, and, in the absence of an equivalent CD from the matchless Julian Bream, this one will do more than nicely. The top-notch liner notes are by John Duarte. Playing time: 46:43. (Angel EMI CDC 49512.) *T.T.*

VILLA-LOBOS "BACHIANAS": GOMEZ, PLEETH CELLO OCTET

This CD was underwritten by ICI Brasil "to mark their 80th anniversary and the centenary of the birth of Villa-Lobos," in 1987. They got their money's worth. Jill Gomez, one of Great Britain's most delightful sopranos, is featured in a version of Heitor Villa-Lobos's *Bachiana brasileira* No. 5 that is beautifully sung without lapsing into mushy sentimentality. The remainder of the disc is given over to the *Bachiana brasileira* No. 1, for eight cellos; four arrangements from Bach's *The Well-Tempered Clavier* for an orchestra of cellos; and Villa-Lobos's 1923 Suite for Voice and Violin. Like Gomez, the Pleeth Cello Octet and violinist Peter Manning make a strong case for the composer's wayward but intriguing music. Be warned that defective copies of this CD are circulating. The bad ones stutter and skip all over the place. Hang on to your receipt. Playing time: 53:39. (Hyperion CDA 66257. Distributed by Harmonia Mundi, U.S.A.) *T.T.*

TCHAIKOVSKY, DOHNÁNYI WORKS: WILD, FISTOULARI

Thanks to the brothers Chesky, Earl Wild's marvelous performances of Dohnányi's perpetually fresh *Variations on a Nursery Song* and Tchaikovsky's First Piano Concerto have staged a welcome return to the catalog. The only competition for this coupling is the dreadful András Schiff/Georg Solti version on London, a sort of musical portrait of Beauty and the Beast in the early stages of their relationship. Here, the New Philharmonia Orchestra, led by the composer's grandson, Christoph von Dohnányi, provides able accompaniment in the *Variations*, as does the Royal Philharmonic, under Anatole Fistoulari, in the Tchaikovsky. Wild's account of Dohnányi's Capriccio in F minor makes a delightful encore, though it should have been placed at the end of the disc. Even Chesky's recorded sound is superior to London's, thanks not only to Charles Gerhardt, the original producer, but to the tremendous care this small label lavishes on every phase of the production process. Playing time: 60:00. (Chesky CD 13.) *D.H.*

THOMSON "FOUR SAINTS IN THREE ACTS": THOME

This 1981 recording of Virgil Thomson's *Four Saints in Three Acts* was made immediately after a public performance by the same forces in commemoration of the composer's eighty-fifth birthday. Some of the soloists are too fruitily operatic, but there is much pleasure to be had from the thoroughly rehearsed pickup chorus and orchestra, the easy and natural pacing of conductor Joel Thome, and the liner notes by Thomson and Eric Salzman. While one may bemoan the simpleminded minimalism of which *Four Saints* is the all-too-obvious ancestor, Thomson's cheeky, charming music and Gertrude Stein's deadpan libretto remain as fresh as paint, even after six decades. RCA, by the way, should reissue Thomson's own abridged 1947 performance. The cuts are grievous and the sound quaint, but the plain-sounding soloists on that recording come a lot closer to what Thomson had in mind than the more cultivated singers heard on these two discs. Playing time: 89:50. (Nonesuch 79035.) *T.T.*

DVOŘÁK SYMPHONY CYCLE: BERLIN, KUBELÍK

Deutsche Grammophon's economical reissue of Rafael Kubelík's Dvořák symphony cycle with the Berlin Philharmonic on six midprice CDs offers an opportunity for a reappraisal. When this set first appeared in 1975, it was received with respect but was generally compared unfavorably to István Kertész's cycle with the London

Symphony Orchestra on London. However, the Berlin Philharmonic outplays Kertész's Londoners, and Kubelík's lighter, defter, more elegantly molded interpretations certainly hold their own. In fact, Kubelík's performances of Symphonies Nos. 1, 3, and 4 are not only superior to Kertész's but are the best these unjustly neglected works have yet received. The set is filled out with Kubelík's Bavarian Radio Symphony accounts of the *Scherzo capriccioso*, *Carnival* Overture, and *The Wood Dove*.

Kubelík's cycle is all the more sensible and rewarding a choice in light of London's strange and spotty strategy in reissuing Kertész's Dvořák. (His early and less successful *New World* Symphony with the Vienna Philharmonic is out at midprice; Symphonies Nos. 4, 5, and 6 plus fillers are available on three full-price CDs; and there is no word on the others.) DG's sound is just fine. Playing time: 7:05:14. (Deutsche Grammophon 423 120-2.)

D.H.

HAYDN SYMPHONIES: HAYDN ORCHESTRA, FISCHER

Nimbus has launched a series of recordings of the Haydn symphonies with the release of Symphony No. 101, in D (*The Clock*), and No. 103, in E flat (*Drumroll*). Nimbus's approach, if not "historical," makes an attempt at authenticity with the recording venue—the Haydnsaal in the Esterházy Palace, where Haydn served as *Kapellmeister*—and the use of the Austro-Hungarian Haydn Orchestra (an ensemble that includes members of the Vienna and Budapest Philharmonic orchestras), led by Adam Fischer. (Can the Hapsburgs be far behind?) In any case, either the locale or the recording technique defeats the effort. Though there is plenty of energy and much beauty in the playing, a blurred, overly reverberant acoustic makes it difficult at times to discern precisely what the musicians are doing. Too bad; it would have been interesting to hear whether they could match the Orpheus Chamber Orchestra in precision of ensemble. Though Orpheus has not recorded this particular repertory, its recordings of earlier Haydn symphonies are extremely authentic in that they do not employ a conductor. Playing time: 60:14. (Nimbus NI 5105.)

R.R.R.

CORELLI CONCERTI GROSSI: LA PETITE BANDE, KUIJKEN

Disappointment. I had been waiting some time for an original-instrument performance of Corelli's Concerti grossi, Op. 6, but this set from La Petite Bande and Sigiswald Kuijken is not the one. Although released on three separate LPs in the late 1970s, these recordings were not readily available in the United States and so are making their first real appearance here now, on CD.

Corelli's twelve concerti grossi were tremendously influential, serving as a model for concerto writing for much of the Baroque period. They are great works in their own right, however—highly melodic and appealing in their rather deceptive simplicity. Unfortunately, La Petite Bande's performance never really gets off the ground. There is very little drive or passion to the playing; everything is staid, deliberate, and tidy to the point of inducing boredom. While the players seem to relish the richness of the harmony, their attacks are timid and they never allow the music to sing. Intonation is also not all it could be, not even from Kuijken, the ordinarily surefooted concertmaster. The sound on this two-disc set is clear and full but a bit strident in the upper strings. On the whole, an unwelcome surprise from a normally first-rate group. Playing time: 136:17. (Angel EMI/Deutsche Harmonia Mundi CDCB 47919.)

C.R.

KING'S SINGERS: "ALL AT ONCE WELL MET"

This generously programmed CD contains 35 English madrigals, some familiar and others less so, culled from three albums recorded between 1976 and 1982 by the King's Singers. The polished, engaging performances serve as a useful reminder that when not horsing around with Johnny Carson or Julie Andrews, the King's Singers are still capable of some of the most stylish singing imaginable. Complete texts and good notes. Playing time: 73:33. (Angel EMI CDC 49265.)

T.T.

WORKS FOR VIOLA AND ORCHESTRA: GOLAN; MIT

The plaintive tone and unassertive register of the viola seem to inspire works tinged with melancholy. Indeed, all four compositions for viola and orchestra recorded here share a spirit of wistful resignation. Martinů's *Rhapsodie* (1952), Hindemith's *Trauermusik* (1936), Frank Martin's *Ballade* (1972), and Holst's *Lyric Movement* (1933) pare down the orchestral complement in an effort not to drown the solo viola. Yet all the composers seem to have been constrained by their task, for only the *Trauermusik*—a somber, understated elegy for King George V—rises above the level of competence.

Then again, it may be that the performers do not present these works in the most favorable light. In the past, the M.I.T. Symphony Orchestra, led by David Epstein, has sounded like a semiprofessional organization; here, its playing is marred by ragged ensemble and sour intonation. Violist Ronald Golan knew Martinů, Holst, and Martin personally (and premiered Martin's *Ballade*), yet his interpretations never seem authoritative. His nasal, pinched tone rarely achieves the dark-hued opulence of which the viola is capable, and his playing, though able, lacks a spark of inner life. Maybe the somewhat distant, undifferentiated recording is partially at fault, but the overall impression is of a disc that disappoints in both repertory and performance. Playing time: 51:14. (Pantheon D 0981 X.)

K.R.S.

BERLIOZ TE DEUM: LONDON, DAVIS

Berlioz's Te Deum remains one of his most underrated masterpieces—an infinitely more consistent, better proportioned work than the more popular Requiem, and hardly less grandiose. This performance by Colin Davis, the London Symphony Orchestra and Chorus, the Wandsworth School Boys' Choir, and tenor Franco Tagliavini, recorded in 1969, stood virtually unchallenged until Claudio Abbado's digital version arrived on Deutsche Grammophon. That performance, albeit slightly grander than Davis's, was compromised by its extraordinarily garish recording, making this CD the only game in town by default. Fortunately, there is nothing at all wrong with Davis's thoroughly musical account, and the sound has fared very well in this transfer. Playing time: 52:19. (Philips 416 660-2.)

D.H.

STRAVINSKY VIOLIN WORKS: PERLMAN

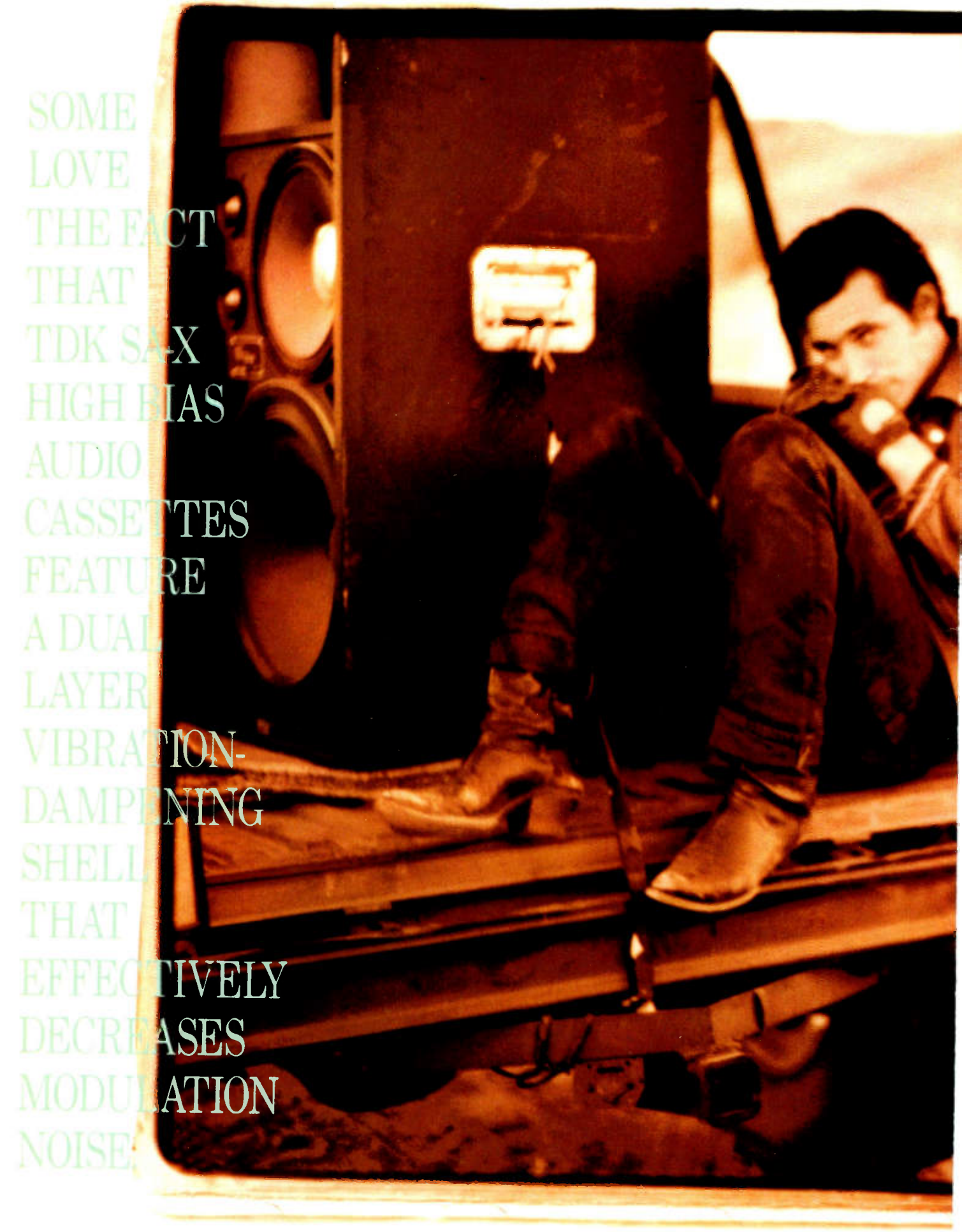
Itzhak Perlman's 1976 album of Stravinsky's three major works for violin and piano, the 1932 *Duo concertante* and a dapper little pair of suites—*Divertimento* and *Suite italienne*—from the ballet scores *Le Baiser de la fée* and *Pulcinella*, is a welcome addition to the CD catalog. Perlman is partnered to fine effect by pianist Bruno Canino in these handsome performances. Good liner notes by Kenneth Dommett. Playing time: 53:12. (Angel EMI CDC 49322.)

T.T.

STRAUSS "METAMORPHOSEN": VIENNA, PREVIN

An utterly apt coupling of two of Richard Strauss's most satisfying later works: the 1945 *Metamorphosen* for 23 solo strings and the 1943 Sonatina No. 1, in F, for 16 winds. *Metamorphosen* receives a darkly passionate performance, the Sonatina a limpid and elegant one, and one suspects that André Previn's natural restraint and the lushness of the Vienna Philharmonic served each other very well. Producer Wilhelm Hellweg has turned in a comfortable-sounding recording that is faithful to a fault—the Sonatina is full of the soft click of woodwind keys. One catch, however: *Metamorphosen* should have been internally banded. Playing time: 61:32. (Philips 420 160-2.)

T.T.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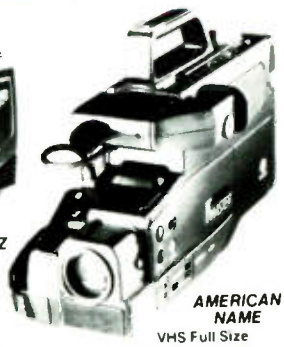

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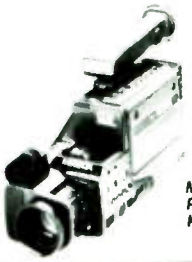

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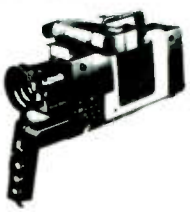

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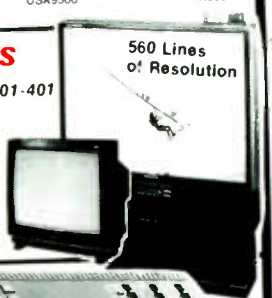

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TWIN BILL FROM LEVINE AND A TWO-CITY TEAM

MOZART: Quintet for Piano, Oboe, Clarinet, Horn, and Bassoon, in E flat, K. 452.
BEETHOVEN: Quintet for Piano, Oboe, Clarinet, Horn, and Bassoon, in E flat, Op. 16.

◑ *Levine, Ensemble Wien-Berlin. Steven Paul, prod. Deutsche Grammophon 419 785-2 (D).*

Neither of these quintets is a momentous piece, notwithstanding that Mozart called his "the best work I have composed" at the time he wrote it, at age 28. He had in fact already written the *Sinfonia concertante* in E flat, K. 364, the *Haffner* Symphony, and all his major choral works except the Requiem, as well as other works whose poignance causes them to assume a greater eminence in our minds than they may have had in his.

Mozart may have felt he achieved something in his quintet, in the way of formal and tonal balance, that especially pleased him as a composer who, as Haydn was to observe, possessed both heart and science. However, if he did, one will not learn what it was from Stanley Sadie's notes for this album, which are a model of the sort of structures that can be built up out of words that say nothing ("The piano is sometimes equal participant, sometimes retiring accompanist . . . and occasionally takes the lead"). And I am not the first who has failed to hear in this slight work what it is that so pleased its composer.

Beethoven wrote his quintet at an earlier stage of his musical development, although he was nearly the same age as Mozart had been at the time he composed K. 452. Opus 16 is often said to be less a chamber work than a miniature piano concerto, but that ascribes to the piano a function as protagonist that, structurally speaking, it does not have—even though it sounds almost continuously, and much of the time in the foreground. In fact, the winds and piano develop the musical material together, in chamber fashion, in each movement of the Beethoven quintet; and it is only because the wind writing is less sophisticated than Mozart's, while the piano writing is already resourceful and imposing, that the keyboard seems to dominate. The instrument remains more of a collaborator than in any of Beethoven's piano concertos.

It is partly James Levine's own gifts as a collaborator that make him the great artist he is, no less in chamber music than in opera. His playing in both of these enjoyable works is even more animated at times than Murray Perahia's in his recording of them (CBS Masterworks MK 42099), and it maintains a strong tensile outline without sacrificing sensitivity. Where required, Levine withdraws without fading to insignificance, and one is always aware that his mind is the guiding force behind the performances' cohesive shape, without ever being made to feel that he is out to establish that fact.

In the foreground, James Levine (left) and producer Steven Paul, with Ensemble Wien-Berlin flutist Wolfgang Schulz (not heard on this disc), hornist Günter Högner, and bassoonist Milan Turković. (Missing from the picture are clarinetist Karl Leister and oboist Hansjörg Schellenberger.)

The Vienna/Berlin wind players are exceptionally well matched and perform beautifully, except that the hornist makes a great many picturesque noises one doesn't expect to hear from a modern, valved instrument. Only some of these can have been intentional. Much of the horn writing in Mozart's quintet, as in his horn concertos, is deliberately comical, but the same is not true of Beethoven's writing for the instrument. The recorded sound is very beautiful, although when I listened over headphones, the reverberation seemed somewhat manufactured, and the complete and abrupt cessation, whenever a performer stopped playing, of any of the shuffling I had heard him do up to that moment made me wonder what sort of suppressors and isolaters might have been used. Over speakers, however, this effect was not noticeable. Playing time: 51:42.

Thomas Hathaway ▶

BARTÓK: Concerto for Violin and Orchestra No. 2*; Concerto for Piano and Orchestra No. 3†.

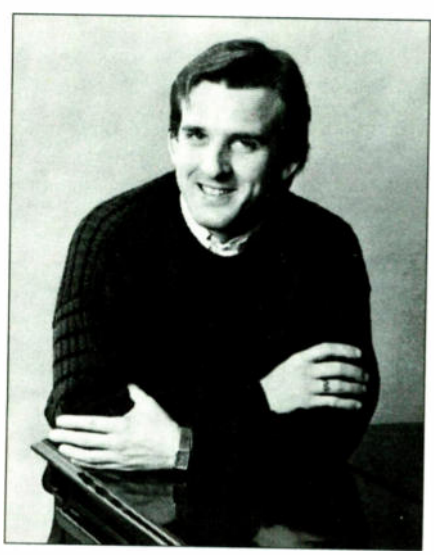
◑ *Menuhin*, Fischer†; Philharmonia Orchestra*, London Symphony Orchestra†, Furtwängler*, Markevitch†. Lawrance Collingwood and David Bicknell, prods. Price-Less D 15100 (A). (Distributed by Outlet Book Co., 255 Park Ave. South, New York, N.Y. 10003.)*

A valuable reissue from this new midprice label. If my memory is accurate, Yehudi Menuhin has recorded Bartók's Second Violin Concerto four times, but none of his other performances beats this one, which dates from 1953. As a Bartók interpreter, Wilhelm Furtwängler may not have ranked as high as some, but on this occasion his close spiritual rapport with Menuhin assured a performance of great dignity and fidelity to the score. Nevertheless, in spite of my admiration for the performance, I find it hard to feel much affection for the work.

The composer's Third Piano Concerto is different. It is among the most tender of modern classics, and this recording of it is one no piano lover should be without. First issued in the mid-1950s in Britain, it was never released in America. What's more, it has never been reissued here in any form. Early in her career, the marvelous Annie Fischer won two Hungarian state awards for her interpretation of this concerto; it is most Romantic, light years distant from the frigid, unappealing account recorded by Bartók's widow—for whom the concerto was written.

Strangely, though, this is Fischer's only recording of the work. For those who are accustomed to the brittle, "hard shell" conceptions offered by most performers, hers will come as a revelation. Until such time as Deutsche Grammophon reissues the classic, deeply human, near-definitive readings of all three of Bartók's piano concertos by the much lamented Géza Anda and Ferenc Fricsay, this ranks as the best Bartók Third on disc. Playing time: 61:58.

Thomas L. Dixon



PETER SCHAAF

Barry Douglas

BRAHMS: Piano Quintet in F minor, Op. 34*; Works for Piano (4).

◑ *Douglas; Tokyo String Quartet*. Jay David Saks, prod. RCA 6673-2 (D).* ⊙ ⊡

Ballade in B, Op. 10, No. 4; Capriccio in G minor, Op. 116, No. 3; Intermezzo in E, Op. 116, No. 4; Capriccio in D minor, Op. 116, No. 7.

Not only the four solo pieces rounding out this release make the young Ulster pianist Barry Douglas the central attraction here. I can't help feeling that RCA could have recorded the quintet without making the string quartet sound quite so top-heavy. Douglas doesn't exactly overpower his colleagues; on the contrary, he shows a great sensitivity in the fundamental chamber-music values of balance and give-and-take. Acoustically, though, during most of the passages in which he plays, from the quartet you hear the first fiddle plus a sort of harmonic wash, and the inner voices more or less go by the board—a pity, especially with a quartet as solid as the Tokyo.

Douglas won first prize at the 1986 International Tchaikovsky Competition in Moscow, so it goes without saying that he has the technique to make this music's considerable demands seem inconsequential. Four bars into the first movement, the sudden sixteenth-notes unmistakably proclaim the presence of a powerhouse at the keyboard. Unfortunately, at that passage's recapitulation, Douglas jumps the gun where Brahms builds in a sort of notated pause, and he also reveals inconsistency in his grace notes and mordents. Otherwise, one can find little to fault in these splendid performances: The F minor Quintet's dreamy slow movement and the solo E major Intermezzo seem to me exceptionally high-quality Brahms.

Incidentally, Richard Freed's notes turn Brahms's Opus 88 and Opus 111 from quintets into quartets. On balance, I incline to suspect Mr. Freed less than some overeager RCA copy editor. Playing time: 61:21.

Paul Moor

CLIVE BARDA

Lydia Mordkovitch

BRAHMS: Sonatas for Violin and Piano: No. 1, in G, Op. 78; No. 2, in A, Op. 100; No. 3, in D minor, Op. 108.

⊙ *Mordkovitch, Oppitz. Tim Handley, prod. Chandos ABRD 1227 (D).* ◑ *CHAN 8517.* ⊡ *ABTD 1227. (Distributed by Harmonia Mundi, U.S.A.)*

This perfunctory reading by violinist Lydia Mordkovitch and pianist Gerhard Oppitz of Brahms's three sonatas for piano and violin (as they were originally titled) neither goes to the heart of the composer's soaring lyricism and gentle sadness nor touches our own. The duo glosses over the surface of the notes without looking for any meaning in them: Crescendos remain an accumulation of sound rather than of intensity, while the softer dynamics are not gentle or haunting but suggest merely the absence of emotion.

Though their accounts actually last a little longer than the average for these works, one feels that the artists are in fact rushing, for there is no natural ebb and flow to their phrasing. The performance unfortunately can boast neither of the excellence of its recording technique nor of the musicians' techniques. The violin is recorded with so much echo around it that it sounds fuzzy, and Mordkovitch's pressed tone is further marred by slight imperfections in intonation.

With so many beautiful versions of these works available (notably the 1985 Angel recording of Perlman and Ashkenazy), this team could be of more service if it were to unearth lesser-known repertory or premiere new works. Playing time: 71:24.

Michelle Krisel ▶

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DELIUS: Orchestral Works (2); Choral Works (2).

◑ *Walker*, Allen†; Ambrosian Singers°, Royal Philharmonic Orchestra, Fenby. Christopher Palmer, prod. Unicorn-Kanchana DKP CD 9063 (D). (Distributed by Harmonia Mundi, U.S.A.)*

Orchestral works: Dance Rhapsody No. 2; Intermezzo from "Fennimore and Gerda." Choral works: Songs of Sunset†°; An Arabesk†°.*

"Languor" . . . lovely word; and I would not contest Christopher Palmer's claim that we find "this state of rapture . . . more frequently in Delius's music than in that of any other composer." Certainly it pervades all the works recorded here, except for the vigorous, whimsical *Dance Rhapsody*; that exudes vigor, and even ends loud, which in Delius's tender, introspective music almost never happens. All the other works here derive from what Eric Fenby calls "a theme which obsessed [Delius] increasingly from his early opera *Koanga*, through the choral works *Appalachia*, *Sea Drift*, *Songs of Sunset* to *An Arabesk*—the transience of creaturely love, its partings, its frailties, and its separations."

The *Songs of Sunset* dominate this selection, and they get an outstanding performance from two ideal soloists, an unsurpassed chorus, and one of London's best orchestras, all conducted by today's leading living Delius expert. (After advanced syphilis left Delius completely blind, Fenby served for the final decade as his amanuensis, writing down the last scores the composer dictated, note for note.) Rather self-defensively, Fenby states here that "in all his choral works Delius always wanted to hear the *orchestra* as a first priority, and we bore this in mind in making this recording." For my taste, they rather overdo it, particularly with regard to soloists Sarah Walker and Thomas Allen, who sound unnecessarily far from their microphones. That makes it less easy to understand Ernest Dowson's touching words, even with the text in the leaflet. The surge at the end, however, on "They are not long, the days of wine and roses," brings a passage of Delius at his best.

In *An Arabesk*, the composer takes his text (translated by Philip Heseltine, a.k.a. Peter Warlock) from Jens Peter Jacobsen, the Dane who also gave us the *Gurrelieder*. I question Fenby's pronouncement that it "exemplifies the best of Delius," but for any true fan of the composer its availability alone makes this a tempting recording. Playing time: 64:41. *Paul Moor*

Thomas Allen

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DVOŘÁK: Symphony No. 7, in D minor, Op. 70.

◑ *Cleveland Orchestra, Dohnányi. Paul Myers, prod. London 417 564-2 (D).* ⊙⊙

DVOŘÁK: Symphony No. 7, in D minor, Op. 70; The Golden Spinning-Wheel, Op. 109.

◑ *Scottish National Orchestra, Järvi. Brian Couzens, prod. Chandos CHAN 8501 (D).* ⊙⊙ *ABTD 1211. (Distributed by Harmonia Mundi, U.S.A.)*

Christoph von Dohnányi's account of Dvořák's Seventh Symphony with the Cleveland Orchestra is another success in his traversal of this composer's symphonies. Never becoming manic, Dohnányi conducts with Beethovenian vigor and brings out a wealth of orchestral details without fussing over them. He keeps things beautifully balanced and maintains a tension that never slackens, yet he doesn't push. It is a bracing and exhilarating performance. The almost startling clarity of orchestral detail is a tribute not only to the Decca/London recording engineers—who here have produced yet another demonstration-class disc—but to the virtuosity of the Clevelanders. The precision and beauty of their playing are extraordinary, and they have a sense of ensemble that a great string quartet could envy.

Neeme Järvi's reading of the Seventh shares roughly the same timings as Dohnányi's (it is only 22 seconds slower), but little else. His conception is more expansive and Romantic, and while it does not lack for vigor, it casts the music in a rather mysterious Brucknerian mold. The recorded perspective might well have been chosen for this conception: It is slightly recessive and lacks a bit of London's sense of presence and definition. Järvi has a way of beautifully shaping individual phrases, but, overall, his performance does not match the energy and high voltage of Dohnányi's. Also, as fine as the Scottish National Orchestra is, it is outclassed by the Cleveland ensemble.

The Chandos disc has a major advantage in that it offers almost another half hour of music in Järvi's stirring, characterful performance of Dvořák's symphonic poem *The Golden Spinning-Wheel*. Whatever possessed London to issue a CD with only 36:25 of music on it? Playing time (Chandos CHAN 8501): 64:50.

Robert R. Reilly

HUMMEL: Concertos for Piano and Orchestra in A minor, Op. 85, and B minor, Op. 89.

◑ *Chang; Budapest Symphony Chamber Orchestra, Pál. Hezser Zoltan, prod. Marco Polo 8.223107 (D). (Distributed by Harmonia Mundi, U.S.A.)*

In the early 19th century, everyone appeared to know that Johann Nepomuk Hummel (1778–1837) was a genius. His contemporaries described him as both the inheritor of Mozart's melodic gift and grace and the principal rival to the young Beethoven. A century and a half after Hummel's death, we can discover why he was included in the pantheon, and also puzzle over the obscurity that engulfed his work as Romanticism swept everything before it. This is in large part thanks to Ian Hobson's superb set of Hummel's six piano sonatas (on three Arabesque CDs) and Stephen Hough's very fine performances of Hummel's Piano Concertos in A minor, Op. 85, and B minor, Op. 89 (on Chandos).

The sure sign of a revival is duplication, and now the program of the Chandos disc is replicated on a Marco Polo CD with performances that surpass it. Without knowing the size of the Budapest Symphony Chamber Orchestra, one can hear that it has the requisite weight for Hummel's brilliant and sometimes powerful orchestral accompaniment—which was rather lacking with the English Chamber Orchestra. The players and conductor Tamás Pál seem to have the style of this mu-

(Continued on page 83)

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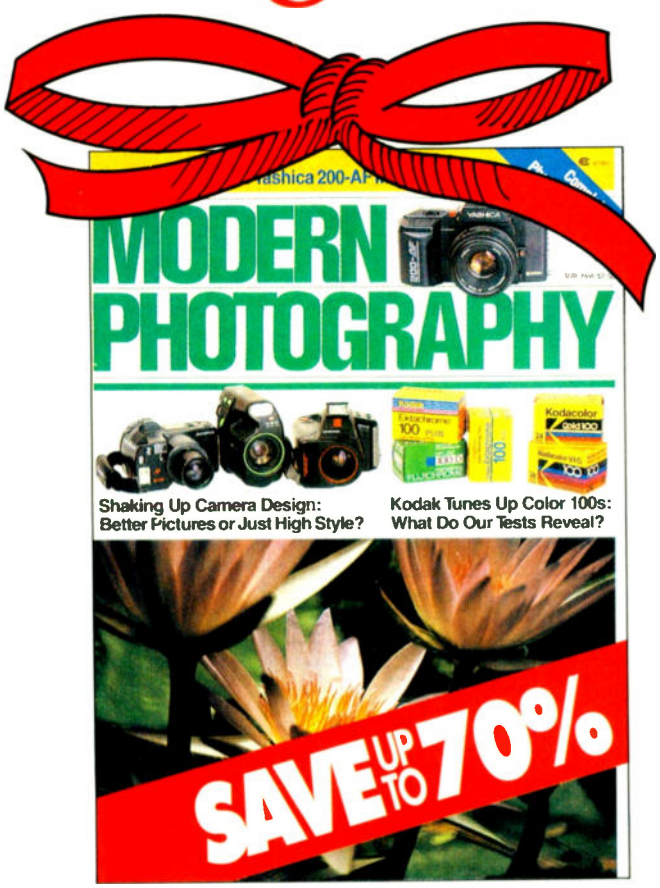

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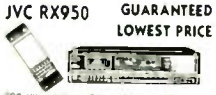

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(Continued from page 80)

sic in their bones. With leisurely but never slack tempos, they outpoint their English rivals in the expression of felicitous details.

Korean pianist Chang Hae-won plays with marvelous fluidity and shading, and the rapport between her and the orchestra is superb. In short, these are the finest performances of this music I have heard. They are a must for lovers of early 19th-century music, and will be a special treat for lovers of Mozart, Hummel's teacher and benefactor. The same singing line, the same operatic orchestral accompaniments, and an almost equal talent for themes of deceptive simplicity and exquisite beauty will be found in these two concertos. Hummel is not exactly like Mozart, but more like Mozart on his way to becoming Chopin.

I have always thought the opening Allegro of Opus 89 to be a masterpiece, and have used it for years to stump musical friends in games of "Who's That Composer?" Anyone who thinks Hummel is a lightweight should listen to the substantial four-minute orchestral introduction, which almost operatically prepares for the entrance of the piano. The following Larghetto could only have been pulled off so brilliantly by a true master, while the Vivace finale is full of high spirits and fun. If there is a little froth in it, it is that of true champagne, not beer. The Opus 85 concerto is equally beguiling and charming, if a bit less powerful.

The all-digital recording is first-rate. This enterprising label should employ the same team to survey the rest of Hummel's piano concertos. Playing time: 71:27.

Robert R. Reilly

LISZT: Sonata in B minor; Ricordanza ("Études d'exécution transcendante," No. 9); Grandes Études de Paganini: No. 4 (3rd version), No. 3 ("La campanella"); Hungarian Rhapsody No. 6, in D flat.

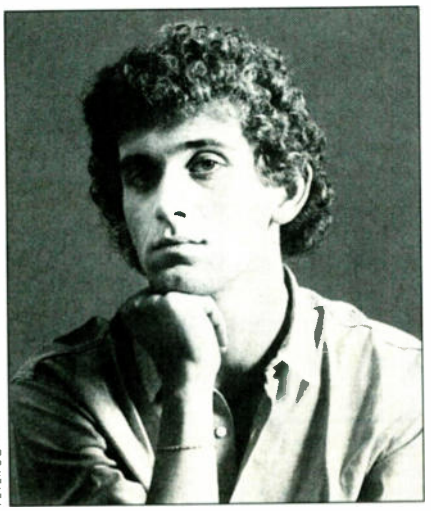
◑ *Lucchesini. John Fraser, prod. Angel EMI CDC 49063 (D).*

BEETHOVEN: Sonatas for Piano: No. 14, in C sharp minor, Op. 27, No. 2, "Quasi una fantasia" ("Moonlight"); No. 29, in B flat, Op. 106 ("Hammerklavier").

◑ *Lucchesini. David Groves, prod. Angel EMI CDC 47738 (D).*

Andrea Lucchesini recorded the Liszt B minor Sonata in 1984 at the age of eighteen. By the time he reached twenty-one, he felt, regrettably, up to Beethoven's daunting *Hammerklavier.*

The young pianist has the requisite technique for Liszt, and then some, but he also lets the music breathe. In the more subjective sections of the sonata, he displays affecting lyricism and poetry; the fugato emerges finely chiseled, crystalline. In *La campanella* he does original things with the grace notes, and his bravura—especially his trip-hammer repeated octaves—makes the *Hungarian Rhapsody* exciting.



PETER SCHAAF

Andrea Lucchesini

For some mysterious reason, Lucchesini displays far more fidelity to the Liszt scores than to the Beethoven. Barely into the opening of the *Moonlight* Sonata, he begins to ignore the composer's unequivocal injunction "always pianissimo," investing the three repeated G sharps in the right hand with much of the doom-ridden portentousness of the Fifth Symphony. And speaking of portentous, he really goes haywire in the *Hammerklavier.* He had a golden opportunity here—to play it, for a change, the way Beethoven specifically notated it. Instead, he has turned his back on the score and heeds most of the pernicious "traditional" barnacles that have come to encrust this misinterpreted score.

I must leave it to more skilled mathematicians to reckon the overall effect of Lucchesini's playing not 138 but merely 100 beats to the minute in the first movement of the *Hammerklavier,* not 80 but 70 in the second, not 92 but 66 (and even 50) in the third, and in the fugue, marked 144, as little as 120. It all gets so fraught with *meaning* that the third movement turns, essentially, into a dirge. I have yet to discover anyone with the transcendental technique and the necessary chutzpah to play this sonata the way Beethoven wrote it. Still, Lucchesini bears watching. At least in Liszt, he already definitely deserves hearing. Playing times: 58:50 (49063); 66:30 (47738).

Paul Moor

RAVEL: Alcyone*; Alyssa†.

◑ *Nicolesco*†, Denize*, Meens*†, Glashoft; Bamberg Symphony Orchestra, Soudant. Rizzoli CD 2005 (D).* ⊙ ⊡

The small but enterprising Rizzoli label has given valuable service by issuing the first recordings ever of two substantial ear-

ly works by Maurice Ravel: the cantatas *Alcyone* and *Alyssa*. Written in 1902 and 1903, respectively, as entries into the Prix de Rome, they were both unsuccessful, the prizes going to two composers so obscure they are not even listed in *Baker's Biographical Dictionary of Musicians*. Nevertheless, these are fine works, even though there isn't much to hear in them in the way of individual personality.

Alcyone and *Alyssa* are both scored for three soloists and a good-sized orchestra. The former involves a Greek queen who has premonitions of the fate of her missing husband, and at the conclusion the king's lifeless body is brought back. The music of *Alcyone* is for the most part more conciliatory than one might expect from the situation; its closest sonic counterpart would seem to be Debussy's equally early cantata *La Demoiselle élue*. *Alyssa*, however, is the more striking work—not because of greater originality, but for its unconventional structure and unusual influences.

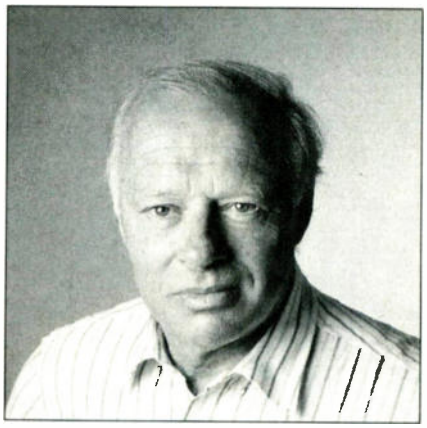
This cantata is more overtly dramatic, dealing with an Irish legend involving a prince's tragic love for a fairy and his conflict between romance and duty to his king. Strangely, much of the first part of the work recalls the Middle East–inspired scores of Rimsky-Korsakov, with most of their enchanting exoticisms intact. The remainder of the cantata—not surprisingly, considering how similar the stories are—seems to have taken its inspiration from Massenet's fantasy-opera *Esclarmonde*. Certainly the climactic passages are as exciting and as grand as anything in that score. At any rate, it is a rewarding listening experience, as the early works of most great composers usually are.

This beautifully recorded disc features four fine singers, the most prominent being soprano Mariana Nicolesco. Her plummy voice may not sound indigenously French to some ears, but her tone is gorgeous, while her style in phrasing and diction is virtually faultless. As a postscript, the excellent conductor, Herbert Soudant, has successfully sung Wagnerian tenor parts; this critic heard him do a more-than-respectable Siegfried a decade ago. Playing time: 52:59. *Bill Zakariasen*

VAUGHAN WILLIAMS: A London Symphony; Fantasia on a Theme by Thomas Tallis.

◑ *London Philharmonic Orchestra, Haitink. John Fraser, prod. Angel EMI CDC 49394 (D).*

One forgets nowadays that not all too long ago people tended to say England's list of great composers ended with Henry Purcell, who died in 1695. We realize now that the first half of this century brought an extraordinary resurgence, with Edward Elgar, Ralph Vaughan Williams, William Walton, and Benjamin Britten leading the



CHRISTINA BURTON

Bernard Haitink

field. Vaughan Williams, full of years and the composer of nine symphonies, eventually looked back on this one, his second, as his personal favorite.

Although it has its feet planted squarely in Brahmsian Romanticism, Vaughan Williams made it unmistakably English, not only by quoting Big Ben but by employing his personal variant of the melos of authentic British folk music. The symphony reveals itself to the listener at once, much more immediately than any of the composer's others. EMI, however, seems to want us to listen to this excellent performance of it not as program but as absolute music; William Mann's entertaining notes, although they refer in passing to the composer's own program notes for the work, relay very little of the quite definite program for the four movements that the composer had in mind. Odd.

With every good new recording of the *Fantasia* that comes along—such as this one—I always hope it may encourage American music lovers finally to get better acquainted with Thomas Tallis (c. 1505–1585), whose music inspired this glowing homage from Vaughan Williams four centuries later. Both the music and the recorded sound here evoke the majesty of English cathedral architecture. Bernard Haitink and this excellent orchestra, in both works, rise handsomely to the occasion. Playing time: 65:51. *Paul Moor*

VILLA-LOBOS: Quinteto em forma de chôros; Quintet; Trio.

◑ *Groupe instrumental de Paris. André Poulain, prod. Adda CD 581035 (D). (Distributed by Qualiton Imports, Ltd. 39-28 Crescent St., Long Island City, N.Y. 11101.)*

VILLA-LOBOS: Bachianas brasileiras, Nos. 1, 5*, and 7.

◑ *Hendricks*; Royal Philharmonic Orchestra, Bátiz. Brian Culverhouse, prod. Angel EMI CDC 47433 (D).*

Heitor Villa-Lobos, a Brazilian Vivaldi, produced more than 700 works, only a score of which are currently available on disc. The centennial year of his birth was 1987, and it produced some recordings that offer at least a small remedy for this neglect. These two illuminate different facets of the composer's vast output.

The French CD gives us three exquisite chamber works: the *Quinteto em forma de chôros* for winds (composed in 1928, revised in 1953); the Quintet for Harp, String Trio, and Flute (1957); and the String Trio (1945). This centennial offering is beautifully performed by the Groupe Instrumental de Paris. Only the *Quinteto em forma de chôros* is otherwise available, but a performance of this high quality is always welcome. The other quintet bears a close resemblance to, and emerges favorably in comparison with, works by Ravel and Roussel for similar ensembles including harp. The dreamy Lento is utterly beguiling.

The String Trio is another work of the highest quality, written in a more serious vein, with a beautiful Andante. One can only hope that the Villa-Lobos centenary brought to the fore other chamber works of this caliber from the vast number of compositions he created.

The Angel EMI CD features the music for which Villa-Lobos is best known: his colorful, exotic, folk-inflected *Bachianas brasileiras*—of which Nos. 1, 5, and 7 are presented here. Himself a cellist, Villa-Lobos developed an affection for the coagulated sound of massed cellos: The improbable combination of eight of them is used in Nos. 1 and 5. In the latter, the texture is considerably relieved by the addition of a soprano vocal line, here sung ably by Barbara Hendricks. In No. 7, the longest of the *Bachianas*, Villa-Lobos shows what he could do with full orchestral resources. The piece is alternately raucous, lyrical, coarse, exhilarating, meditative, and massive. Enrique Bátiz conducts the Royal Philharmonic Orchestra in a lively and hot-blooded performance with fine sound. Playing times: 59:42 (Adda CD 581035); 60:03 (Angel EMI CDC 47433).

Robert R. Reilly

Barbara Hendricks

Backbeat®

ALL CDs GREAT AND SMALL

A look at the 3-inch format leads off another of our section-long surveys of the Compact Disc. Also covered: full-size CDs of classic and contemporary jazz, Enigmatic rock, and the ever digitizing Mr. Zappa.

3 INCH POP

In a few years, the 3-inch Compact Disc will have either carved out a niche in the increasingly crowded music marketplace or become the cutest little collector's item of the late Eighties. Known by a variety of names—CD-3, CD³, CD single, C-Dingle, subcompact disc—the pop 3-incher has gotten off to a shaky start since the first one was released in October 1987. But the format is gaining momentum (at press time, CBS was about to release *forty* titles), and it's now easier to imagine a CD-3 section in your local record store, between the vinyl 45s and the full-size CDs.

The CD-3 can be used in any Compact Disc player, though machines whose disc-loading drawers are not designed to accept the little guy directly (a feature essentially unavailable before this year) require a plastic adapter for the disc. On machines with readouts, playing time and number of tracks appear as usual, and though some discs may have few selections to reorder, the playing sequence is indeed programmable. The sound quality of a CD-3 is as variable as that of a full-size disc, which means it may approach perfection—after all, digital is digital.

Beyond the 3-inch diameter of the disc, there is little consistency among the CD-3s currently available. Number of tracks ranges from one to six, playing times from 3½ to 20 minutes. The music may be available elsewhere or largely exclusive (though we have yet to see a complete disc of CD-3-only material). Storage jackets may be cardboard or plastic, gatefold or single-sleeve, covered with newly designed artwork and notes or devoid of creativity. Even the plastic adapters vary somewhat; the one supplied to us by A&M is easiest for clipping the discs in and out.

In fact, A&M has overall put its best foot forward with its initial line of six CD-3s, each in a meticulously decorated gatefold jacket, carefully credited, and containing three healthy tracks that total an average of 15 minutes. All but one of the A&M titles feature a hit single followed by material that is unavailable on LP or previously unreleased in any format, and

JANETTE BECKMAN

Above: They truly are 3-inch Giants.

most of these rare cuts are well chosen.

The most eccentric A&M offering is from **Robyn Hitchcock and the Egyptians** (A&M CC 31005), with the boppy "Balloon Man" single, an upbeat electric "Globe of Frogs" (which runs rings around the delicate version on the LP of the same name), and a six-minute mournful acoustic ballad called "The Ghost Ship." The disc by **Sting** (CC 31001) is the longest of the A&Ms (18:47), thanks primarily to a rambling ten-minute cover of Jimi Hendrix's "Up from the Skies," recorded with the late Gil Evans and his orchestra. Also included are "Englishman in New York" (from *Nothing Like the Sun*) and a sensitive take on George Gershwin's "Someone to Watch Over Me" (done for the 1987 film). **Squeeze** (CC 31002) starts with "Footprints," the catchy, albeit repetitive, single from *Babylon and On*, and continues with peppy live versions of "Black Coffee in Bed" and "Take Me I'm Yours." The package from **Suzanne Vega** (CC 31003) takes the same approach: *Solitude Standing*'s "Luka" is nicely complemented by "Left of Center" and "Neighborhood Girls," both recorded live in England. **Simple Minds** (CC 31006) reverses the pattern, with an extended live version of "Don't You (Forget About Me)" serving as the hook for two non-LP studio tracks, "Bass Line" and "The American." Finally, a synthy compilation from **Orchestral Manoeuvres in the Dark** (CC 31004) gives us "Dreaming" (from *The Best of OMD*), the previously unreleased "Gravity Never Failed," and the 12-inch remix of "Secret."

Hitchcock (left) and Cash

Rykodisc gets points for introducing the 3-inch pop CD, but there is a sense of randomness to the three Frank Zappa selections on that debut disc, **Peaches en Regalia** (Rykodisc RCD3 1001). Maybe the disconnected feeling comes from the span of years separating the title tune (off *Hots Rats*, 1970) and "I'm Not Satisfied" (*Cruising with Ruben and the Jets*, 1968) from "Lucille Has Messed My Mind Up" (*Joe's Garage*, 1980). The simple sleeve carries only the bare necessities of titles, playing times, legal info, one credit (Zappa), the Zappa Hotline number, and a photo lifted from the cover of *Hot Rats*.

With Rykodisc's subsequent CD-3s, this modest beginning gives way to more elaborate artwork, a few more credits, and gate-fold-'em-yourself packages, which require a month under a stack of books before they *stay* folded. (Zoot allures! At press time, Rykodisc announced it is abandoning this unwieldy sleeve for one that "folds neatly, closes cleanly, and is generally wonderful.") Two more Zappas, **Zomby Woof** (RCD3 1011) and **Sexual Harassment in the Workplace** (RCD3 1010), feature two live cuts each from, respectively, *You Can't Do That On Stage Anymore, Vol. 1* and the all-instrumental *Guitar*. Whereas *Peaches en Regalia* runs 13:15, the two newer discs take two steps backward, to 9:20 and 7:47. Still, the guitar-wailing genius heard on *Sexual Harassment* is priceless in any format. (For more Frank Zappa, in full-size CD format, turn the pages for "More Frank Zappa.")

Rykodisc's other CD-3s are curious choices. **She's King** (RCD3 1002) has Church guitarist Marty Willson-Piper doing three songs from his solo album, *Art Attack*: "She's King" is innocuous fluff, "Listen/Space" is edited (though not edited enough, considering there still are painful lyrics like "The quality of being with you is rich/The ability of working things out is rare"), and "Frightened Just Because of You" is an alternate take that shows a little spunk. Clearly, the value of a bad CD-3 is to help us avoid the longer work it's intended to advertise. Meanwhile, the Residents hold the Rykodisc record for CD-3 playing time (18:41) with **Double Shot** (RCD3 1003). Two cuts are adapted from the CD-only *God in Three Persons*: an extended "Loss of Loved One" and an instrumental "Kiss of Flesh." According to the notes, the previously unavailable "Double Shot"—a remake of the Swinging Medallions' 1966 hit, "Double Shot (of My Baby's Love)"—"served as inspiration" for the *God* epic. The Residents are very weird.

They Might Be Giants' **Don't Let's Start** (Bar/None AHAON 004), released in January of this year, was the first CD-3 to include material unavailable on LP or full-size CD—namely, "We're the Replacements," "When It Rains It Snows," and "The Famous Polka," which expand on the zaniness begun by "Don't Let's Start" (from the Giants' eponymous debut album). Though the tracks average less than two minutes each, the disc is chock full o' fun. The band's second CD-3, **(She Was a) Hotel Detective** (AHAON 005), continues in the same spirit, with the title tune again from the debut album, followed by four non-LP quickies: "Kiss Me, Son of God," "For Science," "The Biggest One," and "Mr. Klaw." The final, unlisted bit of business (for a total of six "tracks," despite a mere 11:05 playing time) is an amusing phone conversation between two clueless people who are baffled by this "There May Be Giants" phenomenon. Though the same *Hotel Detective* collection is available on a maxi-single cassette with lyrics, both TMBG CD-3s come without lyrics in single sleeves. Nevertheless, the rapid-fire digital dada seems perfectly appropriate for the new format.

At press time, Rhino had the largest line of CD-3s: a "Lil' Bit of Gold" series of 20 discs, most running about nine or ten minutes and each containing four songs culled from a greatest-hits package. In standardized single sleeves with a photo and song titles on the front and credits on the back, the discs contain music predomi-

nantly from the Fifties and early Sixties. The only Seventies entry is by the **Raspberries** (Rhino R3 73016), featuring 13 minutes of Eric Carmen rockers that convey the single-mindedness of a boy with hungry eyes: "Go All the Way," "I Wanna Be with You," "Let's Pretend," and "Tonight." The disc of **Eddie Cochran** (R3 73005) is the tastiest, with a garage-band simplicity and undiluted early-rock sensibility on "Summertime Blues," "Somethin Else," "C'mon Everybody," and "Nervous Breakdown." **Johnny Cash** (R3 73002) strums to a different kind of simplicity in the countrified "I Walk the Line," "Folsom Prison Blues," "Guess Things Happen That Way," and "Ballad of a Teenage Queen." One of the Rhino series' most solid compilations, hit-wise, is **The Four Seasons** (R3 73010), with "Sherry," "Working My Way Back to You," "Rag Doll," and "Let's Hang On!," all ringing with a horn-and-tambourine sound that is particularly conducive to digitized improvement. **Classics IV** (R3 73004) gives us four classics (sorry) of prototype mid-Sixties mellow rock: "Spooky," "Traces," "Everyday with You Girl," and "Stormy," which are partly redeemed from shameless softness by some hip sax solos. Only one technical problem with the otherwise fine-sounding Rhinos: The opening "T" is clipped off "Two girls for every boy" at the start of "Surf City" on **Jan & Dean** (R3 73011). The series also includes discs from the Beach Boys, Chordettes, Dixie Cups, Fats Domino, Everly Brothers, Fleetwoods, Jerry Lee Lewis, Little Anthony and the Imperials, Little Richard, Carl Perkins, Turtles, Ritchie Valens, Bobby Vee, and the Ventures.

Apparently marketed in strange note-free, soft-plastic sleeves, Dunhill Compact Classics' early-entry CD-3s are on the short side. A disc of **Harry Chapin** (Dunhill Compact Classics DZS 45-001) has the title cut and "I Miss America" from *Remember When the Music*—fine tunes but nothing special. The disc by **Ray Charles** (DZS 45-002) holds a solitary song from *His Greatest Hits, Vol. 2*: "America the Beautiful." Charles truly pulls off the national-pride act with style ("Now wait a minute—I'm talkin' about America, sweet America, y'know, God done shed his grace on thee . . ."), but a Compact Disc with a 3:38 playing time takes some getting used to.

By contrast, two of Enigma's CD-3s (packaged in full-size plastic cases) are the longest yet released. Unfortunately, they are also the trashiest. **When We Kiss** (Enigma/Synthicide D3 75018), from two women who call themselves Bardeux, clocks in at 19:59 with "When We Kiss" and "Sex Machine" from *Bold as Love*, a special remix of "Magic Carpet Ride" (no, not the Steppenwolf song), and a radio edit of "When We Kiss." Mostly sex and synthesizers, this stuff is full of whispering, pouting, and drum machines. **Always There for You** (Enigma D3 75509) offers 19:49 worth of Christian heavy metal from Stryper: "Always There for You" and "The Reign" are from *In God We Trust*, and "Soldiers Under Command" is a previously unreleased live track. Ending the disc is a seven-minute interview with drummer Robert Sweet, who explains that the band's current album is "a rock 'n' roll reminder of what the truth really is." Unavailable at press time was an Enigma CD-3 of Devo (though the band's new album, *Total Devo*, was indeed available; turn the pages for "Enigma Artists"). Too bad: It has to be the label's best CD-3, no matter *what* it sounds like. *Andrew Nash*

ATLANTIC JAZZ REISSUES

For a period covering, roughly, the mid-Fifties through the mid-Sixties, Atlantic had one of the most important jazz lines in the world, a catalog that included releases essential to one's understanding of the often turbulent changes the music was going through at the time. The company also issued a goodly amount of pure entertainment, as well as some exemplary if not groundbreaking work by established artists. Atlantic's initial batch of CD reissues, sampled here, admirably touches all of these bases.

Bassist/composer Charles Mingus's first successful realization of his uninhibited program music can be found on the title piece of **Pithecanthropus Erectus** (Atlantic 8809-2). Recorded in 1956, this quintet session, helped along by the saxes of altoist Jackie McLean and tenorist J. R. Monterose, seems in retrospect an almost modest precursor of things to come. Mingus's conception burst into full flower on 1959's **Blues and Roots** (1305-2) and 1961's **Oh Yeah** (90667-2): Gospel, blues, atonality, and free-form yelling are all part of the mix. As jazz had become a highly intellectualized music by the late Fifties, Mingus aimed to reintroduce primal elements of passion and spirituality. The *Oh Yeah* CD has a 24½-minute bonus cut: an interview with the bassist conducted by producer Nesuhi Ertegun. Mingus reminisces about mentors and contemporaries with customary intensity until Ertegun leaves to take a phone call; the musician then goes into a monologue about identity and loneliness and finally, reaching beyond words, starts playing a haunting mel-

HIGH FIDELITY ARCHIVES

Atlantic's Kirk

ody on the piano . . . a beautiful and sad moment.

Also essential are John Coltrane's **Giant Steps** (1311-2) and **My Favorite Things** (1361-2), from '59 and '60, and Ornette Coleman's **The Shape of Jazz to Come** (1317-2) and **Free Jazz** (1364-2), also from '59 and '60. The Tranes represent, respectively, the pinnacle of his postbop phase and his first soprano sax effort (and best seller until '64's *A Love Supreme*). The *Giant Steps* CD is lengthened by five alternate takes, two coming from a slightly earlier session. *The Shape of Jazz* was Coleman's first Atlantic LP, and his radicalism wears well: "Lonely Woman" has become a jazz standard, and the rest of the pieces—then a bridge between bop and the coming avant-garde—retain their expressive urgency. The rough beast of freedom appears full-fledged on the 37-minute octet (or double quartet) improvisation *Free Jazz*. Here, CD clarity is especially welcome, allowing one to follow the denser group improvs and to savor the stunning passages of bassists Charlie Haden and Scott La Faro. This CD also includes a warmup, the 17-minute "First Take" from Coleman's LP *Twins*.

Less momentous, but far from run-of-the-mill, are the Modern Jazz Quartet's 1959–60 recording **Pyramid** (1325-2) and Duke Ellington's 1970 **New Orleans Suite** (1580-2), two model works by singular aggregations. *Pyramid*'s program of blues, standards, and original material features the pointillistic piano of John Lewis and the fluid vibes of Milt Jackson, both encompassing elegance and swing. Those two words sum up Duke's suite, too. The maestro honors the Crescent City by eschewing touristy Dixieland for plenty of smouldering blues, notably from trumpeter Cootie Williams on musical "portraits" of Louis Armstrong and legendary Ellington bassist Wellman Braud and from altoist Johnny Hodges (this was his last recording date) on "Blues for New Orleans."

Pianist Lewis also appears on **Stitt Plays Bird** (1418-2), with altoist Sonny Stitt leading a quintet through ten Charlie Parker tunes plus Jay McShann's "Hootie Blues." ("Now's the Time" and "Yardbird Suite" are CD-only tracks, for an additional eight minutes.) Though Stitt was a Parkerite, he was no Bird clone: His thicker tone and earthier phrasing serve an individual style, while the presence of Lewis and guitarist Jim Hall further ensure that this 1966 recording rises above cookie-cutter bop. Another son of Bird, altoist Phil Woods, is featured with his European Rhythm Machine (i.e., trio) on 1970's **At the Frankfurt Jazz Festival** (90531-2). Woods is a big-hearted slob of a player, his impressive technique never getting in the way of his almost tantrum-like

emotionalism. On this four-song 50-minute set, he wails through bop, blues, and wholly appropriate free passages (well, if not quite free, then pretty damn loose), including sizzling versions of Eddie Harris's "Freedom Jazz Dance" and Victor Feldman's "Josua."

Among the worthiest of Atlantic's commercial jazz hits was Herbie Mann's 1964 **At the Village Gate** (1380-2), surely the flutist's finest hour. Cool and rhythmic, with extra percussion and long hypnotic improvs (only three songs on the 40-minute set), this is like a B-movie beatnik dream of how jazz should sound: groovin' but, like, smooth, Daddy-O. Another respectable hit, from 1969, was the Les McCann/Eddie Harris **Swiss Movement** (1537-2), which gave us McCann's sub-Ray Charles vocalizing on Gene McDaniels's "Compared to What" ("sock it to me!"). The funky sarcasm here is very Vietnam-era but speaks to the present, too: Jibes at phoney preachers and presidential (as opposed to popular) wars seem timeless. Unfortunately, the rest of the set doesn't live up to the kick-ass opener.

Finally, two unclassifiables. Dave Brubeck's 1973–74 **All the Things We Are** (1684-2) has Lee Konitz and Anthony Braxton, a promise of much that delivers just a little. Konitz is featured on only two cuts, Braxton on just one, and they make a joint appearance on "All the Things You Are." As a mainstream player, Braxton favors a cluttered, mildly eccentric phrasing, and though he digs into Bru's "In Your Own Sweet Way" with brio, there's no real interaction with the pianist. The CD's second half is taken up by a so-so trio rendition of a Jimmy Van Heusen medley.

For one that does deliver, there's the always eccentric and not-so-mild Rahsaan Roland Kirk's '75 **The Case of the 3-Sided Dream in Audio Color** (1674-2), a treat for those who like the multi-instrumentalist's bluesy wild-guy approach—though why he does four of the songs here twice isn't clear. Still, this is pure Kirk, from the spacey connective material and surly raps to the bizarre 12-minute joke finale. It helps to remember that this was a player who did apprentice work with Mingus on *Oh Yeah* . . . a player who listened and learned. *Richard C. Walls*

ENIGMA ARTISTS

Enigma is the type of independent company where an artist is likely to spend time either before or after a stint with a "major label": not as single-mindedly avant as,

DEBORAH FEINGOLD

Enigma's Smithereens

say, SST, but still a ways off the main rock path.

Which is where you find groups like Close Lobsters, a Scottish quintet one suspects has been doing a lot of listening to post-Velvet Underground, N.Y.C.-based bands of the Seventies. **Foxheads Stalk This Land** (Enigma CDE 73333) has a layered guitar sound that conjures a fairly explicit mood of doomy fun, and the Lobsters convey a droll cynicism in their songs of life before a revolution that they don't really believe is coming. Poppish yet never lighthearted, these guys deal out hooks judiciously, maybe one every other song, as befitting a serious-minded group. The closer, "Mother of God," is a rousing, almost painful jet-exhaust blast of a song that's only occasionally foreshadowed in the preceding nine vignettes—a climax that dares one to turn it all the way up.

Also poppish, but gentler, is the self-named second album from **Velvet Elvis** (CDE 73300), which was produced by Mitch Easter. As that implies, the group specializes in tightly wrought songcraft and a classic, seductive sound. Guitarist/composer Dan Trisko has the knack for condensed, catchy melodies, but the lyrics are ordinary to a fault and tend to go in one ear and out the other. Listening to the Smithereens, who on **Green Thoughts** (Enigma/Capitol CDP 48375) also dole out indifferent "relationship" lyrics wrapped in perfectly made pop/rock, I wondered why their version stuck to the ribs so much more than Velvet Elvis's. The secret ingredient seems to be obsession: There's a compelling neurotic quality, a restless edge, to songs like "The World We Know," "Drown in My Own Tears," and "Spellbound." It's subtle, but the group's auteur, Pat DiNizio, manages to deliver something almost sinister. As though for balance, cuts like "Deep Black" and "Elaine" are in a more innocent pop style and are therefore less interesting.

And speaking of almost sinister, Devo's first release in four years, **Total Devo** (Enigma CDE 73303), continues their current phase of ultra-slick dance music and weirdly off-center lyrics. The precision bump-and-thump here bears out the band's stated intention of reviving disco, while ear-candy lyrics every bit as alienated as those of Close Lobsters show the boys haven't gone soft in the head. Another group that has devolved from quirky new thing to spiffy fashion plate is Wire, though unlike Devo they don't have cool lyrics as counterpoint to their formulaic (and, again unlike Devo, not much fun) music. What they do have on **A Bell Is a Cup Until It Is Struck** (Enigma/Mute CDE 73314) is a kind of hokey obscurity disguised as lyrics (all too typical sample: "Antennaes my currency/Programme your set/My pockets are drunk/The Illinois Tool Works/The flight nurse attends me," etc.). Of the four not-on-the-LP cuts, the two live performances of "Over Theirs" and "Drill" give one a sense of what the group's appeal might be: Great pounding, throbbing swaths of sound get the heart beating, making the lyrics' sophomoric surrealism irrelevant.

Wire's abstrusiveness is kid's stuff compared with Bill Nelson's. The former ace guitarist and conceptualizer of Be Bop Deluxe continues his series of uncompromising solo efforts with a two-CD work entitled **Chance Encounters in the Garden of Lights** (Enigma/Cocteau CDE 73337). Comprising 63 mostly short cuts (22 of which aren't on the double LP) and running just over two hours, this is, says Nelson, meditative moods for fellow occultists—though, presumably, mere rationalists are free to listen in. Some of the short cuts are intriguing, like the blast-furnace fantasia "Welcome to Realm Seven" and the tropical-rain-forest hallucination "Realm of Archons," but generally these are fragments with no time for development, out-of-tempo synth pieces that offer a rather familiar sonic approximation of internal musing. For Nelson, the human interior is like a huge cathedral, and the spirit makes a sound like a musical note expanding and sustaining with airy gran-

deur. As a concept, it is, in a word, corny. And when he breaks from this mode for a straightforward melodic bit, the result is usually equally banal pop (oh, when will the occult produce great art?).

At the other end of the self-indulgence spectrum stands guitarist Ronnie Montrose, whose **The Speed of Sound** (Enigma CDE 73323) is unpretentious (to put it mildly). With titles like "Hyper-Thrust," "Zero G," and "Windshear," you get what you expect: polished, generic hard rock with a little synth gloss. This is the kind of disc they might use in hi-fi showrooms to demonstrate CD players, having a nice full sound from which the music doesn't distract.

After all these heavy jams, you might want to lighten up with the Dead Milkmen's **Bucky Fellini** (CDE 73260). Posing as a post-hardcore band, the Milkmen have a sense of humor that works best when it's expressed in the spirit of the song, as in "Big Time Operator," "The Badger Song," and "Surfin' Cow." When the yuks are in the message—"Going to Graceland," "Instant Club Hit (You'll Dance to Anything)"—the going gets pretty heavy-handed. Working from a similar smart-ass perspective, Mojo Nixon and Skid Roper finesse their potshots with a little ambivalence on **Bo-Day-Shus!!!** (CDE 73272): When Mojo sings about Elvis ("Elvis Is Everywhere"), it's definitely a love/hate affair. His growly voice and hipper-than-you'd-expect guitar (Skid mainly supplies atmospherics: washboard, maracas, mandolin) both celebrate and bemoan the lost disruptive qualities of rock/soul/blues. If Mo's chronic libertarianism gets a little obnoxious at times (e.g., the immortal "I Ain't Gonna Piss in No Jar"), it's an obnoxiousness that most of us can relate to. The two CD-only cuts include the inspirational prose-poem "Don't Want No Foo-Foo Haircut on My Head."

What these malcontents need to do is listen to a solid rock band like the Del-Lords, preservers of the old values and then some. Though their third and latest release, **Based on a True Story** (CDE 73326), is another step away from the roots rock of their debut, *Frontier Days*—producer Neil Geraldo has toughened up the sound, late-Eighties style—Scott Kempner's songs survive the polishing. And if occasionally his heart-over-head choices get a little irritating (you wish he could see how his rejection of specific politics in "Crawl in Bed" contributes to his feeling of helplessness on "Ashes to Ashes"), at least he's on the side of the good guys. And when a song like "Judas Kiss" or "Cheyenne" sinks its riff in you, the pleasure is deep. *Richard C. Walls*

GRP AND PRO JAZZ ARTISTS

Founded by pianist Dave Grusin and businessman Larry Rosen, GRP continues to release a series of mostly lightweight recordings of variable charm. Their idea of contemporary jazz is quite different from that of the producers behind the label Pro Jazz. In the collection of GRP and Pro Jazz discs I find sprawling across my desk at the moment, Pro Jazz focuses on acoustic jazz (one might almost say acoustic jazz from the studios of Manhattan) while GRP, with the exception of an ambitious new disc from clarinetist Eddie Daniels, concentrates on a sweeter, often electrified product.

The thread running through many of the new GRP discs is the presence of Chick Corea, whose Elektric Band might be the quintessential GRP group. It is featured on one disc of the double set **GRP Super Live in Concert** (GRP GRD 2-1650), whose not entirely grammatical title suggests that GRP artists in person are more alive than the ordinary mortal. I find myself resenting the implication but enjoying much of the music, including the fluent performances of Lee Ritenour on "Water from the Moon/Earth Run" and Tom Scott on "Target." After its pompous "Overture," which has a portentous opening in the tradition of *Also sprach Zarathustra*, Corea's band plays a pleasingly relaxed, open-sounding set.

There's some of that relaxation on the Chick Corea Elektric Band's own **Eye of the Beholder** (GRD 9564). I don't hear any masterpieces here, but the group has fine moments on Corea's Latinesque title tune, which will remind many listeners of his "La Fiesta" and "Spain." Corea's special lyricism never quite deserts him; his band members, however, don't share his compositional skills. Corea produced the solo discs of two of his players—**John Patitucci** (GRD 9560) and Eric Marienthal's **Voices of the Heart** (GRD 9563)—but both sound stiff and uninspired, largely because of thumping rhythm sections and formulaic writing. Saxophonist Marienthal relies too heavily on his very attractive, singing tone, and bassist Patitucci seems willing to substitute sweetness for light, to say nothing of fire.

That prevailing sweetness is what dooms pianist David Benoit's mild improvisations on **Every Step of the Way** (GRD 9558). I'm not sure whether he's in the tradition of Keith Jarrett or George Winston, but he seems to be working in a genre that should perhaps be called New Age Cocktail Music. Kevin Eubanks's **Shadow Prophets** (GRD 9565), though nowhere near as free and challenging as the guitarist's live performances, is on a different plane altogether. Eubanks may not be taking chances on this disc, but at least you can tell he has taken some in the past.

An interesting moment of Special EFX's last album was when the duo played with pianist McCoy Tyner. The new **Double Feature** (GRD 9559) has no such distinguished guest, but the compositions and sounds of guitarist Chieli Minucci and percussionist George Jinda are frequently appealing. Over on **Sticks and Stones** (GRD 9562), brothers Dave and Don Grusin team up for the first time, on a recording wholly dedicated to their over-

"-AND AFTER THE ENGINEERS HAVE DONE FREQUENCY SWEEPS, THD, TIM, AND IM DISTORTION CURVES ON THE PROTOTYPE, IT MOVES ON TO THE PSYCHIC DIVISION WHERE THEY MAKE IT SOUND GOOD."

dubbed performances on synthesizer and, rarely, acoustic piano.

In many ways, the standout disc of the GRP batch is Eddie Daniels's **Memos from Paradise** (GRD 9561), where the clarinetist plays with a string quartet (which, for once, phrases as if it had some knowledge of jazz) and with a rhythm section usually including pianist Roger Kellaway, bassist Eddie Gomez, and drummer Al Foster. Daniels is one of the best clarinetists around, and Kellaway's compositions, admirably varied, are nowhere near as pretentious as his titles ("Eight-Pointed Star," "Impressions from Ancient Dreams").

The late Gil Evans might be called the godfather of Pro Jazz's latest releases. His **Bud & Bird** (Pro Jazz CDJ 671), though sometimes sloppy, is a typically expansive, exciting collection that was recorded live at New York City's Sweet Basil in December 1986. Among the soloists is trumpeter Lew Soloff; formerly of Blood, Sweat, and Tears, he matured in Evans's band, as can be heard on his own **Speak Low** (CDJ 656), which features a stellar rhythm section of pianist Kenny Kirkland, bassist Richard Davis, and drummer Elvin Jones. Soloff has a brilliantly clear sound, ample range, and considerable imagination: He plays a Charles Mingus piece as well as Van Heusen and Burke's "But Beautiful." He also offers the funky Frank Foster composition "Raunchy Rita," which Davis and Jones recorded 20 years ago on *Heavy Sounds*.

Soloff is also the trumpeter on **My Favorite Things** (CDJ 648) by the Manhattan Jazz Quintet, a band with an odd history: Formed by pianist David Matthews, whose arrangements sometimes sound like those of Gil Evans, this other MJQ has performed almost exclusively in Japan, where its previous albums have been astonishing hits. Other members are saxophonist George Young, bassist Eddie Gomez, and drummer Steve Gadd, seasoned professionals who all sound like they're having a ball. Meanwhile, Matthews's trio recording, **Manhattan Sunset** (CDJ 647), reminds one of Bill Evans; Matthews even plays Evans's "Waltz for Debby," in a performance enlivened by the wonderfully spry, inventive bass-playing of Michael Moore but damaged by the relatively stiff drumming of Dave Weckl. Which brings us almost full circle, as Weckl is Chick Corea's drummer as well—and obviously more at home in the Elektric Band than in this more sensitive context.

For the rest, Pro Jazz offers two recordings with drummers as bandleaders: Art Blakey and the Jazz Messengers' **Hard Champion** (CDJ 657), mostly recorded live at Sweet Basil, and George Kawaguchi's **Maiden Voyage** (CDJ 655), a collection of Herbie Hancock tunes. The Blakey set features what one might call his second New Orleans band, including trumpeter Terence Blanchard and alto saxophonist Donald Harrison; there are no revelations here. Blanchard and Harrison also appear with Kawaguchi's Japanese rhythm section. I'm among the critics who believe that Herbie Hancock is a more reliable composer than pianist, and *Maiden Voyage* seems to want to prove that point. *Michael Ullman*

MORE FRANK ZAPPA

I've blown hot and cold over Frank Zappa. In the Sixties, though his music was literate and breezy, his socially satiric lyrics were nearly lost on this budding feminist/hippie conformist. Sometimes I'd have to laugh at his broadly painted groupies, roadies, and love children, but there was a niggling self-consciousness underlying that laughter. Revolution through identification with liberal ideals (and the wearing of tie-dyed gauze clothes) was my M.O., and Zappa's prolific jabs, feints, and thrusts hit too close to home. Then, too, card-carrying N.O.W. members denounced his female foil, Suzy Creamcheese, as a cartoon whose purpose could only be to undermine the movement. I know, I was there, I was them.

In the Seventies, the Zappa I overheard was prolix, his music a masticated wad of flavorless, regurgitated gloop, his humor redundant, sophomoric, limp. During this period, Zappa's need to elude the refinement of labels required ever greater vigilance and self-policing; what I found was an arid, academic canon, overbred in its crabbed, micro-sutured fashion. Just more Zappa to ignore.

Then came the mid-Eighties, and something happened to me: I'd been told so often to get serious that I realized I missed laughing. And one day, listening to vintage Zappa, I suddenly got him: It was all an infectious joke, a backhanded compliment, the dazzling irony and yin-yang of perennial adolescence's doofus-coated, snickering, serious humor. Heard through fresh ears, I began to love that dippy, free-spirit bimbo Suzy Creamcheese.

Then Rykodisc began to dip into Zappa's remixed and remastered vaults, releasing a hodgepodge of seminal and so-so nuggets on Compact Disc (the first batch of which we reviewed in our April 1987 issue). Sticklers who loved the sweaty, hairy, crooked-seams-showing LPs may cavil at CD articulation that isolates and brightens individual sounds, or they may

(Continued on page 95)

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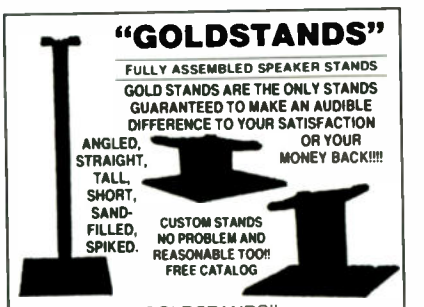

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(Continued from page 91)

decry the revision of (read "tampering with") songs that live in their personal soundtrack, but I don't mind the studious enhancements. Grunge is for live music.

But now let me say, in complete about-face, that my favorite of the current crop of shined-up Zappa CDs was never a record. **You Can't Do That on Stage Anymore, Vol. 1** (Rykodisc RCD 10081/82) is a live double CD, first in a series of *six* live double CDs, that flip-flops through the Zappa years with abandon, now drawing on sterling performances from this era, now offhandedly remixing adequate outtakes from that. When the opus is completed in mid-1989, 13 CD-hours will have been produced, with extensive recording notes ("Yeah!"—technofreaks) but no lyrics ("Boo!"—plebe fans). Though the whole series will be digitally remixed and remastered in Uncle Frank's Utility Muffin Research Kitchen, varied and sometimes rudimentary original formats (from 7½-ips two-track analog all the way to 24-track digital) ensure an archival undercurrent remains. *Vol. 1* includes "Plastic People," complete with commentary on its "Louie Louie" melody. This version—recorded in 1969 at The Factory, an unprepossessing Bronx club whose audience Zappa contends would rather have been listening to Vanilla Fudge—features backing vocals and rhythm guitar from Lowell George. Another great track is "The Torture Never Stops," recorded in 1977 at the Hemmerleinhalle in Nuremberg, West Germany, before a crowd of American soldiers and featuring a young Adrian Belew. Added bonus: Six of the 28 songs have never appeared anywhere before.

Uncle Meat (RCD 10064/65), the soundtrack for a pseudo sci-fi horror flick, was originally recorded in 1967–68. As a double CD, the project includes additional material: 40 minutes of film dialogue/effects and a previously unavailable song, "Tengo Na Minchia Tanta." The music is better than ever—a stew of styles and sounds that is Zappa at his eclectic, inquisitive best—but the dialogue, divorced from the (I presume) slapstick visuals, is reminiscent of a junior-high class's attempt to make a video yearbook.

Much to my surprise, I took a shine to **Joe's Garage: Acts I, II, & III** (RCD 10060/61). This is the 1980 rock operetta whose prescient plot—the government plans to make music illegal—seems reasonable, now that Zappa has had a highly-publicized clash over First Amendment rights with censorship-crazed Tipper Gore and the Parents Music Resource Center. *Joe's Garage* comes complete with a 24-page libretto indicating between-songs matter. Laugh, I thought I'd never stop. And I found the source of one of my hubby's best lines. Hmmm.

Then we have **Freak Out!** (RCD 40062), released in 1966, with its spoken/sung vocal layering, chambered-nautilus echo effects, and noise-as-music fills, all as numinous and fresh as the day it was born; **Hot Rats** (RCD 10066), from 1970, with added material from the original sessions, featuring cameo appearances by Captain Beefheart, Jean-Luc Ponty, and a fifteen-year-old Shuggy Otis; and **Cruising with Ruben and the Jets** (RCD 10063), recorded in 1968, a stylized doo-wop take-off that's beginning to resemble the oldies tours it parodies (not my favorite CD, it does, however, include both the jelly-roll hairdo instructions and "do the bop" dance diagrams). And for the serious collector: **Guitar** (RCD 10079/80), another new double-CD creation, with 32 instrumentals recorded live primarily from 1981 to 1984, intended as the follow-up to last year's double-CD-from-three-LP *Shut Up 'n' Play Yer Guitar*. As with the earlier release, these solos cycle endlessly, at times dismissably, though there is gold to be mined for fanatics with staying power. Actually, that's a fair commentary on *toute l'oeuvre*. *Leslie Berman*

ADVERTISING INDEX

Many advertisers will send you additional product literature free of charge. Write them care of Dept. 10/88, unless otherwise noted, at the address below. If no address appears, literature is available only through dealers. Bold-face numbers by company names are page numbers for ads in this issue.

CURRENTS

Onkyo DX-7500: 8x oversampling, 18 bits

(Continued from page 14)

stable reference voltage for the DAC power supply. Optical coupling is used elsewhere to isolate the digital and analog circuitry. Both models also include optical and coaxial digital outputs, fixed and variable analog outputs, trays that accept three-inch CDs, and a remote that operates certain Onkyo cassette decks. *Onkyo U.S.A. Corp., 200 Williams Dr., Ramsey, N.J. 07446.*

Super Deck

JVC's third Super VHS Hi-Fi VCR, the HR-S5000U, offers a wealth of features to complement its high-resolution recording. Among them: noiseless still frames and variable slow motion, a flying erase head that ensures clean edits, the VHS Index Search System, cueing by time, remote timer programming with on-screen instructions, and an MTS (stereo TV) tuner. The flip-down control panel doubles as a cover for the tape slot. Price was not available at press time, but should be lower than for JVC's previous S-VHS decks. *JVC Co., 41 Slater Dr., Elmwood Park, N.J. 07407.*

Big and Bright

Last month we reported here on the new Philips IDTV (Improved Definition Television) sets. The good news continues with a line of rear-projection sets said to provide 40 percent increases in brightness and contrast as well as improved sharpness and color accuracy in comparison with typical rear-projection models. Philips claims that its Internal Angular Reflection Coating (IARC), deposited on the inner side of each of the three picture tubes, reduces light scattering and turns the tubes into more efficient light sources. Colors are also said to be rendered more accurately—with "film quality," to use the company's words.

Available in October will be three stereo models: the 41-inch 41-JP21SA ($2,999), the 46-inch 46-JP45SA ($3,599), and the 52-inch 52-JP55SA ($3,999). All sets feature six-speaker audio, S-video inputs, picture-in-picture (PIP) display of a second video source, and a variety of on-screen menus for control adjustments. The learning remote supplied with each set is also preprogrammed to control most other manufacturers' VCRs and cable boxes, as well as audio products (including, of course, those from Philips); the remote can also adjust the set's convergence. *Philips Consumer Electronics Co., P.O. Box 14810, Knoxville, Tenn. 37914.*

Show and Tell

How about a user-friendly VCR? Hitachi's VT-3050 ($429) has a built-in memory containing 16 pages (or screens) of operating and troubleshooting instructions that can be displayed on your TV set. Such thorny procedures as timer programming and channel setting are described, as well as how to go about identifying the cause of a problem (an 800 service number is even provided). The VHS model includes four video heads, clean still frames and slow motion, and a remote that can transmit timer programs. *Hitachi Sales Corp., 401 W. Artesia Blvd., Compton, Calif., 90220.*

Music Without a Cord

"Private Ears" ($100) is a wireless headphone that operates by radio frequency (RF) transmission over a stated range of 75 feet. The small transmitter, which operates from an AC adapter, connects to an audio or headphone output and broadcasts to a miniature, battery-operated receiver. A pair of bud-style headphones plugs into the receiver. Both receiver and transmitter have volume controls and two-position frequency selectors (giving you a choice of the clearest broadcast channel). Unlike infrared headphones, Private Ears is not restricted to line-of-sight use. *Datawave, Inc., 19611 Ventura Blvd., 2nd Fl., Tarzana, Calif. 91356.* □

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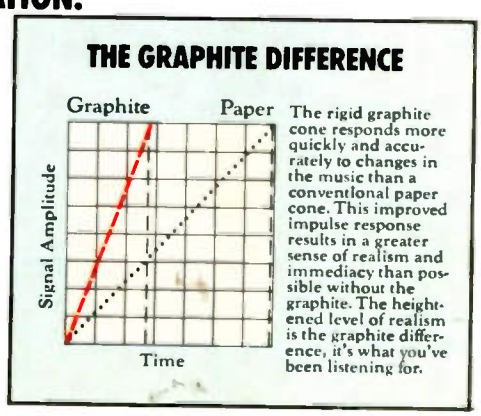

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