

# Audio

**ALL-REVIEW  
ISSUE**

NOVEMBER 1984 • \$2.00

**MASS TEST!!!  
5 VHS HI-FI DECKS**



**FIRST REVIEW!!!  
NAKAMICHI BX-300  
HOT NEW THREE-HEAD DECK**

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Stable, Transparent Sound

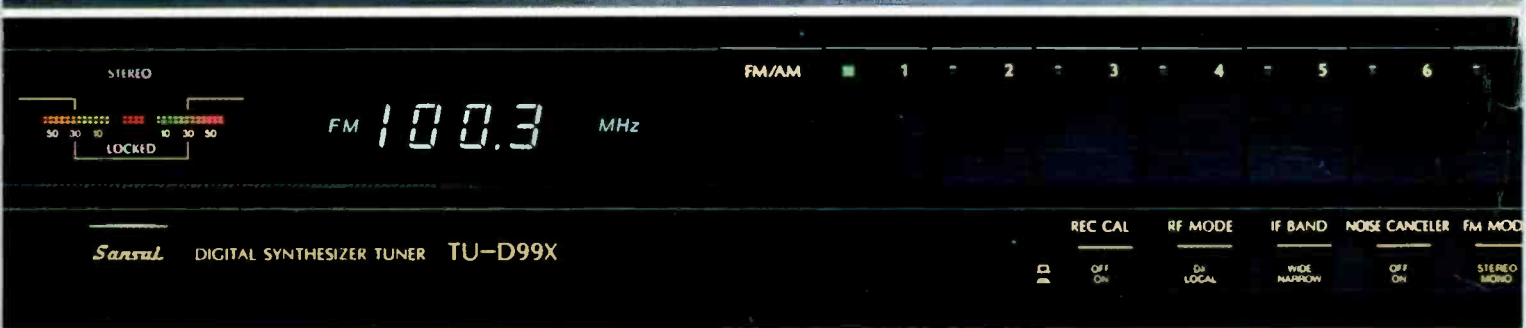
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**USIONS MODULUS**

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*You'll know why we're  
first, the second  
you hear us.*



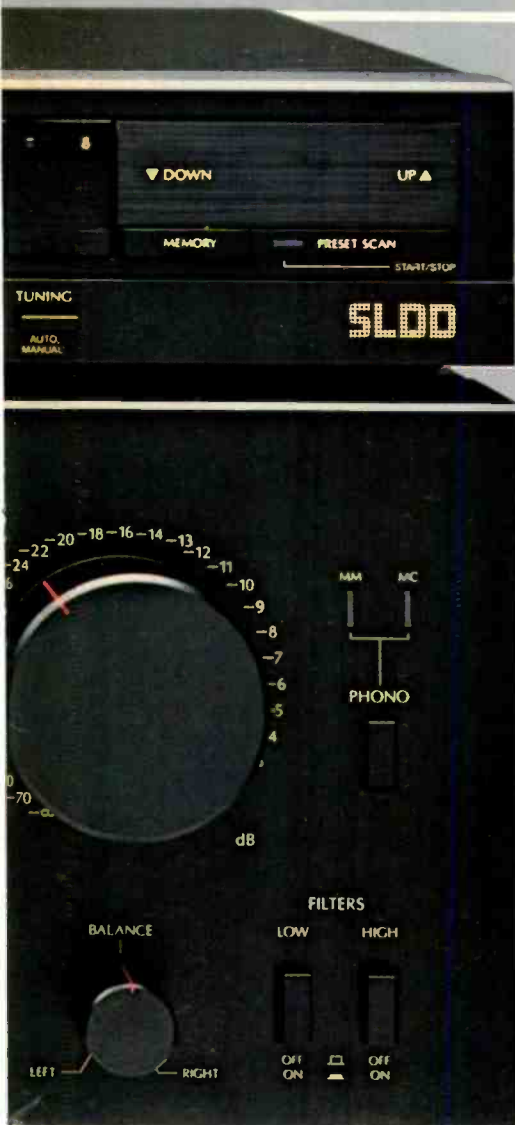
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# Audio

NOVEMBER 1984

VOL. 68, NO. 11



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See page 34.



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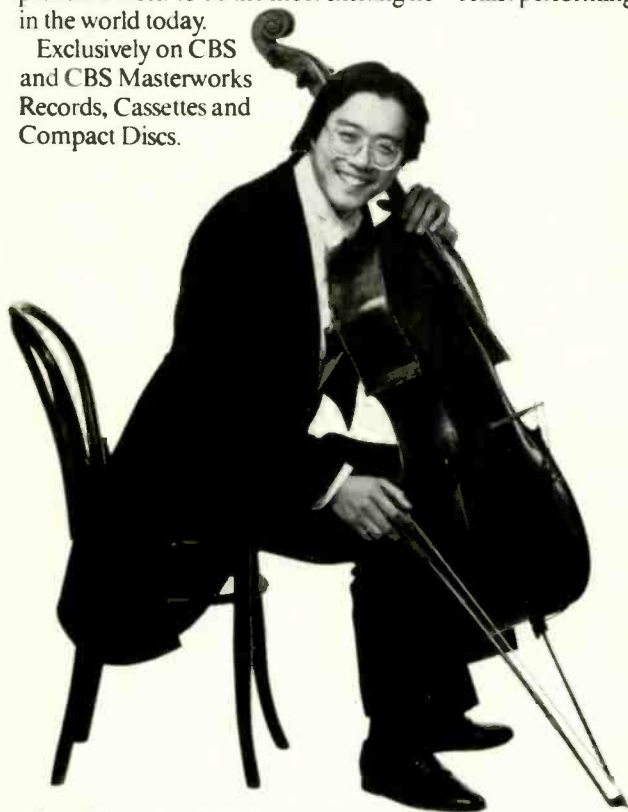


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## CLASSICAL BROWS

In my February column I wrote some words on the idea of classical music which seem to have disturbed a few readers who thought that I was forecasting the doom of all such music. Far from it! I meant the category, "classical," on which so much of the recording industry has so long been based, even unto its corporate setup. Also "popular," which complements classical. I didn't mean the music itself.

The very idea of a special, separate body of "highbrow" music, much of it from earlier times, all of it intended somehow for the music connoisseur, is paradoxically quite new—newer by far, indeed, than most of the music which it includes. This "classical" idea began to flourish around the turn of our century. Now it is beginning to fade away again.

Of course, there was "highbrow" music before, and popular music, too. But in the first place, as I said in February, it was largely contemporary (as we would now say), composed and produced by living composers. And, second, there wasn't any special name for the highbrow end of it, beyond the useful descriptives—concert music, chamber music, church music, and so on. The same with music for lower brows. All music was popular in some sense, otherwise it would not have been played at all. The Viennese waltz was enormously popular in its time. Now, of course, it is classical.

Classical is going out for two pleasant reasons, both positive. It started on a very limited basis, mostly opera excerpts on the early 78-rpm discs. Now it has grown so enormously that its coverage is getting out of hand. A million kinds of classical! Moreover, we are all becoming, to an extent, connoisseurs. As classical has grown in variety and in sheer volume, so have we also grown. I wouldn't say that the average listener is any musical genius quite yet. Most of us prefer our music in the background—or the very loud foreground. Nevertheless, we understand and enjoy far more kinds of music than our grandfathers ever could, simply because we hear so many.

Classical music, then, is blending into other categories, crossbreeding with pop, spreading into a thousand new corners. So are we as listeners. It's like book publishing in the paper-

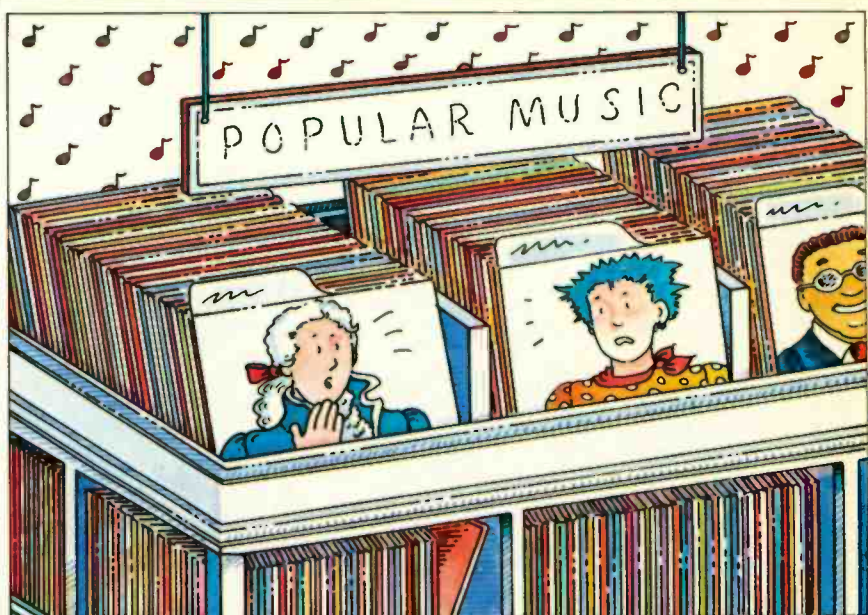


Illustration: Teresa Anderko

back and book club age—but do we ever hear of classical and popular books? Publishing, which is a lot older than recorded music, dispenses with all such terminology, except perhaps in those hefty sets of "great classics" which get bought but are seldom read. Instead, we have best-sellers in all areas, from fancy fiction and nonfiction to the hardest core, without any oversimplified big categories. Books range from highbrow to bottom-brow and, seamlessly, all the way between. So, in plain fact, does our music. Why bother, then, with classical and popular? Mainly, I think, because we always have. That is, since around 90 years ago, when records began to sell.

The biggest point I made in February was that the idea of classical music belongs basically to us, who are involved in recording and sound reproduction, not to the much older "live" music business. The idea of classical music began with those early operatic discs and has determined the very shape of the entire recording industry, along with those later offshoots radio, hi-fi, and even, to some extent, television. Before we began, there was no such thing as classical, though "live" music was everywhere.

Ask a friend in 1880 whether he liked classical music, and you might have heard a very odd answer, "Oh, yes, I do like Viennese music, Haydn and

Beethoven." Composers of the "classical period," as we now say, would then have been called "classical." Moreover, the friend might continue, "But I really can't abide these dreadful new operas by Wagner, and that Russian man, Tchaikovsky! All hideous noise, without any sort of taste or harmony."

If you had similarly asked do you like popular music?, the answer could have been a puzzled one, "Well, of course, I would not listen to any unpopular music if I had my way. But I do find the Philharmonic concerts delightful whenever I attend, and they are very popular." Getting nowhere rapidly, as you see.

We can be rather specifically technical about the beginning of classical music. It was based on the all-out, patent pooling of rival disc systems, around 1901, when the recording industry ground itself to a halt due to rival lawsuits for assorted infringements. The patent pool is still a great way out of a commercial impasse if each contestant owns some useful, protected technology that the others need. The modern disc (and for a long time the cylinder) began our industry with that memorable patent pool, after which there was only one type of phonograph record (not counting Edison's vertical-cut discs and, of course, the cylinder) with features that were accessible to all manufacturers.





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**IT'S WORTH IT.**

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When WW II broke out, classical music on records, being suddenly restricted, became even more precious. It came to represent civilization itself.

Within a couple of years, the first great wave of celebrity opera recordings appeared, soon making use of the elegant and expensive 12-inch discs at very fancy prices. (Some single-sided records, playing four-plus minutes, cost as much as \$7.00 at the time, which is a sum scarcely imaginable in terms of the present dollar.) So "classical music" was born, on records. It was for a time more likely to be called "Great Music" or "Immortal Art" or, more directly, "Great Artists," but the idea was there. Even I can remember the awe with which those precious records were received by the discriminating public. Somehow, their very fragility, their very short playing time, added to their value. The many collectors of these old discs still share in that feeling today.

It wasn't just the "discriminating" public, either. Opera singers were far bigger stars, back then, rather like pop stars today. We still have dishes named for them—Clams Caruso, Peach Melba. And the first million-selling artist was Caruso.

Strange that, for purely technical reasons, "classical music" was at first pretty much limited to opera excerpts. You couldn't record anything else! And it's odd, too, that much of the opera music at that time was actually contemporary, or not far from it. Puccini was in full flower; Verdi and many others were recent composers by a few decades or so.

And then, still on acoustic records, came the first tentative string quartets, brief excerpts from symphonies, bits of ballet music, items from the famous concert tone poems. The Boston Symphony (reduced) recorded in 1917. My very first classical record experience was that not-so-highbrow piece, *Scheherazade*, about the young prince and princess. So classical music began to grow a bit, defying the medium, anticipating what was to come with electrical recording.

I might say, at this point, you know the rest. But do you? I have previously described the astonishing explosion of "classical" electric recording, which began as soon as the new possibilities of the microphone were realized and ran right on straight through the Great Depression. This was the great period of classical music, its time of real im-

pact. It was at that time that I began to collect records and I know all about the feeling. I spent hours in cramped, airless record-store cubbyholes where you could actually play all the records you wanted, if you could stand the sonic competition from other, unsound-proofed booths next to you, and if you survived the total lack of ventilation. In my later years I have come to understand that these difficulties were not accidental. Some people just wouldn't quit unless they were about to faint from lack of oxygen.


When WW II broke out, classical music on records, being suddenly restricted, became even more precious. Somehow, it came to represent civilization itself, so dreadfully imperiled. People hauled ancient phonographs or gramophones into fox holes, down air raid shelters, into clandestine retreats along with the forbidden record player or radio. (See Hans Fantel's "A Christmas Gift of Music, Long Ago," *Audio*, Dec. 1981.) By the war's end there was an immense emotional backlog of need which had to be satisfied when the lights went on again. It took several years, worldwide, just to replenish the stocks of prewar recordings on the same old electrical-shellac 78s. Thus, the first great expansion of classical music spread onward right into the late 1940s. And then—we ran straight into a new world, combining tape recording and the new LP record. And FM radio broadcast.

Who can forget that heady, early decade of the LP, when the classical repertory was expanded a hundredfold to cover enormous quantities of music not previously available—and, for that matter, seldom heard in any "live" concert hall? This was the second great boom in classical music. The sound was still pretty poor on most LP records, and the incidental noise was mostly dreadful—not much better than the worst of the old 78s. But prices were low, unbelievably low for the new long-playing time, a thing we had never heard before except via radio broadcast. And then came stereo—which turned out to be a multi-pronged stimulus, not only to rerecord most of the music on mono LP but to improve the whole reproduction chain in the process of adapting to the new-type stereo groove.

That was a splendid decade for classical music, the '60s! But we did not really get back into stride in terms of audio quality until the 1970s. And so—on to the audiophile disc, Direct-to-Disc, digital and so on. The expansion of classical repertory goes on today but the audiophile recording hasn't done much for it. Stick to the tried and true. Necessarily, the impetus towards more repertory is slowing down—we have such immense, unthinkable quantities already. And so classical falters. And loses meaning. It's happening everywhere.

Why do I now hear Mozart, or more often, fake Mozart, out of every loudspeaker, be it in the supermarket, bank, or on the radio? Because Mozart is "in" and the sound of Mozart is pop, not classical. Same with Vivaldi. Also Bach. The "beautiful music" services abound with pseudoclassical "Romantic" music, concertos, symphonies, all copied from the real thing. Is this classical? Not remotely so! See definition, beginning of this column. Music by all sorts of classical composers (as we call them) is now heard in varying degrees of, shall I say, pop-ness, from highbrow straight down to no-brow. Okay, and I don't mind. It's an inevitable step forward towards a wider musical viewpoint for all of us. And just as well. The classical idea, born with recordings, has served its time and is on the way to retirement.

No end to this heady process. We find Professors of Jazz in many music schools and conservatories; there are academic courses in Third Stream music, midway between the old pop and classical categories. Hard-core porn movies have Beethoven sonatas on their soundtracks (I heard one), Kurt Weill's most recently recorded work is a very serious and dissonant choral piece, George Gershwin takes up a column and a half of small type in the *Schwann Record & Tape Guide* classical section, right next to Gilbert & Sullivan. Classical music, you understand, is simply diffusing itself out and away in all directions. A good thing, I'm sure, and about time.

Symbolic P.S.: Recently, *Schwann's* computer erased the entire works of Mozart from the classical section, all by itself. Mozart had to be reconstructed by hand. That's typical. 



## WHAT'S A GUITARIST FROM NEW JERSEY DOING WITH AN AMPLIFIER FROM NEW ZEALAND

He's listening to the sweetness of his own pure sound on Perreaux.

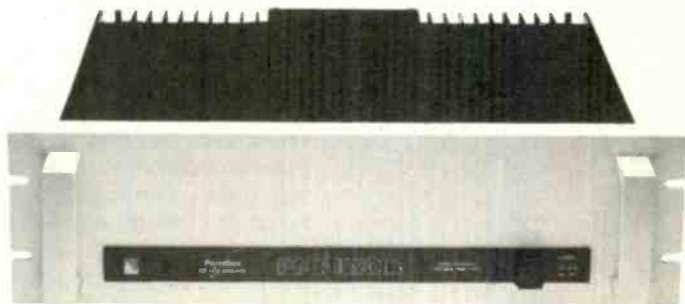
World renowned jazz guitarist Al Di Meola, who spends much of his time at his home in New Jersey wanted to buy new audio components for his system. He chose Perreaux of New Zealand.

Although the country of origin may seem ludicrous, given the Kiwi, would you believe that Perreaux of New Zealand is the only facility in the world that completely handcrafts its audio components. Each Perreaux is custom crafted under the supervision of Peter Perreaux, as it has been for over ten years.

Al Di Meola, who has earned a sublime reputation for his mercurial dexterity and finesse playing jazz guitar, appreciates the work done by craftsmen at the Perreaux factory. Handcrafting is necessary for the attention to detail demanded by the Perreaux design. From the cutting, drilling and anodizing of the rigid aluminum chassis, to the testing, matching and soldering of the transistors, Perreaux's sonic quality is unattainable by mass production.

Al Di Meola's obsession with the highest quality of music reproduction will be evident on his new album *21st Century*

*Guitar* due to be released in January 1985 on Manhattan/EMI and pressed on the finest virgin vinyl. If you don't own a Perreaux audio component, you probably won't hear every nuance Al Di Meola has intended for you to hear.



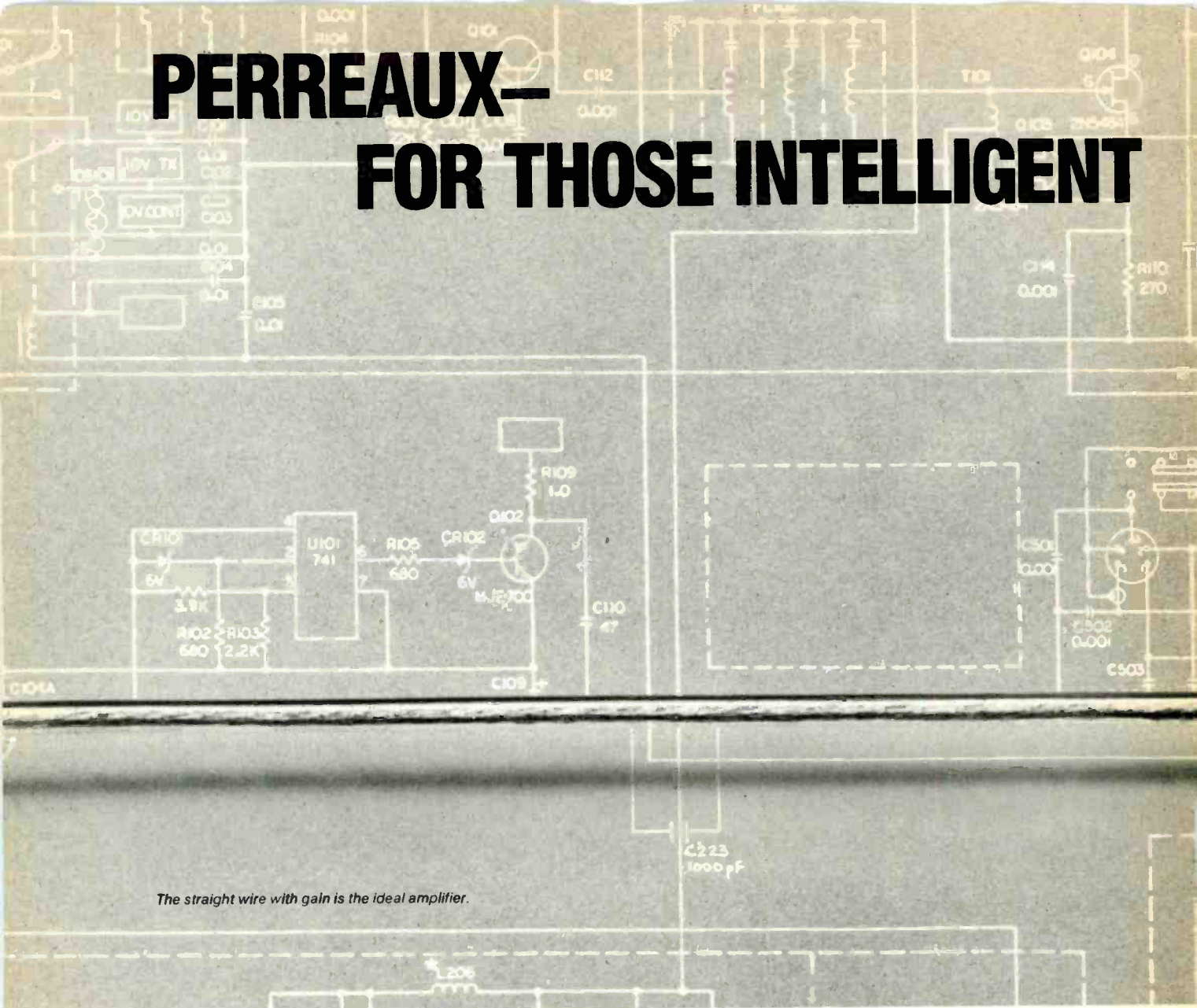
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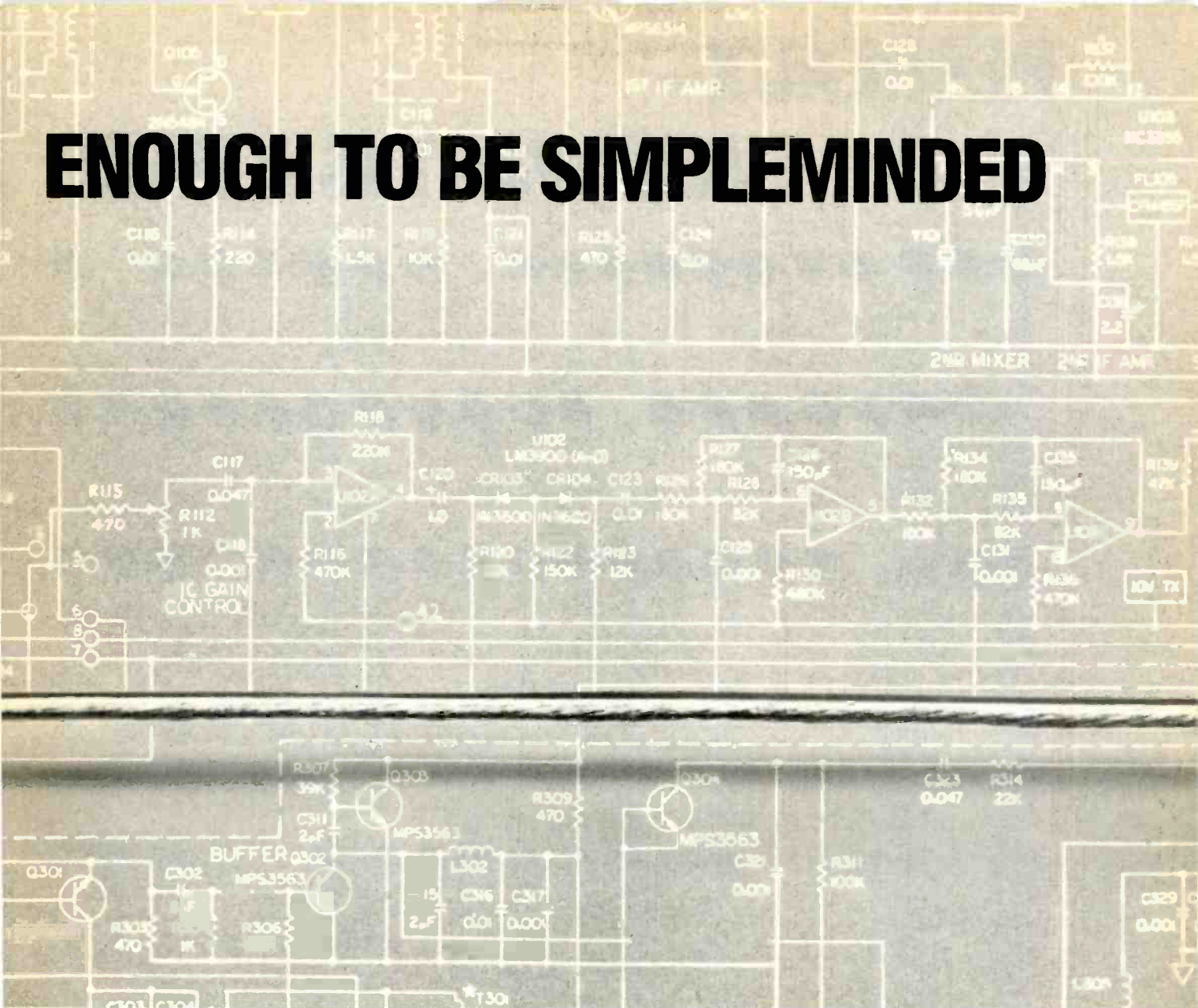
The “less” that comes between you and the original music signal, the more it sounds like the original music. In audio, this concept is known as “straight wire with gain”. The ideal amplifier would have *no* parts other than a wire between the source and the speakers. Perreux comes closer to this ideal than any other audio component ever created. The renowned British magazine HI FI FOR PLEASURE says: “There is little more that I can add about the ‘sound’ of the Perreux as it can’t really be said to contribute any particular character of its own to the musical performance—it is as *innocent* a component as I have ever been

privileged to hear.”

Perreux circuits are so simple that a single integrated circuit chip usually contains more circuitry than a Perreux component. No integrated chips or trick circuits are used by Perreux. Each circuit has been refined over and over again until it accomplishes its task with the shortest circuit path and the fewest parts. Perreux simply designs the most refined audio components in the world.

Other manufacturers use additional parts to correct for differences in transistors, Perreux tests, calibrates and matches every transistor. Others use additional parts to block radio interference, Perreux plates its circuit board with 24 karat gold, creating the most conductive ground plane possible to “absorb” and isolate interference. Others require complex protection circuits to prevent their amplifiers from self destructing, Perreux power amplifiers require no protection circuitry whatsoever—the stability is inherent in

# ENOUGH TO BE SIMPLEMENTED

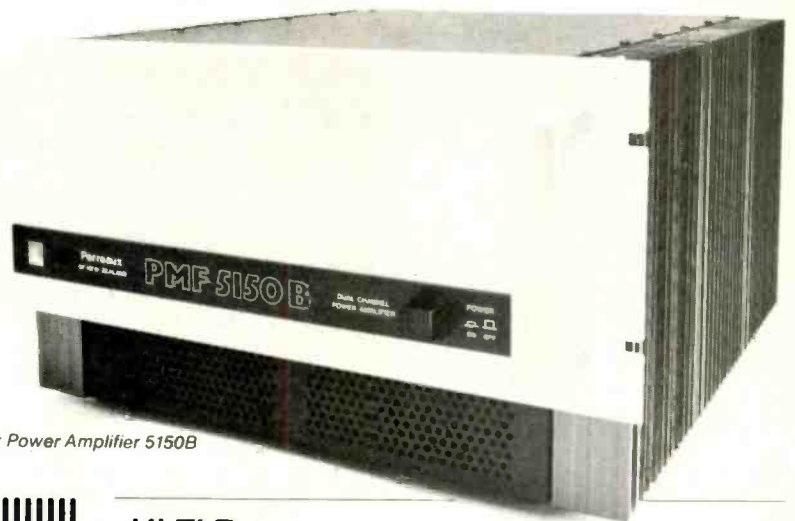


the design. While other manufacturers require additional circuitry to boost the gain of a low output moving coil phono cartridge, Perreux preamplifiers accept moving coils without any additional pre-amplifier circuitry.

Perreux has even created an amplifier capable of harnessing all the electricity your power company can supply to your home—the PMF5150B. Its brute strength is also derived from elegant simplicity. Perreux can deliver more massive power than any other home amplifier with only five transistors in the driver stage and twelve transistors at the output. The filter capacitors and power transformer can deliver over 2,000 amps to the circuit, eliminating the need for dual transformers which cause severe phase shifts.

Every Perreux component reflects its internal beauty and simplicity with its external design. Perreux has no flashing lights or panels that glow in the dark.

Perreux has no need to shout its authority.



Perreux Power Amplifier 5150B



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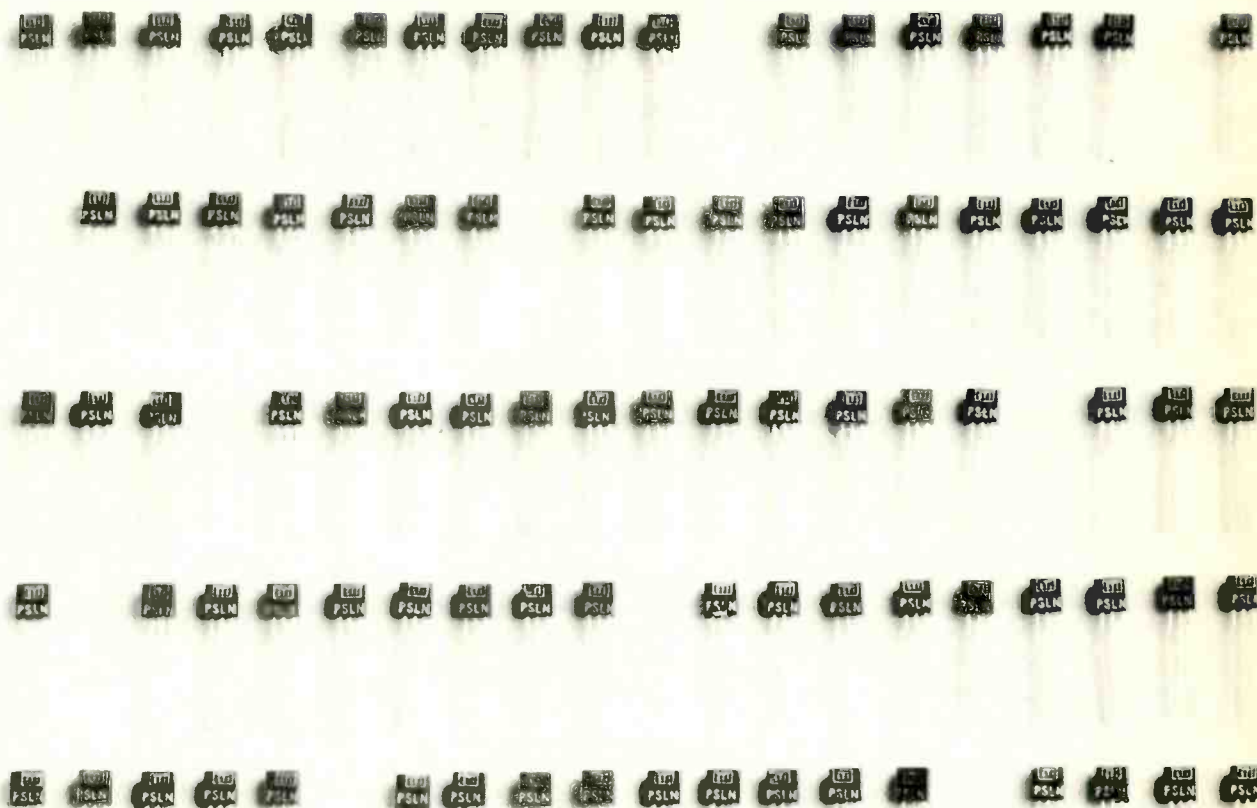
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# PERREAUX—

## EVERY PART IS A PART



Every Perreux is handcrafted in New Zealand from the finest parts the world has to offer.

Transistors are custom made for Perreux in the United States. Filter capacitors are built in Japan to Perreux's specifications. Power transformers are custom built in New Zealand. Polypropylene capacitors in the signal path are carefully selected in West Germany.

Perreux places each of these superlative parts through stringent test procedures. Over 90% of the transistors tested for use in Perreux preamplifiers are rejected as not meeting the demanding requirements.

When a circuit is nearly completed, Perreux continues the quest for perfection by inserting critical circuit elements at the very last, thus "tweaking" each amplifier individually for ultimate performance.

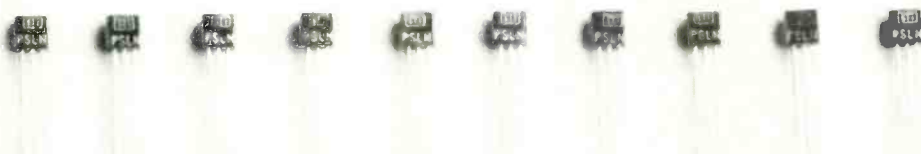
By the time each Perreux audio component reaches its final quality control stage, it has been through over 100 quality control checks of sonic performance.

### *The Chassis*

Only the finest quality aluminum is used to create a Perreux chassis. Each aluminum component is blasted with chemically inert glass beads, etched and anodized. To achieve the smooth, even finish of Perreux, the metal must be completely free of imperfections such as grain pattern. You will see no sanding marks that hide imperfections on a Perreux front panel. (Other component manufacturers just aren't willing to go to the same expense for the level of craftsmanship that Perreux demands for a part as basic as the front panel.)

The heat sinks are one of the most com-

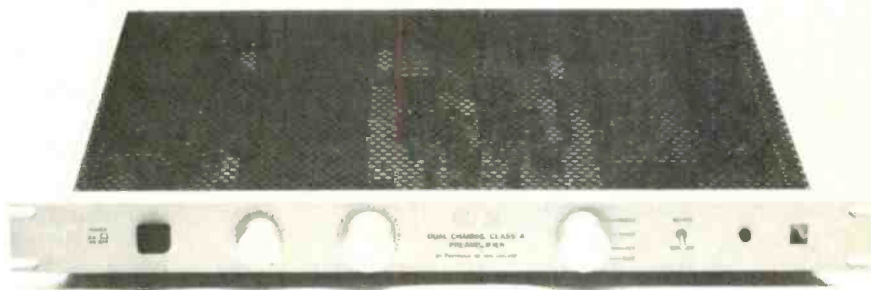
# APART FROM THE REST



*Over 90% of the transistors tested are rejected for use in Perreux preamplifiers.*

plex extrusions in the world. Designed by Perreux for maximum heat dissipation, each fin contains over 60 ribs per inch. This attention to the smallest chassis detail maintains the relative temperature of the output devices within  $\pm 1^\circ\text{C}$ . Knobs are individually machined from solid aluminum, rather than molded plastic, as on many other supposedly high quality components. All this prompted STEREO REVIEW magazine to say of Perreux's construction: "This sort of 'no-holds-barred' approach to doing a first rate design and manufacturing job is uncommon in all walks of life these days, and the result is an audio component of which both the manufacturer and the lucky owners can be justly proud."

Perreux—awarded the Hi Fi Grand Prix for "its Mercedes-like construction" by AUDIO/VIDEO magazine.



*Perreux Preamplifier SM-2*



## Audio Associates

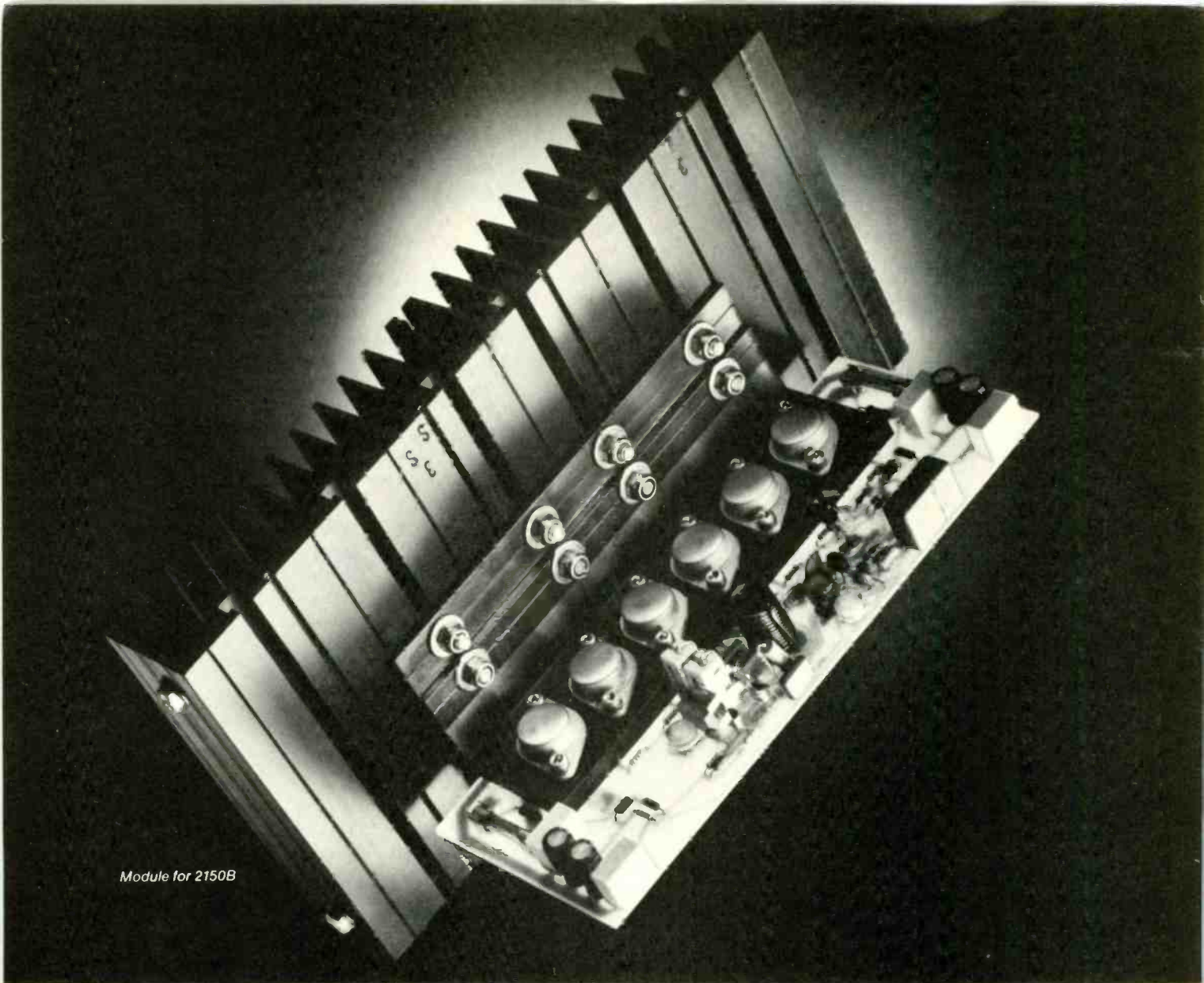
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## PERREAUX INTRODUCES THE OBSOLESCENCE OF PLANNED OBSOLESCENCE

When you acquire a Perreaux audio component, you enter into a company. Our future does not lie in throw-away components, since the components we manufacture do not become obsolete. Our future does not lie in trendy styling, but in the enduring elegance of fit and finish. Perreaux understands that performance can become obsolete by an advance in technology. In fact, Perreaux has been responsible for significant design and manufacturing breakthroughs:

- The first high power MOS-FET amplifier
- The first high power amplifier requiring no protection circuitry
- The first wide bandwidth amplifier (3,000,000 Hz)
- The first preamplifier capable of accepting any phono-cartridge with a single gain stage
- The first passive RIAA phono section with low noise
- The first pre and power amplifier combination with  $\pm 1^\circ$  phase accuracy.

When Perreaux develops a new circuit, it makes certain that existing Perreaux amplifiers and preamplifiers can be upgraded to the new technology for substantially less than the cost difference of a new component. Perreaux's classic styling will never appear out of date. You do not purchase Perreaux...you invest in Perreaux.

With your investment in Perreaux, comes the assurance of the highest level of service.

Perreaux is available only at the finest audio specialists. Personnel, trained by Perreaux, both sales and service, have a thorough understanding of each component. They will be happy to install a Perreaux system in your home and be sure it is operating properly. If by chance, your Perreaux should require service, it is backed by the longest warranty period in the industry. We assure you in writing that Perreaux's value is unsurpassed.

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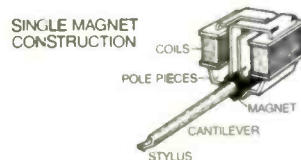
## Two is Perfect!

### Two is Perfect!

Getting two signals from the single groove of a stereo record is the job of the magnet/coil structure inside the stereo phono cartridge. The stereo signals are recorded at 90° to each other, and at 45° to the surface of the record. Each groove wall has its own recorded pattern intended to be sensed independently of the other.

### The Crowded Single Magnet

In ordinary moving magnet cartridges, a single magnet is located at the end of the stylus cantilever. Packed tightly around it are two pairs of pole pieces. Each pair senses the changing magnetic flux as the magnet is moved in response to the stylus motion from "its side" of the record groove. But because the pole pieces must be very close to the magnet to sense the changes, they must also be very close to each other.

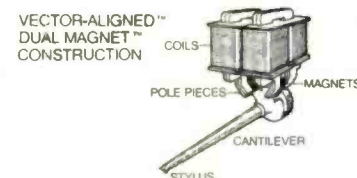


### A Problem to be Solved

Audio-Technica engineers noted the crowding, with its danger of electrical crosstalk which could reduce stereo separation. They were also concerned with minimizing magnet size, but a single magnet had to be large enough to accommodate both pairs of pole pieces. And then they found a better way.

### The A-T Solution

Their response was to create the unique Vector-Aligned™ magnet structure exclusive to Audio-Technica cartridges. By using two very small magnets, aligned to mirror the geometry of the original recording cutter, they eliminated the crowding, reduced the moving mass, and improved both stereo separation and high frequency response. The magnets could be located just in front of the pivot point, further reducing moving mass and greatly increasing the overall stiffness of the assembly.



In our next column we'll discuss in detail why two magnets is the ideal number for stereo reproduction.

Good listening.

*Jon R. Kelly*

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



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The World's Favorite Phono Cartridge

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### Back Issues Available

Dear Editor:

I have a Life Member subscription to *Audio*, and I have compiled a large quantity of the magazines from Volume 38 (1954) to the present, with only five copies missing in all. In addition, I have 13 more sets, almost all complete.

I also have back issues of *Hi-Fi/Stereo Review*, *QST*, *Electronics*, *Radio News* and *Communications*, as well as 25 volumes of *Riders TV Service*.

I no longer have room to store all these magazines, and wonder if any of your readers would be interested in purchasing them. I have a complete inventory of issues.

Edward Scribner  
Schoharie, N.Y.

*Editor's Note:* If you are interested in purchasing back issues from Mr. Scribner, send a letter to him care of this magazine (1515 Broadway, New York, N.Y. 10036). We will forward all inquiries.—A. H.

### CD Fulfillment

Dear Editor:

I address this observation to the manufacturers of Compact Discs. The disc itself has the capacity to contain over 60 minutes of music. It is somewhat disappointing to purchase a collection of works just to find out that it only has 34 minutes of music on it. Why not use the Compact Disc to its maximum capacity by filling out the remaining 26 minutes or so with another collection? It would be nice to feel that you get close to 100% of what you pay for, and not just 50%.

Harlan Lassiter  
Newport Beach, Cal.

### Off the Beaten Format

Dear Editor:

Thank you for mentioning the fact that we offer real-time duplicated cassettes in both Dolby C and "TypeX" (dbx-compatible) formats, in addition to the Dolby B format. (See "Spectrum," February issue).

In addition, we have products in the other two formats Mr. Berger discussed, PCM digital cassettes and 15-ips open-reel tapes on metal reels. We offer all of our releases (over 45 titles) in all formats. Our price for PCM digital

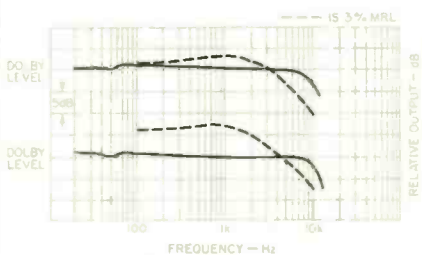
cassettes (VHS and Beta formats) ranges from about \$25 to \$31, while our price for the 15-ips open-reel tapes ranges from about \$30 to \$36 on metal reels (\$5 less on NAB-hub plastic reels). Our open-reel tapes, whether on "standard" tape at 7½ ips or on mastering tape at 7½ or 15 ips, are available in 2- or 4-track with no noise reduction, or with Dolby B, Dolby C, or "TypeX" noise reduction.

*Audio* readers may also be interested in our plans to offer our complete tape catalog in one additional format, Beta Hi-Fi, for the same price as our PCM digital tapes. I feel that the Beta Hi-Fi system is an excellent choice for the audiophile who wants very high-quality sound but doesn't want the expense, trouble, and inconvenience of open reel at 15 or 30 ips, especially with wider tape.

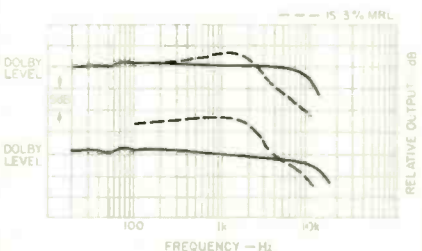
Bob Sellman  
Direct-to-Tape Recording Co.  
14 Station Ave.  
Haddon Heights, N.J. 08305

### Erratum

In the feature article, "Cassette Test Update: 12 Formulations," in the September issue, the figures for two Type I and two Type II formulations appeared incorrectly. Below are the correct versions.



Type I: Realistic Low Noise (top) and Supertape Gold



Type II: Swire Laser UHDII (top) and TDK HX-S



### Technics CD Player

Designed for studio use, the SL-P50 includes dual VU meters and a calibrated fader; a "Fader Start" feature automatically starts

play, if desired, as soon as the fader is moved from full attenuation, for smooth fade-ins. A display shows track, index, frame and time selected, while another shows the current track and

time remaining within that track or the entire disc, plus an analog "map" of the disc's contents. Selection may be made by numeric pad, automatic location, or a manual search dial with resolution switchable between 1 S and 30 S per turn. A monitor speaker with switch and level control is built in, as is a remote-cue indicator lamp. Outputs are balanced-line, selectable at +4 or -20 dBm for 0 VU. A start/stop remote control is included, and a full-control remote is optional. Price: \$4,000.00. For literature, circle No. 100



### Pioneer FM/AM Tuner

The F-101T tuner has a built-in clock and timer, which can turn the tuner and associated audio equipment on and off at selected times up to twice a day on an everyday

basis, and one additional time on the current day. Other features include a sleep-timer button and memories for up to eight AM and eight FM stations. Price: \$269.95. For literature, circle No. 102



### Realistic PZM Microphone

PZM microphones are now available from Radio Shack stores and dealers. The Realistic PZM microphone (No. 33-1090) is a 600-ohm model with response rated from 20 Hz to 18 kHz. It features an on/standby/off switch on its power-supply box and an 18-foot cord with 1/4-inch phone plug. One AA battery is required. Price: \$39.95.

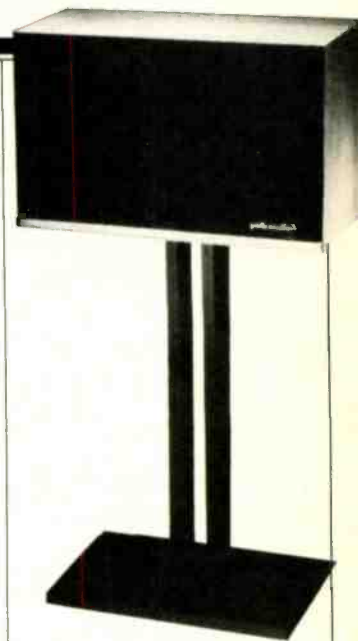
For literature, circle No. 101

### Akai Timer

Unlike most audio timers, the Akai DT-220 can be programmed for up to four events over a one-week

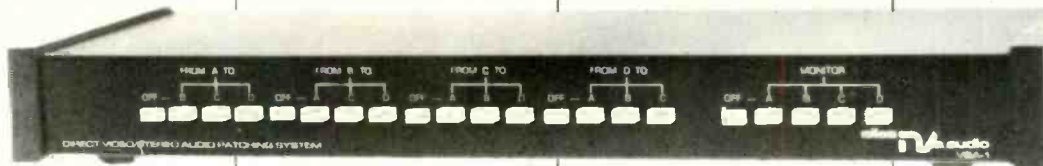
period. Events can be set for any specific day, for every day, for all days but Sunday, or for all weekdays. A one-button

sleep timer, a light-sensing auto dimmer, and a quartz clock are also included. Price: \$149.95. For literature, circle No. 104



### Polk Loudspeakers

The SDA Compact Reference System is a bookshelf-sized version of Polk's Stereo Dimensional Array speaker technology, using acoustic cancellation to minimize stereo imaging anomalies. The enclosures each contain two tweeters, two 6 1/2-inch midrange/woofer units and a 10-inch woofer in the rear. Standard finishes are walnut- and rosewood-grain vinyl, with oak or walnut wood veneers available at extra cost. Price: \$395.00 each. For literature, circle No. 103



**Niles Audio/Video Switcher**

The VSA-1 is a passive matrix switcher for use with video and audio/video systems. All audio circuits

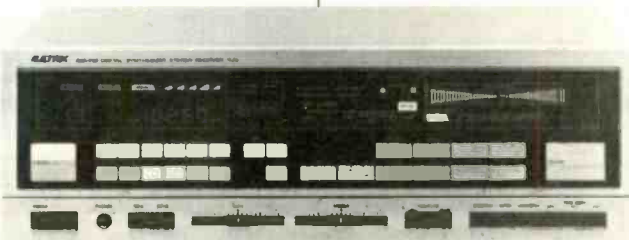
are stereo. A four-in, five-out matrix allows complete dubbing and monitoring flexibility for any four video and audio devices, plus a monitor screen and

amplifier. Walnut side panels and rack-mount brackets are optional. Price: \$149.95. For literature, circle No. 105



**Celestion Speaker**

The cabinet of the Celestion SL600 is not the usual wood, but a honeycombed aluminum sandwich, to eliminate cabinet resonances. The two-way system measures just 14 in. H x 8 in. W x 9 in. D. Price: \$1,500.00 per pair. For literature, circle No. 108



**ULTRX Receiver**

The top receiver in the new, premium ULTRX line from Sanyo is the R70. It contains a matrix stereo synthesizer for use with monophonic signals from

TV, VCR and other sources. Other features include 20 station presets and remote control. Output power is 70 watts per channel. Price: \$479.95. For literature, circle No. 106

**Hitachi VHS Hi-Fi VCR**

Hitachi's VT-88A videocassette recorder uses the new VHS Hi-Fi sound system to achieve 80 dB of dynamic range, with wide frequency response and low wow and flutter; conventional, linear audio tracks are also

provided, for full compatibility with existing VCRs and recordings. The front-loading deck has a six-program, 14-day timer and a tuner that can be set up to receive any 14 VHF UHF or common cable channels. Price: \$1,195.00. For literature, circle No. 109



**Linn MC Cartridge**

The body of the Linn Karma AL22621 moving-coil cartridge is milled from a solid piece of aluminum, for more rigid coupling of the cartridge to the tonearm and of the cartridge's generating elements to the cartridge body. A new magnetic system allows reduced moving mass with no reduction in stylus mass,



which could shorten stylus life. The 470-ohm cartridge weighs only 6 grams. Price: \$725.00. For literature, circle No. 107



### Autotek Car Receiver

The Model 5770E is Autotek's first receiver in the knobless, DIN E format. It features both DNR and Dolby B NR, usable in FM (and, for DNR, AM) as well as tape modes. It also has

auto reverse, key-off eject, six station-preset buttons and a dual-function fader which controls either the internal amplifier or two external ones. Price: \$399.95.

For literature, circle No. 110

### Bush Audio Cabinet

The Gallery Collection Model A665 cabinet holds



equipment up to 19 inches wide, but the wood trim edging its glass doors prevents visual gaps when using components as narrow as 17 inches. The doors of the lower storage compartment can be reversed, to show a contrasting dark brown, and the unit moves on hidden casters. The Model A665 is 20½ in. W x 48 in H x 17¼ in. D and is finished in pecan. Price: \$199.95.

For literature, circle No. 111

### NEC Compact Disc Player

As with many second-generation CD players, the NEC CD-705E offers more features for less money, and takes up less space than its predecessor. Both the disc and the multi-mode remote control load in drawers; the remote control can also be used in place, to program the system. Selections can be programmed by track

number, index number and time within track. The display shows elapsed or remaining time for the track or the entire disc, as well



### Denon

#### CD Test Disc

The Denon Audio Technical CD (38C39-7147) combines musical excerpts (classical, jazz and rock) with computer-generated test signals to provide a series of more than 90 signals for checking CD players and audio systems. Among the test signals are channel identification, separation and phasing tests, group-delay measurements, frequency response sweeps, silent tracks for noise tests, square waves, tone bursts, white noise and many more. Price: \$19.95.

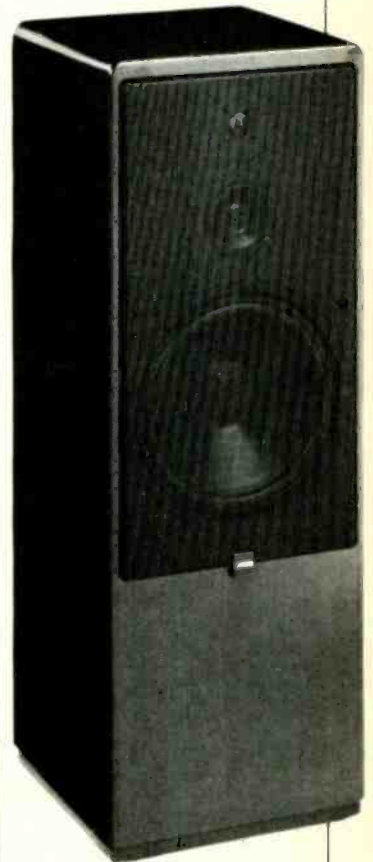
For literature, circle No. 112

as current track and index numbers. There is also a front-panel headphone-level control. Price: \$995.00. For literature, circle No. 113



### Canton Speaker

The CT 2000 floor-standing speakers use a modified vent system instead of the company's usual acoustic-suspension design, for higher efficiency and a frequency range from 18 Hz to 30 kHz. The 12.2-inch (310-mm) woofer has a surface coating to suppress resonance and a voice-coil pressure-relief vent. The three-way system also includes a 4.7-inch (120-mm) midrange and a 1-inch (25-mm), titanium-dome tweeter. Price: \$2,000.00 per pair in black, white or walnut; \$2,250.00 per pair in gloss mahogany. For literature, circle No. 114





**Onkyo Receiver**

A built-in expander increases the dynamic range of music played through the TX-85 receiver. Other features include

selectable FM bandwidth, manual high-blend control, and both dbx and DNR noise reduction. Power output is 60 watts. Price: \$620.00. For literature, circle No. 115

**Luxman Amplifier and Preamplifier**

Luxman's Twin-Monolithic C-05 preamplifier features dual tape monitors with record-output defeat and one MC and one switchable MC/MM phono input. The matching M-05 Twin-Monolithic pure Class-A power amplifier delivers 105 watts per channel (bridgeable to 400 watts in mono) in Class A, and features noiseless fans. Both use Lux's Duo/Beta circuitry, oxygen-free copper wire and copper isolation. Prices: C-05, \$1,800.00; M-05, \$2,800.00. For literature, circle No. 116



**Sansui PCM Digital Audio Processor**

The PC-X11 is the second version of Sansui's Tricode PCM processor, used in digital recording on

videotape. The Tricode PCM technology allows the use of slow VCR speeds for longer, less expensive recording. The PC-X11 uses a 14-bit linear code,

for more than 85 dB S/N. Connections for two decks allow uninterrupted recording or dubbing. Price: \$900.00. For literature, circle No. 117

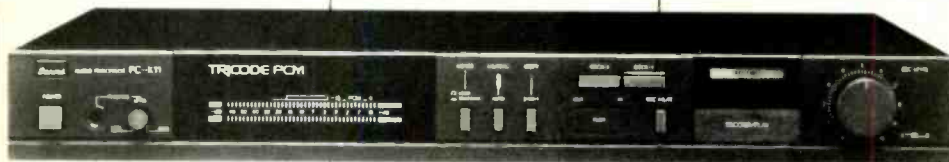
**Bertagni Indoor/Outdoor Speaker**

The BES SM90 is a weatherproof, omnidirectional speaker designed for indoor or outdoor use. The speaker may be either suspended from the ceiling or placed on the floor, using installation hardware provided. Price: \$380.00 each. For literature, circle No. 118



**AKG Mini Headphones**

The AKG K-1 mini phone has a unique, pantograph (scissors-type) folding headband, which allows it to be carried in a pocket or in the protective case provided. The case can be worn on a belt. An adaptor is supplied for use with the quarter-inch headphone jacks in home hi-fi systems. The K-1 weighs 2.3 ounces. Price: \$29.00. For literature, circle No. 119



## DITHERING HEIGHTS

Previously we have explored time sampling, amplitude quantization, and aliasing. We have seen that band-limited sampling is a lossless process, that the problem of aliasing can be largely overcome through an input low-pass filter, and that quantization stubbornly determines the signal-to-error ratio inherent in our digitization system.

If we specify a high sampling rate and a steep filter, sampling and aliasing cease to be meaningful obstacles to the high-fidelity recording and reproduction of audio. But quantization is a different story; that error floor is directly determined by the number of bits in the system.

Although a 16-bit system would yield a theoretical signal-to-error ratio of 98 dB, it is disturbing, at least conceptually, to know that there is still some error down there and that as the signal amplitude decreases to the order of one least-significant bit (LSB)—that is, one quantization increment—an error might even be audible under certain signal conditions.

In any case, quantization always destroys some information, which can create unexpected problems. Let's look at those problems as well as an extremely nifty remedy for quantization error.

Digital signals are made up of discrete bits. This is a real blessing; it permits us to employ fantastic digital methods for processing and storage. However, in quantization, the discrete nature of digital and the ensuing amplitude increments can create nonlinearity. Consider the case of a signal with amplitude on the order of one quantization increment (Fig. 1), as proposed

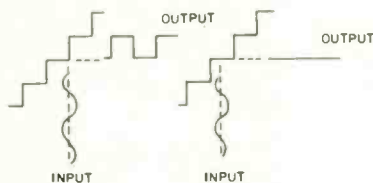


Fig. 1—Without dither, small signals can be reproduced as square waves or as d.c., depending on whether or not they cross a quantization threshold.

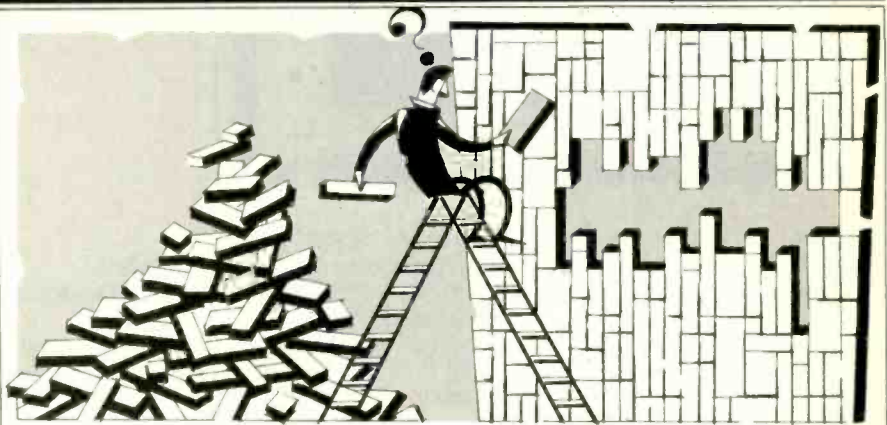


Illustration: Philip Anderson

by John Vanderkooy and Stanley P. Lipshitz [1]. The signal value would either vary within one increment, resulting in a d.c. signal, or cross back and forth across the increment threshold, resulting in a square-wave output signal. That square wave, created at very low levels, suggests that quantization ultimately acts like a hard limiter; in other words, severe distortion takes place. This quantized fluctuation in the noise floor is perceived as a particularly nasty kind of sound, which is called "granulation noise" because it has been described as a gritty sound. To make matters worse, a square wave is rich in odd harmonics, extending far beyond the Nyquist (half-sampling) frequency; thus, our dear friend aliasing reappears after the anti-aliasing low-pass filter.

Consider the example of a low-level sine wave of 15.333 kHz in a 44-kHz sampling system. The third harmonic creates a 2-kHz component, the fifth harmonic a 32.666-kHz component, the seventh harmonic a 19.333-kHz component, etc. An entire quantization error spectrum has been created, and the anti-aliasing filter is powerless to stop it; these are entirely new components not masked by the original fundamental or its harmonics. If the harmonics are very close to a multiple of the sampling frequency, the beat tones drift through the frequency origin to produce a sound called "bird-singing" or "birdies."

Okay, here we are destroying perfectly good information and creating entirely off-the-wall information; even worse, this junk has been euphemistically renamed. Of course, this effect occurs for very low-amplitude input

signals; thus, the amplitude of the distortion is also very low. However, it can also happen for higher level input signals of very narrow band. It's a question of the degree of statistical correlation between successive samples. In much the same way that white noise is perceptually benign because successive values of the signal are random (whereas predictable noise signals are more perceptible), we desire noise input signals, and their resulting errors, to be uncorrelated to be least audible. For broad-band, low-level audio signals, the correlation factor is about 0.5, and for high-level signals it decreases to 0.01. But it rises again for narrow-band signals. Quantization error is least perceptible with broad-band audio signals; the correlation is low, and the resulting error is very similar to white noise. But for low-level or narrow-band signals, the error takes on a new, more troubling guise. Yet there is a solution.

A conversion system must suppress any digital quality of its noise. Obviously, the number of bits could be increased, with a resultant decrease in error by 6 dB per bit. This is uneconomical, and it has been estimated that two extra bits would be needed to reduce granulation noise satisfactorily. An alternative is to add a small amount of analog white noise to the input signal; this noise is referred to as "dither." Dither has been around for a long time (at least since its use in video technology, circa 1950), but it is only now being applied to audio technology. The point of dither is that a small amount of noise removes the quantization artifacts from a signal—it doesn't mask the artifacts, it removes them.

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The professionals at Toshiba. With their incredible System 55.

And what a system. It includes an integrated amplifier with 85 watts per channel\*, a direct drive turntable, a digital synthesized tuner, a full auto-reverse cassette deck, a set of 3-way speakers, plus the options of a compact disc player and a 20-band graphic equalizer. All enclosed in an elegant cabinet with glass door and top.

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**TOSHIBA**

Toshiba America, Inc., 82 Totowa Road, Wayne, NJ 07420

\*85 watts per channel, minimum RMS power into 8 ohms, from 20 to 20,000 Hz with more than 0.04% THD.

Let's reconsider our example of a signal crossing a quantization threshold. But this time, let's add a dither signal equal to two quantizing steps. The result (Fig. 2) is a duty-cycle modulation which still preserves the information of the original signal. As Barry Blesser has pointed out [2], the average value of the quantized signal can move continuously between two levels, and thus the incremental danger of quantization has been alleviated. Audibly, the result is the original sine wave, with added noise. But that is far more desirable than the severely distorting square wave.

Vanderkooy and Lipshitz have proved this hypothesis with the example of a 1-kHz sine wave with a peak-to-peak excursion of one LSB, shown in Fig. 3. The familiar square wave is output from the digital-to-analog converter as the limiting action takes place. But when dither with an amplitude of one LSB is added, a duty-cycle-modulated waveform results. While this might still look distinctly digi-

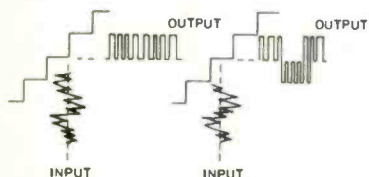


Fig. 2—With dither, the quantized signal is duty-cycle-modulated, reproducing more of the original signal information without quantization noise.

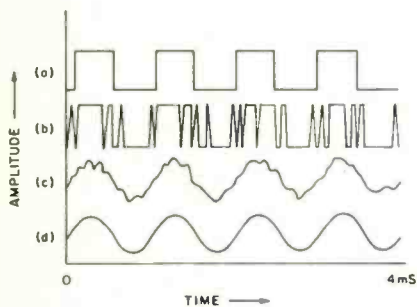


Fig. 3—Small threshold-crossing signal, as output from D/A converter (a) without dither, (b) with one-LSB dither, (c) after averaging 32 times, and (d) after averaging 960 times.



Granulation noise sounds nasty, and its harmonics pass the Nyquist limit, reintroducing aliasing *after* the anti-aliasing filter.

tal, its hidden sine-wave information can be revealed when the signal is averaged tens or hundreds of times by our ears. A fairly clean sine wave distinctly emerges. And that averaging technique isn't some kind of trick; rather, it illustrates how the ear will actually perceive the signal.

Our ears are quite good at resolving narrow-band signals below the noise floor because of the averaging properties of the ear's basilar membrane. It behaves like a  $\frac{1}{3}$ -octave filter with a Q of 4, such that the quantization error (which has been given a white-noise character by dither) is averaged out by

the ear, and the original narrow-band sine wave is heard without distortion. In other words, dither changes the digital nature of the quantization error into a white noise, and the ear may then resolve signals with levels well below one quantization level.

I think that is a startling and important conclusion: *With dither, the resolution of a digitization system is below the least significant bit.* By encoding the audio signal with dither to produce modulation of the information, we may later recover that information, even though it might be smaller than the smallest increment of the quantizer. Exactly how is the dither produced? The mathematical definition for the best kind of dither is, "a noise with rectangular probability density with peak-to-peak amplitude exactly equal to one quantization increment." However, this is a difficult signal to generate, and an ordinary Gaussian (white) noise can be used. In fact, a digital system might not even need a dither circuit, because the residual analog noise in the input stages or the input audio signal itself can act as dither. The performance price? A degradation of about 1.5 dB in the broad-band noise floor of the digitization system results, an increase which is negligible compared to the signal-to-error ratio inherent in the digital system.

Dither thus represents a unique and unlikely concept. The idea of adding analog noise to a digital system seems a little strange. But, as we have seen, the bottom line is lower distortion and, thus, higher fidelity for the digital system. I think it demonstrates the first stages of maturity in the design of digital audio systems. The nuances of detail are becoming apparent, and the sound just keeps getting better and better. **A**

#### References

1. Vanderkooy, John and Stanley P. Lipshitz, "Resolution Below the Least Significant Bit in Digital Audio Systems with Dither," *Journal of the Audio Engineering Society*, March 1984, pp. 106-113.
2. Blesser, Barry, "Digitization of Audio: A Comprehensive Examination of Theory, Implementation, and Current Practice," *JAES*, Oct. 1978, pp. 739-771.

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Bert Whyte, *AUDIO*, September 1984



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However, in the real world of audio electronics, "nothing" wasn't easy to come by; virtually every aspect of the signal path, and the circuitry that supports it, required reevaluation. Tandberg embarked on a 5-year research project to systematically localize and eliminate every source of audible distortion, however subtle.

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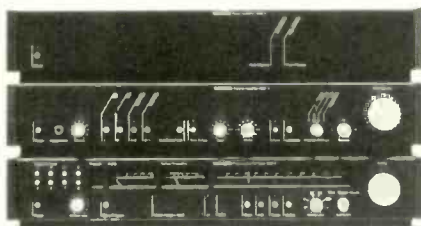
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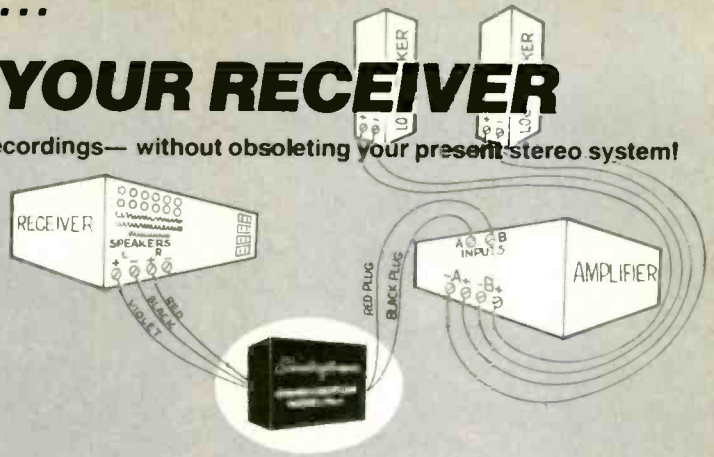
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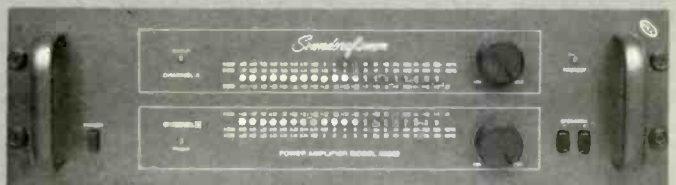
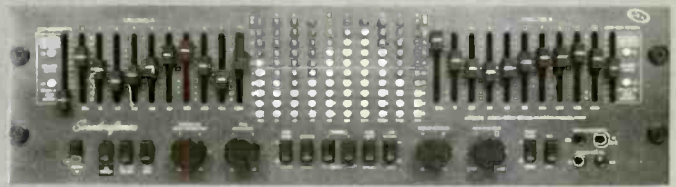
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**Is the Price Right?**

*Q. I purchased a high-quality cassette deck, costing over \$500, about 15 months ago. Recently, I took it back to where I bought it to have the deck cleaned and checked. I was told it would cost me \$60 in labor plus the cost of parts to correct the following: Azimuth misalignment of the playback head, excessively fast speed, erratic motion of the take-up reel, and bias out of adjustment. Is this an excessive price? If I am going to have to pay this much each year for service, is it really worth having a deck like this?—Richard Butia, New Wilmington, Pa.*

*A. For a high-quality deck, the price doesn't seem out of line. After all, it costs more to service a Cadillac than a Chevrolet. On the other hand, you could choose to live with your deck as it is if you hear nothing wrong, and wait until something goes obviously wrong before you seek repairs. But I don't think this is the way to go. As with a car that you value, you should be prepared to periodically pay repair and maintenance costs for your tape deck.*

**Taping AM**

Reader Harrison Pierce Reed III has some cautions about taping AM broadcasts in the Dolby mode:

*When taping AM radio, unless one is practically on top of the transmitter, Dolby noise reduction should never be used. The 19-kHz filter in the deck will be practically worthless, because the problem is caused by other frequencies. The problem frequencies include heterodynes at 10 and 20 kHz. Additional heterodynes are caused by the many Caribbean stations that operate on half-channels—for example, 1,035 kHz—and European stations that are spaced at 9-kHz intervals. Further, noise frequencies are generated by cross-modulation of sidebands. This mash may be acceptable to the ear, but the Dolby circuit sees it as legitimate treble energy and tries to follow it. The Dolby will go nuts.*

*If one insists on Dolby encoding when recording AM, one must settle only for clear-channel, 50,000-watt stations that are nearby, and tape only from two hours after sunrise until two hours before sunset. And one cannot tape during the colder months, when skip signals of 1,000 miles or more are*

*common during midday. Even if taping during the time of year when skip signals are virtually nonexistent, one had better make sure there is no adjacent-channel station within the remotest ground-wave distance, and had better hope there isn't a thunderstorm anywhere within 800 miles.*

*In sum, no matter what AM tuner is used, one is hardly going to tape AM satisfactorily with Dolby on unless the signal is so strong that it overloads the tuner's front-end, resulting in gross distortion! Anyways, considering how noisy and low-fi AM typically is, it is not going to benefit much from Dolby. I am aware that some AM broadcasters, especially in high-budget major markets, do an excellent job of producing audio signals worthy of the best on FM. However, the AM medium itself adds too much distortion unless one lives a nose-distance from the station. Something as critical as Dolby tracking requires at least the reliability of FM reception quality to work properly.*

**Dubbing-Deck Quality**

*Q. High-speed dubbing cassette decks, such as those made by Radio Shack and Technics, may save time when dubbing, but will the quality of sound on the dubbed tape match the original's? I've been told these systems introduce distortion and reduce sound quality, but I thought higher tape speeds meant less information per tape area, thus improving sound quality.—Theodore Floyd, Tampa, Fla.*

*A. Try the model of your choice, connected to a good demo system in the store, and see if you can hear a difference when you play back the dubbed tape.*

*In general, any copy will add some THD and noise. Also, with Dolby B and C NR, there may well be tracking problems with high-speed duping, since the normal procedure (decode the tape you're playing and re-encode for the tape you're recording) will be thrown off because the frequencies on the tapes will temporarily be transposed up. The only way to prevent this would be to copy Dolby tapes without any Dolby circuits switched on—and to make that work, you'll have to set your recording levels so that a recording made on the dubber would have precisely the same level as the tape it was*

*copied from. You might try dubbing a Dolby-level test tape to check and adjust the level match.*

*Dubbing at high speed does not change the information per tape area. If the tape speeds are doubled, then the frequencies are also doubled, which neutralizes the effect. For example, a 1-kHz tone on a normal-speed cassette will occupy about 0.05 mm of tape. Double the playback speed, and that tone's frequency becomes 2 kHz—just long enough to record onto 0.05 mm of a tape being recorded at double speed. The tone's recorded wavelength stays the same, even though its frequency has been temporarily doubled.*

**Magnetic Field Danger**

*Q. I have bought an old tube amp (it was cheap and has a nice sound) which comes in a wood cabinet and has several large transformers inside. Should I go to great lengths to keep my tapes away from this amp? Or is it okay to place my cassette deck next to the amp?—Paul Rubin, Berkeley, Cal.*

*A. Ordinarily, tapes are safe if they are kept at least 3 inches distant from magnetic fields which may be emitted by the transformers in audio equipment. Therefore, it is probably safe to place your cassette deck alongside your amplifier.*

**Warp Frequency Problem**

*Q. I hope you can help me with a problem involving my cassette and 8-track decks; I have written to the manufacturers but have never received an answer. Whenever I copy a phono record onto 8-track tape, the drums, cymbals, and handclaps are distorted in playback. This makes the background very raspy and produces a terrible swooshing sound. When I record from the cassette deck to the 8-track deck, this does not happen, and the recording is perfect. I have had the 8-track deck checked, and it is fine. I use only the best 8-track cartridges and am not overloading the tape, as I have tried recording at various levels. Phono*

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

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When dubbing records, subsonic warp frequencies can make some tape decks block, distort or oscillate.

*records play fine, and my cassette tapes of these records are also fine. Pre-recorded 8-track cartridges play excellently on the 8-track deck. It is only when I try to record phono discs onto 8-track cartridges that I experience distortion.*—Bill Schuh, Scottsdale, Ariz.

A. Others have run into a problem such as yours. The answer appears to be that the electronics of the offending deck (in your case, the 8-track unit) are unable to handle all frequencies presented to them at high or even moderate levels. Specifically, the deck is unable to handle the warp frequency generated by many discs and therefore presented by the phono pickup and phono preamp. The warp frequency is too low to be audible to the human ear, but it exists and is amplified by the bass boost supplied by the phono preamp. Given such a frequency, the electronics of a tape deck may block, distort, and/or oscillate.

On the other hand, it appears that your cassette deck, apparently of high quality, can accept the warp frequency without trouble. However, its output drops sharply below about 20 or 30 Hz, so very little of the warp frequency remains in the signal presented to your 8-track deck. Therefore, the 8-track works satisfactorily when dubbing from cassette.

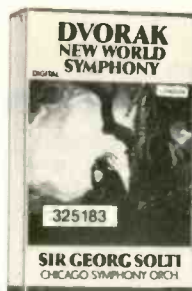
### Flat Spots

Q. My car cassette deck does not automatically eject the tape when the motor is turned off, and tapes are therefore forgotten at times and remain in play position. Can this damage any of the parts and cause a deterioration in playback response?—Samuel J. Neiditch, Redlands, Cal.

A. Yes. If the tape remains in operating position, this may cause the pressure roller to develop a flat spot at the place of contact with the tape and capstan, resulting in wow. If the mechanism contains rubber drive wheels, these may also tend to develop flats. The flat is not necessarily permanent, because the rubber tends to have a "memory" of its original shape, but it may tend to become so if the deck is in play position long enough. It's difficult to define long enough; a few minutes of engagement is unlikely to do harm, but a few hours very well may. **A**

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**305730. Mendelssohn: Symphony No. 4 (Italian); Overtures—André Previn, London Symphony (Angel)**

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**325365. Mozart: Eine Kleine Nachtmusik; Symph. No. 40—Casals, Marlboro Festival Orch. (CBS Portrait)**

**309492. Mussorgsky: Pictures At An Exhibition; Night On Bald Mountain—Bernstein, New York Phil. (CBS Great Performances)**

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**318691. Prokofiev: Love For Three Oranges Suite; Lt. Kije Suite—Thomas, L.A. Phil. (CBS Masterworks)**

**245043. Rachmaninoff: Piano Concertos Nos. 1 & 2—Ashkenazy, Previn, London Symphony (London)**

**313767. Ravel: Sonatine, La Valse, Miroirs, etc.—all played by pianist Ruth Laredo (CBS Masterworks)**

**324822. Ravel: Bolero; La Valse; others—Lorin Maazel, Orch. National de France (Digital—CBS Masterworks)**

**324533. Respighi: Feste Romane; Pines & Fountains Of Rome—Dutoit, Orch. de Montreal (Digital—London)**

**318436. Rimsky-Korsakov: Scheherazade—Svetlanov, London Symphony (Angel)**

**325100. Saint-Saens: Carnival of the Animals—also works by Debussy, Satie, Philip Jones Brass Ensemble (Digital—London)**

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**317677. Schubert: Symphony No. 8 (Unfinished); Rosamunde Overture and Ballet Music—von Karajan, Berlin Philharmonic (Angel)**

**225888. Smetana: Moldau, Bartered Bride Overture, Dances; Dvorak: Camival Overture—Bernstein, N.Y. Phil. (Columbia)**

**310870-390872. Johann Strauss' Greatest Waltzes Ormandy, Szell, Bernstein (Count as 2—Columbia)**

**320424. Richard Strauss: Ein Heldenleben—Dicterow, violin; Mehta, N.Y. Phil. (Digital—CBS Masterworks)**

**281493. Stravinsky: Rite Of Spring. Zubin Mehta, N.Y. Phil. (Columbia)**

**308874. Tchaikovsky: Piano Concerto No. 1—Gavrilov; Kitarenko cond. Moscow Radio/TV Sym. Orch. (Col./Melodiya)**

**329169. Tchaikovsky: Symphony No. 4—Lorin Maazel, Cleveland Orch. (CBS Masterworks)**

**245399. Tchaikovsky: Symphony No. 6 (Pathétique)—Ormandy and Phil. Orch. (Columbia)**

**231563. Tchaikovsky: Swan Lake and Sleeping Beauty Ballet Suites—Ormandy, Philadelphia Orchestra (Columbia)**

**289207-399204. Tchaikovsky: The Nutcracker (complete)—An American Ballet Theatre Production directed by Baryshnikov (Counts as 2—Columbia)**

**293191. Tchaikovsky: Violin Concerto; Meditation—Stern, Rostropovich, National Sym. (Columbia)**

**321844-391847. Verdi: La Traviata—Original Motion Picture Soundtrack. Stars Domingo, Stratas (Counts as 2—Elektra)**

**326447. Verdi: Overtures—La Forza del Destino, I Vespri Siciliani, Nabucco, etc. Chailly, National Philharmonic (Digital—London)**

**324897. Vivaldi: The Four Seasons—Lorin Maazel and Orch. National de France (Digital—CBS Masterworks)**

**324525. An Isaac Stern Vivaldi Gala: Concertos For 2 and 3 Violins; etc. Stern, Zukerman, Perlman, others (CBS Masterworks)**

**323733. Wagner: Orchestral Music from "The Ring"—Ride of the Valkyries, etc. Mehta and New York Phil. (Digital—CBS Masterworks)**

**308890-398891. Bernstein Conducts World's Greatest Marches—Pomp and Circumstance; Washington Post; etc. (Counts as 2—Columbia)**

**325886. Liona Boyd—Live in Tokyo. Works by Dowland, Soler, Farka, etc. (Digital—CBS Masterworks)**

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**308890-398891. Bernstein Conducts World's Greatest Marches—Pomp and Circumstance; Washington Post; etc. (Counts as 2—Columbia)**

**314172. Plácido Domingo With John Denver—Perhaps Love. Also: Annie's Song, Yesterday; etc. (CBS)**

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**280610. Jean-Pierre Rampal Greatest Hits—Debussy's Girl With The Flaxen Hair; Handel's Largo; etc. (Columbia)**

**319582. Jean-Pierre Rampal Plays Scott Joplin. The Entertainer, etc. (CBS)**

**311647. Isaac Stern 60th Anniversary Celebration—master violinist is joined by Zukerman, Perlman, Mehta, etc. (Columbia)**

**316570. The Tango Project—La Cumparsita; Adios Muchachos, etc. William Schimmel, accordion, etc. (Digital—Nonesuch)**

**324772. Kiri Te Kanawa—Songs of the Auvergne (by Canteloube) English Chamber Orch. (Digital—London)**

**320887. Kiri Te Kanawa—Verdi and Puccini Arias. Pritchard, London Phil. (Digital—CBS Masterworks)**

**319848. Andre Watts—Live in Tokyo. Works by Ravel, Brahms, Debussy, Haydn, etc. (Digital—CBS Masterworks)**

**320895. Portrait of John Williams—Theme from "The Deerhunter"; Fool On The Hill, etc. (CBS Masterworks)**

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Note: selections with two numbers are 2-record sets or double-length tapes. Each of these "double selections" counts as 2—so write in both numbers.

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## Tuner Antenna Connections and Pilot Lamp

*Q. My tuner is connected to a 75-ohm outdoor FM antenna via a balun transformer attached to the tuner's 300-ohm input. Recently, while reconnecting the tuner to the cable, I accidentally connected it to the 75-ohm input. When I turned the unit on, the dial light flashed on and, a moment later, off. The light has not worked since. The tuner itself works perfectly.*

*What made this happen? Is it likely that any other damage has been done? And would I get better performance if I took the balun out of the circuit and connected the cable directly to the 75-ohm input terminals?*—Patrick J. Callery, Massapequa Park, N.Y.

*A. You will be glad to learn that the lamp's burning out and the accidental connection of your cable directly to the tuner were coincidental events. Replace the lamp and all should be fine.*

The balun serves as an impedance-matching device when placed between the 300-ohm input and the 75-ohm transmission line. It also creates the balanced condition needed by the tuner's 300-ohm input and the unbalanced arrangement required by the transmission line. However, considering that you have a 75-ohm input, you should connect the transmission line directly to this input. It is unbalanced and of the proper impedance for matching the transmission line. Eliminating the balun removes a device which introduces a small amount of signal loss. As long as your tuner can live without it, don't use the balun.

## Disc Stabilizers and Turntable Speed

*Q. I have used a disc stabilizer for some time. When I do so, I see that the platter drops about 1/16 of an inch. I am concerned this drop can harm my direct-drive motor. Do you think the disc stabilizer is too heavy? (It weighs about 600 g.) When the stabilizer is used, will it change the speed of the turntable?*—C. K. Chan, Long Island City, N. Y.

*A. On direct-drive turntables, the platter and the motor are one unit; so if the platter sinks, the motor is sinking with it. If you check your turntable carefully, you'll probably find that the extra weight is either making the entire*

*base sink on its suspension or making the motor and platter assembly sink slightly on its shock mounts. There should be no immediate harm, as long as no rotating parts are made to rub against the base and the arm and turntable remain rigidly coupled so that their relative positions do not change. In the very long run, there might possibly be extra wear on the motor bearings; check with the manufacturer of the turntable on that.*

On other types of turntables, additional problems could occur if the weight made the platter sink or tilt relative to the motor; bearing wear would affect platter motion, but not the motor.

The stabilizer should not affect turntable speed. Its added mass may make the turntable take somewhat longer to come up to proper speed. But once it is running at speed, no adverse effects should be noticed.

## Tonearm Wiring

*Q. My question relates to phono-graph wiring: Why is there a separate left-channel ground and a right-channel ground? Would not one common ground suffice? Electrically, it is all the same at the phono inputs. Additionally, one less wire in the tonearm would be beneficial from a mass/pivot-friction standpoint.*—Nicholas A. Sisco, Jr., Columbus, Ohio

*A. You are correct about tonearm wiring regarding the reduction of mass and drag, but the grounding situation is something else again. If a common ground is used for both channels, there is a risk of hum resulting from a ground loop. By using two separate grounds, it is possible to keep electrical grounding as close to its corresponding input as is practical, eliminating this ground-loop problem.*

## Eliminating Static from Phonographs

*One problem which has been brought up again and again with turntables is static electricity. It is an inevitable, but unwanted, byproduct of cleaning and playing your phonograph records.*

*Since I purchased the Discwasher Zerostat, I have eliminated this problem to a certain extent. But, there always seemed to be a static charge remaining on the record and the turntable*

*mat. In the end I still had a statically charged record and a statically charged mat—both of which draw dust, further complicating things.*

*I was particularly interested in removing static electricity from the turntable mat without having to purchase an additional mat. After I "sprayed" the stationary disc (about 12 inches above its center), I would touch the center tip of the Zerostat to the center spindle and slowly squeeze the trigger. This effectively removed any static electricity from the turntable mat.*

*Since a static charge could enter the ground system and damage the phono-graph preamp, amp and possibly the loudspeaker systems, you should turn the volume down and set the program selector to a position other than phono before using the Zerostat.*

*In summary, by using a Zerostat gun on both the record and the turntable platter, static electricity can be effectively controlled.*—Fred Botway, North Merrick, N.Y.

## Noise Generators and RTAs

*Q. What's the purpose of a real-time spectrum analyzer and a pink-noise generator in an equalizer?*—Elmer F. Maye, Jr., Coram, N.Y.

*A. The spectrum analyzer and pink-noise generator help determine the frequency response of a sound system (including the room's acoustics), while the equalizer is used to correct any deficiencies thus discovered.*

*In use, the pink-noise generator provides a signal having equal energy in every octave of the sound spectrum. The real-time analyzer shows the system's output level in each of several (usually 10) frequency bands, so you can tell in which bands the signal should be boosted and in which it should be cut to obtain flat response.*

## Phonograph Hum

*Q. Two or three times a week I hear a low-frequency hum produced by some disorder in my turntable. When it occurs, it is accompanied by the loss of one channel. I can cure the problem*

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



# Dolby® HX Pro

Dolby HX Pro™ headroom extension is a program-adaptive bias technique which can significantly improve the quality of cassette recordings. High-level frequencies can be recorded more accurately, without sacrificing signal-to-noise ratio, while such side effects of tape saturation as distortion are reduced. For both the home recordist and the duplicator of pre-recorded cassettes, Dolby HX Pro improves the performance of good conventional tapes to match that of costlier, more exotic formulations, and even the more expensive tapes benefit from Dolby HX Pro.

## The problem of self-bias

Even when a cassette deck is adjusted for the nominally optimum bias for a given tape, performance is nevertheless compromised under some signal conditions. In particular, music which is rich in high frequencies has what's called a self-biasing effect. The musical high frequencies act in and of themselves as recording bias on the tape, effectively adding to the external bias supplied by the recorder's bias oscillator. The net result under such signal conditions is momentarily too much effective bias, which leads to the familiar symptoms of tape saturation. The highest frequencies don't get recorded at all, and considerable IM distortion is generated at lower frequencies.

## How Dolby HX Pro deals with the problem

Dolby HX Pro uses a special circuit which constantly monitors the total effective bias — a combination of bias from the recorder's oscillator and self-bias contributed by the musical signal — while the recording is being made. If it senses the total bias increasing beyond the optimum level as a result of high frequencies

in the music, it instantly compensates for the increase by lowering the bias from the recorder's oscillator, thus keeping the total effective bias constant. Even on music with a great deal of high-frequency energy, the tape remains optimally biased, and so tape saturation and its side effects are significantly reduced. The improvement in high-frequency

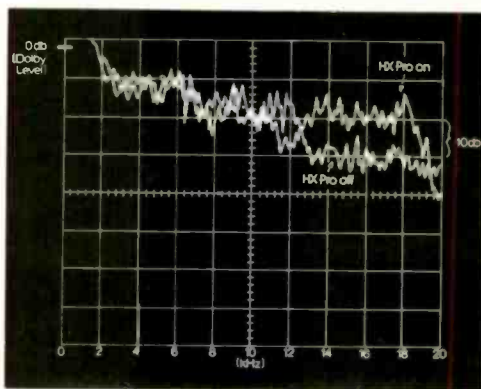
headroom can be 6 dB or more, depending on the particular tape formulation. No decoding is necessary to realize the benefits of Dolby HX Pro.

## Improve both the cassettes you make and those you buy

Dolby HX Pro technology, developed by Bang & Olufsen with the assistance of Dolby Laboratories, is provided along with Dolby noise reduction in home cassette deck models from Aiwa, B&O and Harmon-Kardon.

Just as important, Dolby HX Pro can be applied to high-speed cassette duplication, where its ability to improve good conventional tape formulations is economically, as well as sonically, significant. Commercial duplicating facilities are now equipped, and the first pre-recorded cassettes made with Dolby HX Pro (as well as Dolby noise reduction) are available from the following labels: Capitol, Liberty, EMI/America, Angel, Warner Brothers, Electra/Asylum, and Atlantic.

For further information, including a complete technical explanation of Dolby HX Pro, contact Dolby Laboratories at the address below.



Spectral analysis of two high-speed (32 times) cassette recordings of the same selection of rock music show the highest levels accumulated over time at each frequency. Both recordings were made on conventional iron oxide tape of the type favored for commercial cassette duplicating; in this example, the high-frequency headroom improvement provided by Dolby HX Pro is as much as 10 dB.



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Intermittent cartridge contact can occur at the cartridge terminals, inside the cartridge, or at the headshell connections.

*by tapping on my phono cartridge, but I am afraid of damaging the cartridge. Is there a wiring problem?*—Bill Bales, Roanoke, Va.

A. There are several possible causes for your problem. The most likely is that one of the slide lugs which fit over the terminals of your cartridge

is loose and intermittently fails to make good electrical contact. It is probably a ground connection. (When a "hot" lead is intermittent, it does not tend to produce hum.) Remove the slide terminal, gently squeeze it with pliers, and then replace it. If you have not squeezed the lug too much, it will now fit snugly

over the terminal and the hum should disappear.

A similar problem involving the cartridge terminals can occur if the electrical connection from the coil to the terminal *within* the cartridge is not properly attached. This problem cannot be fixed; you will need to replace your cartridge or have it repaired by the manufacturer.


Intermittent contact can also occur where the shell's contacts mate with those within the tonearm. A little squirt of contact cleaner on these terminals will generally cure problems that result from oxidation but not those caused by weak spring tension. If the springs are a part of the shell, all that is needed is a new shell. If, however, these contacts are within the tonearm, then the arm must be repaired by its manufacturer.

The final possibility is less likely, but I am including it for the sake of completeness. Check all of the connections on the cables which connect your turntable to the rest of the sound system. Sometimes the plugs' skirts will widen with repeated insertions and withdrawals. Squeeze them gently and reinsert them into their sockets. All should then be well. There is also the chance of a cable defect, usually found at the connector. Although rarer, it can happen that the "hot" connector inside the equipment has enlarged, resulting in an intermittent connection. The equipment must be opened, the connector on the offending socket squeezed a bit, and the plug reattached.

#### Direct to Digital Disc

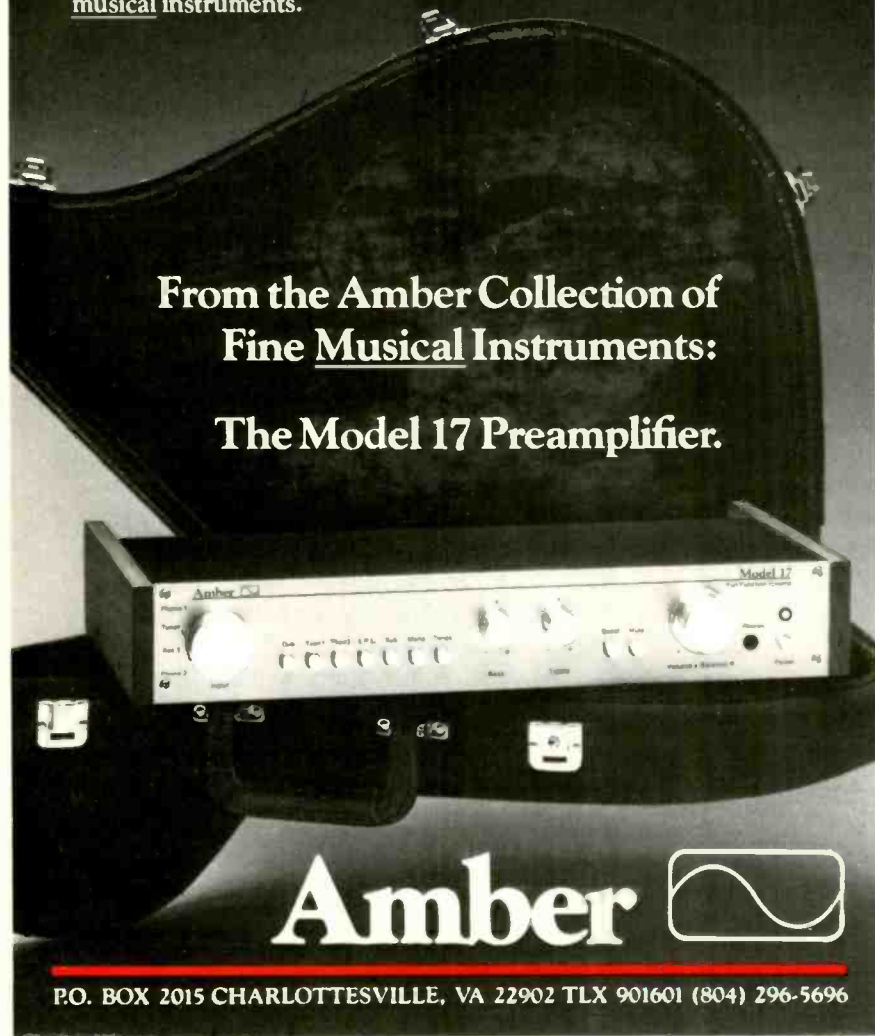
*Q. Is it necessary to make a digital tape of a performance before producing a Compact Disc? Or can we expect a few "direct-to-digital discs"?*—Karl E. Landgren, Smithfield, N.C.

A. I doubt that any direct-to-digital disc recordings will be produced. The equipment needed to make a CD recording is not portable. It requires a special, "clean-room" environment, where positive air pressure keeps dust from being deposited onto the surface of the master.

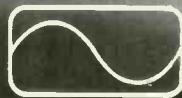
Further, digitally made tapes should be virtually identical in audio quality to CDs. This takes away any advantage that direct-to-digital disc recording would otherwise have had. 

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## TWEAKAHOLICS UNANIMOUS

It is generally acknowledged that audiophilia is an incurable disease, victims of which are engaged in a never-ending quest for the elusive goal of sonic perfection in their audio systems. Audiophiles will go to incredible lengths and expense to achieve even the most minuscule improvement in the performance of their systems. The really committed and affluent audiophiles—and there are more of them than is generally realized—think nothing of laying out \$6,000+ for a pair of Levinson ML-6A preamplifiers or \$7,000 for a pair of Krell KMA-200 Class-A power amplifiers. For the price of an Infinity Reference Standard Series III loudspeaker system, I could be burning up the highway in a sleek Jaguar XJS!

Nor do true-blue audiophiles confine their pursuit of ultimate sonic perfection to audio hardware alone. The really knowledgeable audiophiles are aware of the tremendous importance of purpose-built, acoustically treated listening rooms. Some years ago, I mentioned that Dick Burwen (guru of single-ended noise-reduction systems) had three huge exponential horns cast in concrete in the foundation of his home. (See also "20,000 Watt Home Hi-Fi," *Audio*, April 1976.) I have visited the England home of the urbane Alastair Robertson-Aikman, head of the well-known tonearm-manufacturing firm, SME. His listening room has a 30-ton reinforced concrete ceiling, and he stacks four Quad ESL speakers in a special tubular framework filled with 900 pounds of lead on each side of his 1-ton concrete subwoofers, which use 18-inch drivers!

Audiophiles will exhaustively investigate alleged improvements, some seemingly outrageous, that fly in the face of engineering logic or even try to abrogate the laws of physics. This would include such items as unidirectional speaker wire, marked with indicator arrows showing which end connects to amplifier and loudspeaker to ensure proper electron flow!

Be that as it may, all audiophiles indulge in endless upgrading and tweaking of their music systems to extract still another iota of realism. But barring the unexpected legacy from Aunt Matilda or a lottery windfall, most audiophiles don't have the wherewithal



Illustration: Bob Scott

to permit big-ticket, high-end improvements. However, every once in a while, a clever person comes up with a very bright idea for a relatively inexpensive device that can effect dramatic improvement in the fidelity of any music system—even the megabuck audio jewels of the wealthy.

The Mod Squad, a unique hi-fi company, offers a wide variety of unusual products and services. Co-owners Steve McCormack and Joyce Fleming might well be dubbed the "Duke and Duchess of Tweak." Their main activity is providing modifications to certain audio products, thus tweaking them for optimum performance (usually significantly superior to the original specifications). Among their most successful modifications are those for the Quad 303 and 405 amplifiers, Linn Ittok tonearm, Spatial TVA-1 and Belles Research DMC preamps, and the Trans Audio/Oracle Delphi turntable. They also offer modification kits for such diverse items as the Rogers LS3/5A loudspeaker, the Quad ESL 63 speaker, and the Technics EPA-100 tonearm. In addition, The Mod Squad manufactures the \$2,000 Triplanar tonearm and \$2,500 Phoenix preamp.

Surely one of the most clever products in their catalog is what they call

MacMod Tiptoes. The Tiptoes are machined cones of hardened aluminum available in two sizes, either ½ inch or 1½ inches high. The smaller cones taper to moderately sharp tips and are placed under turntables, amps and preamps, while the larger cones taper to much sharper points and are placed beneath loudspeakers. In all cases, the tip of the cone faces down on whatever surface is supporting the equipment. What these simple Tiptoes cones do is mass-couple the component to the surface beneath it. The pressure per square inch on the tiny tips is enormous, linking component to surface as solidly as if the component had far higher mass.

The smaller Tiptoes afford more clarity and resolution to the sound from turntables and preamps/amps. However, the large Tiptoes, placed under loudspeakers, offer a truly dramatic improvement in sound quality. It is not a subtle effect, discernible only to golden ears, but something that is immediately apparent to anyone with normal hearing. I would venture to say that most audiophiles have carpet on the floor of their listening rooms. With the usual rubber underpadding, the loudspeaker is sitting on a rather thick, semi-resilient, amorphous surface and

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The large Tiptoes, placed under loudspeakers, offer a truly dramatic improvement in sound quality, not merely a subtle difference.

is therefore not in contact with the floor itself. The very sharp tip of the larger Tiptoes, under the weight of the loudspeaker, pierces the rug and padding and couples it directly to the floor. (British audiophiles have been using mass floor coupling for some time, employing various proprietary spikes. Some of these chaps even use special screws to fasten their speaker stands right through the carpeting into the floor!)

The results using Tiptoes are really amazing. The mass coupling disperses the resonant energies of the loudspeaker enclosure and reduces boominess to a remarkable degree, as well as giving the sound significantly more clarity, better focus and imaging, and improved dynamics. The coupling is very effective on wood floors and quite dramatic on concrete floors.

I am fortunate in having a concrete floor in my listening room. It is covered by a thick rug with padding. I first placed Tiptoes underneath Janis subwoofers, using three of them in a tripod arrangement. The result was a cleaner bass, with more clarity and a singular lack of coloration. Then I placed a pair of B & W 801F speakers on the Tiptoes and got very satisfactory improvements, on the same order as with the subwoofers. Finally, although it was a bit tricky, I managed to place Quad ESL 63s and their metal stands on Tiptoes. To add more weight to these fairly light loudspeakers, I placed two VPI magic bricks on the struts of each Quad stand. When these bricks aren't sopping up eddy currents, which they do quite effectively, they are handy objects of concentrated mass. (By the way, wrapped in aluminum foil, they are great for compressing freshly baked country paté.)

Incidentally, for the apprehensive, there are no visible marks or damage to the carpeting when the cones are removed. And perhaps best of all, these Tiptoes cost \$5.00 each for the smaller size and \$7.00 each for the larger size—quite likely representing the most significant improvement in sound quality that can be obtained for such a small expenditure.

Having had such good results with the Tiptoes, I then tried The Mod Squad's modification kit for the Quad ESL 63. Everyone acknowledges that

Peter and Ross Walker's Quad ESL 63 is a very accurate loudspeaker, with superb sound qualities. However, there is always room for improvement. One point that many Quad owners find irksome is the use of spring-loaded input terminals. These will not permit the use of large-diameter, audiophile-type speaker wire. In The Mod Squad kit, good five-way binding posts are provided. Steve McCormack felt that the electrolytic input coupling capacitor of the Quad ESL 63 speakers could be profitably bypassed with high-quality polypropylene capacitors. Thus, he provides three of the well-known Wonder Caps for each speaker. A soldering iron and a screwdriver are the only tools required to make this simple modification.

The binding posts are easy to install, but the new capacitors may require a bit of reorienting of components to get them into the electronics chassis at the base of the speakers. The binding posts cost \$10 and the capacitor kit \$70 for both speakers.

Is it worth the trouble? Definitely. Without in any way denigrating the Quad design, one must always keep in mind that commercial restraints often preclude incorporating costlier components. With The Mod Squad's binding posts, I was able to use the excellent Discrete Technology speaker wire. This and the superior capacitors did indeed provide a smoother, more transparent sound, with better focus and imaging and better resolution of detail and complex music textures. However, there is no technical justification whatever to explain why the Quads seemed more dynamic and seemed to play louder. All I can say is that there was more output before the protection circuit tripped. Perhaps it was the speaker wire? Whatever the case, this modification justifies its fairly modest cost by making a great speaker just that much better.

The Mod Squad catalog features other interesting and useful items. You can get a copy by writing this company at 542 Coast Highway 101, Leucadia, Cal., 92024.

So friends, you don't necessarily have to pop for that new \$1,000 phono cartridge to upgrade your audio system. As is so often the case, it's the little things that count. **A**



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## MAKING WAVES

## Speakers and Such

Car-speaker design runs in waves. First, most speakers were flush-mounting types, designed to fit in round or oval holes sized like their cones. Then there was a trend toward plate speakers, with two or three round drivers on rectangular plates like the fronts of mini-box systems. Now, the emphasis is increasingly on separates, woofers and tweeters that mount side by side—essentially, plate speakers without the plates.

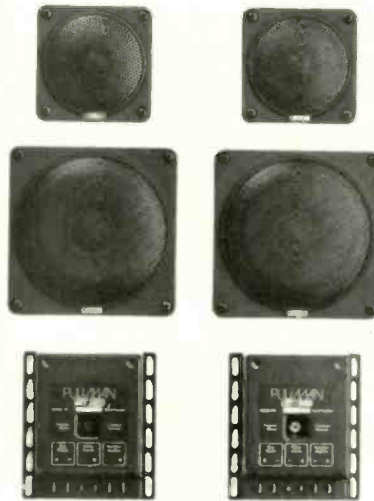
ADS, Boston Acoustics, Canton, Nakamichi and Visonik all showed new separates at the Summer Consumer Electronics Show. Boston's 741 and 751 intrigued me most, because their tweeters come with removable, surface-mount housings which are angled, so the highs can be aimed where they are needed. The 741, with 4-inch woofer, is \$169.95 per pair; the 751, with 5¼-inch woofer, is \$219.95 per pair.

ADS's new 315i system, which also has a tweeter which can be surface- or flush-mounted, is priced at \$159.50 each. Canton's Pullman separates apparently use the same drivers as the Pullman cross-the-deck surface-mount system, but fewer of them: Set 200 (\$275 per pair) uses one tweeter and one 4⅜-inch woofer per channel, while Set 300 (\$375 per pair) adds a second woofer for each side. (The surface-mount version has two

woofers and two tweeters per channel.) Alphasonik's D-7200 (\$235 per pair) uses a 5¼-inch woofer and surface-mounting tweeter.

Nakamichi's SP-10 tweeter and SP-50 5⅞-inch woofer are actually the drivers from their new SP-300 plate. In that version, the tweeter is mounted 15° off vertical and can be rotated ±45°. The crossover has two woofer cutoff frequencies, selectable to match the speaker's placement and the car's acoustics.

The new emphasis on separates doesn't preclude introduction of new plate or single-hole speakers. EPI's new LS70X plates are molded as



Canton Pullman Set 200

single units, driver basket and all, allowing a 6-inch woofer in a fairly compact (6⅞ × 9⅞ inch) space. The MP-46, from MTX, fits into an even smaller, 4 × 6 inch space, by using a 3½-inch main driver candidly described as a midrange unit; it's designed to cross over at 200 Hz to a subwoofer.

There were woofers aplenty, too. Nakamichi's first car woofer, the 7⅞-inch SP-80, made its debut, as did Jensen's J2090, a 6 × 9 inch model. ADS rolled out its CS700, using a pair of 7½-inch drivers, which replaces the CS400. It's rated at ±3 dB from 30 to 125 Hz, and is priced at \$259. Woofer boxes for pickups and hatchbacks were shown by MTX, while similar boxes with full-range systems were shown by Stillwater Designs.

Boston Acoustics 751



Infinity A32 (left) and A462 (right) replacement speakers



Perhaps the most newsworthy speakers, though, were in the venerable, single-hole, flush-mount format: Jensen's P/EQ models. As their names imply, these speakers have built-in equalization—passive networks which cut the midrange down to match the speaker's bass ability. A switch behind the speaker selects flat, -3 dB (for use in pickups and other vehicles with many reflective surfaces) or -6 dB (to leave some headroom for boost in systems with external equalizers).

Jensen also has a new, unequalized, US series, with nifty-looking, molded-in grilles. This line includes three flush-mount units (4½- and 5¼-inch coaxes plus a 5¼-inch Triax) and a surface-mount version of the small coaxial.

JBL's new ER/G Graphite series of one-holers are so named for their graphite-reinforced, high-temperature plastic baskets. The frames are acoustically dead, magnetically inert and electrically non-conducting, while costing less than JBL's traditional cast-aluminum frames. The speakers themselves are "Co-Motional"—that is, their piezo tweeters are mounted on the woofer cones. This avoids any possibility of sound obstruction or diffraction from the back of the tweeter or an overhanging tweeter bridge, eliminates the dirt-sealing problems of pole-mounted tweeters, and improves phase coherency by bringing the high- and low-frequency sources closer together. The thought of Doppler distortion did pass through

MTX bass extender



JBL ER/G Graphite speakers

Despite the new wave of speaker plates and separates, the most newsworthy speakers may be of the good, old hole-mount type.



Jensen J2090 woofer



Nakamichi SP-80 subwoofers



AR LMFC 5.25 woofer/midrange driver



Nakamichi SP-10 tweeters



EPI LS70X



Jensen US630 triaxial



Nakamichi SP-300

for building others and adjusting filter Q (sharpness), too.

The Calisto crossover (\$150) from Hifonics has separate frequency adjustments for left and right channels—not for systems whose left and right speakers differ, but to avoid the expense of closely tracking, four-gang controls and to allow use as a monophonic, three-way crossover. Filter frequencies can be set anywhere from 70 Hz to 7 kHz.

In equalizers, Blaupunkt showed a dual nine-band unit, the BEQ F/R (\$179.95) for independent front and rear equalization—sensible, since speakers and their environments differ so much. Blaupunkt's BEQ MS (\$99.95) is a five-band unit built on two chassis to keep its control unit small for easy placement.

JVC's amplified, seven-band KS-EA55 (\$179.95) includes a Biphonic processor to enhance stereo separation. Parasound now has a pushbutton-controlled, nine-band model, the 300EQP (\$139.95) with LED indicators.

In amps, the most powerful stereo model now available is the Hifonics Zeus, at 200 watts per side. Rockford Fosgate's most powerful is now the Power 650 (125 × 4 watts, bridgeable to 325 watts in stereo), and it incorporates a crossover (\$1,060). Nakamichi's new PA-400M is a subwoofer amp, summing its left- and right-channel inputs into one monophonic output rated at 140 watts into 4 ohms and 220 watts into 2 ohms.

Linear Power has revamped most of its line: The new "02" models have faster slew rates and either more power, less THD, or both than the "01" models they replace. The remaining "01" models have new, low-profile, cooler-running wraparound heat-sinks like those on the 02s. The 02 models and the cooler 01s have the same prices as their predecessors.

Fuji has now put Type II tape into the cassette shell they introduced last year with automotive use in mind. Like the original GT-I, the new GT-II has a heat-resistant shell, ribbed for easier grip. Side A and Side B are made easier to tell apart, both by touch (the Side-A indicator is concave, Side-B

my mind when I first heard of this, but I heard no sign of it from the speakers themselves.

In other single-hole news: Infinity has small models to replace the 3½-inch and 4 × 6 inch speakers factory-installed in many cars; Altec Lansing has thin-mount speakers requiring only 15/16 inch of mounting depth; AR has expanded its in-car line to a total of nine models (including an 8-inch subwoofer), and Sherwood has announced its first three car speakers.

So far, I've not seen any British car speakers, save the mobile versions of the B & W LM1 Leisure Monitors. But KEF's latest home speaker, the 104.2, operates on a principle apparently

much like that of Linear Power's Bass Vent subwoofer, with two bass drivers firing at each other into a plenum chamber from whose side the sound emerges.

In electronics, both Nakamichi and ADS offered electronic crossovers whose high-pass and low-pass frequencies could be independently adjusted. Nakamichi's EC-200H has five, switch-selectable crossover frequencies, from 1.8 to 6 kHz, for triamp systems. ADS's AX-2 (which is also supplied with their CS-700 subwoofer) uses plug-in frequency networks, built up on DIP headers which plug into IC sockets. The AX-2 comes with networks for 125 Hz, plus a spare header, resistors, and data



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Fuji's new tape makes it easy to tell which side is up, by touch or at the merest glance.



Nakamichi PA-400M subwoofer amplifier



Hifonics Zeus power amplifier



Nakamichi EC-200H crossover



Hifonics Calisto crossover

convex) and by a quick glance (the label is at the right of the Side A and the left of Side B). A large tape window makes it easier to check which side is ready to play before loading.

Sparkomatic has a new accessory line, including flat, 12-gauge speaker cables. Monster Cable has expanded its Hotwires line, adding Hotwires 2 (at 40¢/foot, a lower-cost, thinner-gauge version of Hotwires 1), Hotwires 2+2 (two pair of Hotwires 2, zip-corded together, for ease in running wires to the two speakers in the rear, 90¢/foot), and Interlink 4+4 (\$2.75/foot), which combines two Interlink 4 multi-gauge interconnect cables with a 12-V power line for use in biamped systems.

### Trouble in Saab City

I've just had fresh proof of two rules I'd known already: More than one cause can produce the same effect, especially in complex systems, and, if a tape gives you troubles anywhere else, don't stick it in the slot of your car stereo—if it gives you trouble there, it may be hard to get out.

I didn't do that on purpose. I just pulled a tape from my jacket pocket and forgot it was the one that had played with lots of wow and flutter on my Walkman. The tape went in the Alpine's slot but didn't sink out of sight, as usual. The system just stopped, with the tape tantalizingly visible, but out of reach.

On my way to work, I stopped by Wally's Tape City, on 47th St., to have the tape removed. Harold Wally looked in the slot with a flashlight, tested the player's grip on the tape, then gently withdrew it with needlenose pliers.

Only, the Alpine still wouldn't go on. I tried pushing the tuner-on switch, with no result (I didn't dare stick another tape in till I saw some sign of life). Harold looked in the slot again, and said the automatic tape/tuner selector looked okay, so it was probably a blown fuse. I found it, and replaced it . . . and still nothing.

The next weekend, I took the car out to troubleshoot and fix the problem . . . and the system came on as soon as the ignition did. It had fixed itself—only, now, I couldn't turn the tuner off!

Another problem gave the clue—turning down the volume turned the bass and treble down as well. The

volume knob shaft had gotten bent somehow. Straightening it out with my fingers also fixed the tuner switch, which uses the same shaft.

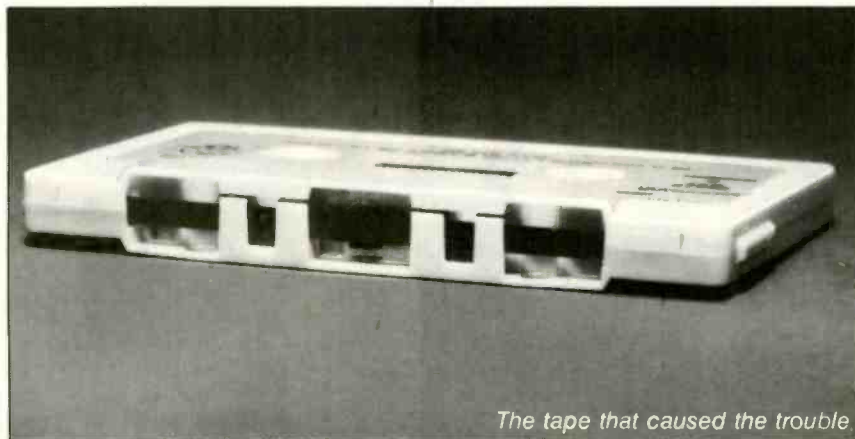
And the tape that started the whole chain? It wasn't properly welded shut, as you can see from the picture.

With complex systems like the one in my Super-Sound Saab ("Roadsigns," July and August '83 and March '84), bliss is great but sometimes fleeting. Not long after the original problem had been solved, the car needed another dose of diagnostics.

This time, its main amplifier (the Rockford Power 6 that drives the under-dash tweeters and midranges) started cutting out as soon as I turned the volume up beyond a whisper. Once out of the car, though, the amp performed okay: "Must be the speaker wires or a rubbing voice-coil," Rockford told me on the phone.

That rang a bell. A while before the amp began to cut out, I noticed an occasional tinkle from the left speaker housing when I played the system loud. I thought it was a loose part somewhere—but New England Radio, who'd done the original installation, suggested that it was a rubbing voice-coil.

I turned the system on with the balance control swung all the way right; the amp played just fine. Then I turned the control to the left and found the midrange wasn't working and the tweeter was cutting out as soon as things got loud. With the midrange driver disconnected, the amp stopped cutting out. A new driver fixed the system up just fine.



The tape that caused the trouble

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# VHS HI-FI: FIVE UNITS TESTED

By Leonard Feldman

Photo: Carl Zapp



**W**ith the advent of stereo simulcasts, stereo on prerecorded videocassettes and now stereo TV broadcasting, the makers of both Beta and VHS videocassette recorders (VCRs) have finally turned their attention to sound quality.

The first breakthrough in this area came from Sony, who announced a true, high-fidelity stereo recording system, which they called Beta Hi-Fi. Compared with the audio performance specifications for the conventional audio tracks of a VCR, the capabilities of Beta Hi-Fi seemed almost too good to be true. Claimed dynamic range for Beta Hi-Fi was 30 dB, as opposed to the signal-to-noise ratio of 40 dB or so commonly achieved with conventional audio recording on home videotape re-

recorders. Distortion had been cut by a factor of 10—from around 3% to 0.3%! Frequency response, normally no better than from about 50 Hz to 10 kHz at best (and at the higher Beta II speed, at that) was now flat from 20 Hz to 20 kHz. Wow and flutter, perhaps the most annoying defect in conventionally recorded audio on VCRs, was reduced from as much as 0.4% or more to a negligible 0.005% or less! Basking in the glory of their achievement, the Beta people confidently predicted that the VHS camp (whose share of the exploding VCR market far exceeded Beta's) would not be able to duplicate this audio feat without degrading picture quality.

But, like the proverbial bumblebee who flies because he doesn't know it's technically impossible, the engineers

at JVC have created their own hi-fi audio system for VHS-format VCRs. Having listened to the new system and watched the video pictures accompanying its sound, I can attest that VHS Hi-Fi not only works magnificently, but does not noticeably degrade picture quality in any way.

In the past several months, many VHS licensees have begun to sell VCRs with the new VHS Hi-Fi stereo capability. As these machines became available, I began to hear rumors that there were some problems with the VHS Hi-Fi system. There was talk of incompatibility; stories about some prerecorded videocassettes not playing properly on some VHS Hi-Fi machines. Some VHS supporters insisted that these rumors had been started by supporters of the Beta format. Others



# VHS HI-FI

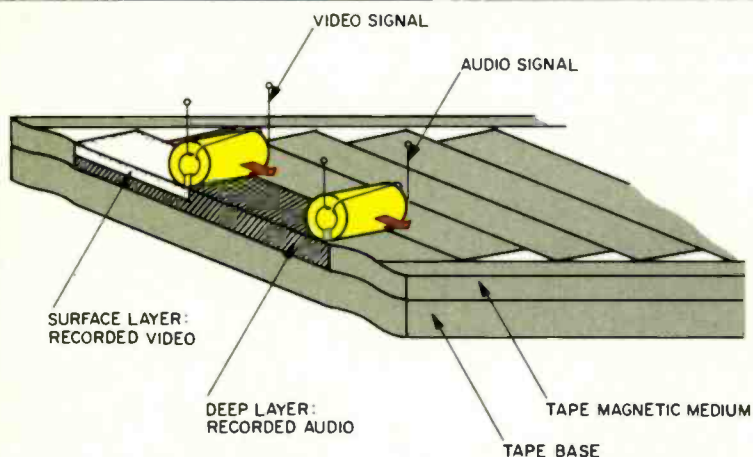


Fig. 1—In Depth Multiplex recording, separate heads lay down the FM audio signals first, followed by the video.

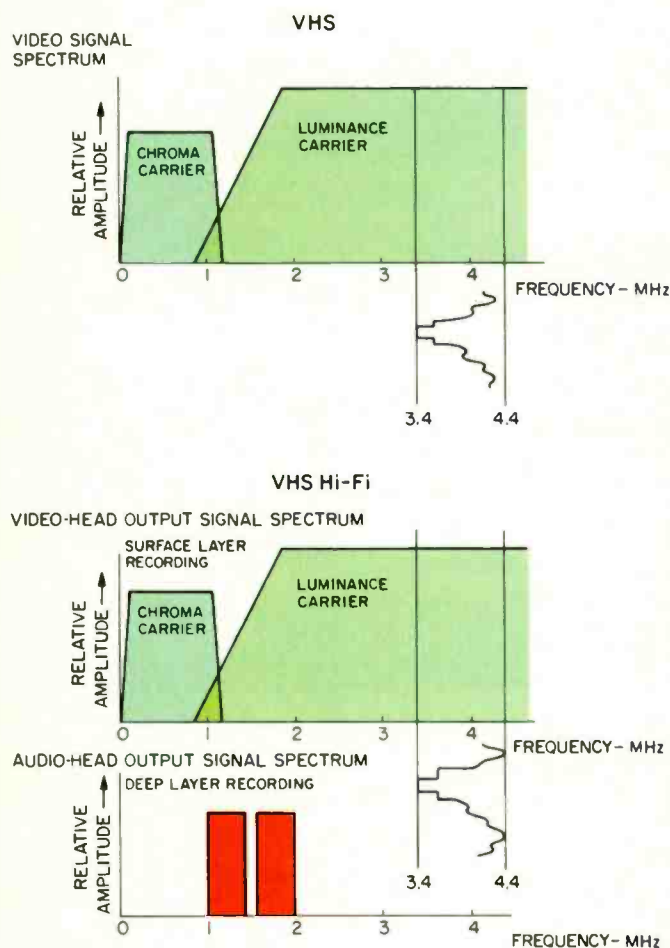


Fig. 2—Frequency spectra of conventional (top) and VHS Hi-Fi recording. Note overlap of video and Hi-Fi audio tracks, requiring Depth Multiplex technique.

insisted that the problems were real and that they did, indeed, exist. Still others said that the problems were not in the VHS Hi-Fi system itself, but rather with duplicators grown careless in their haste to fill a need for prerecorded cassettes incorporating the new and better sound.

In the face of all this talk, the Editor of *Audio Magazine* and I decided to measure the audio quality of a few of the first VHS Hi-Fi machines. We tested five VHS Hi-Fi VCRs, from JVC, Jensen, Panasonic, RCA and Sharp. Then, to provide some frame of reference, I also measured one VHS model with conventional, longitudinal-track stereo sound, from GE. That unit was equipped with Dolby noise reduction, and all of the audio measurements were made with the Dolby circuits on.

Before I tell you about the tests and their results, it might be useful to outline the principles behind VHS Hi-Fi and, for that matter, the operation of conventional audio recordings on videocassette tape. Before the advent of Beta Hi-Fi or VHS Hi-Fi, the audio track (or tracks, in the case of stereo) on home videotape was a mere 1 mm wide and ran along an outside edge of the tape. Longitudinal linear tape speed in VHS machines is only 1.31 inches per second at the fastest (SP) speed. Beta machines run even slower, around 0.8 inch per second at their fastest (Beta II) speed. Audio cassette decks, by contrast, run at 1.875 inches per second and have tracks just about twice as wide as the longitudinal audio tracks on a VCR. All this should help explain why audio performance using a VCR's conventional soundtracks is as poor as it is.

Like Beta Hi-Fi (*Audio*, May 1983) VHS Hi-Fi records audio as frequency modulations on two r.f. carriers (one per stereo channel). But the Beta system mixes these FM signals in with the video signals recorded and played by the regular video heads. By contrast, VHS Hi-Fi, because of a different frequency spectrum (the reason Beta engineers doubted VHS Hi-Fi was possible), must use an extra pair of audio heads to record these signals. These heads are not stationary, like the conventional-track audio heads, but are mounted on the same rotating drum as the video heads. Thus, for a VCR hav-

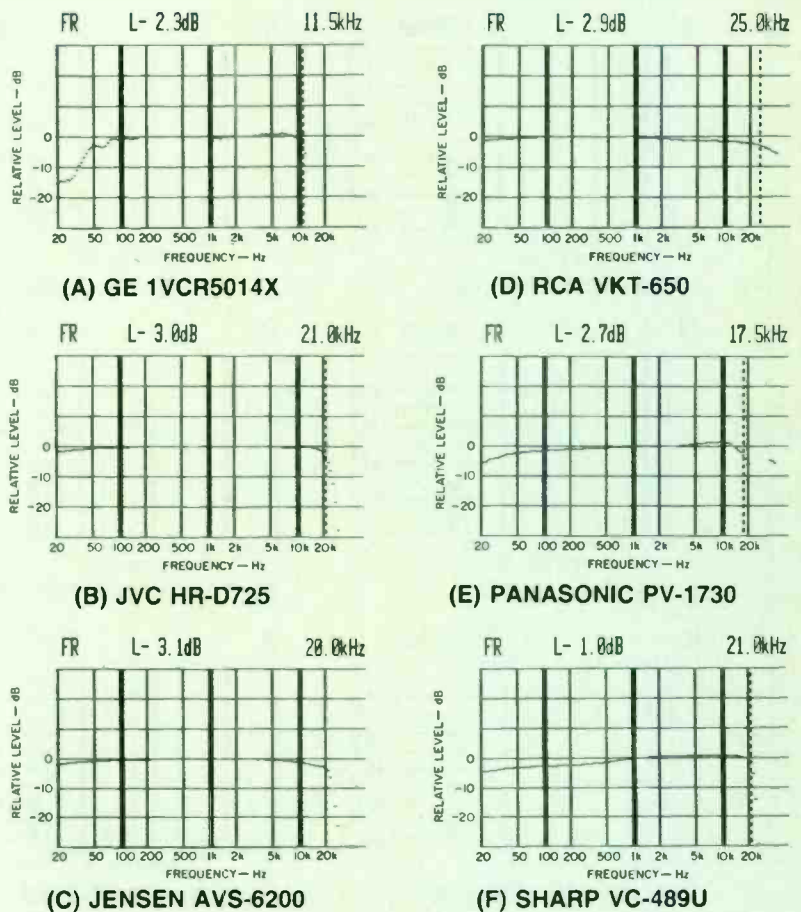
# VHS HI-FI

ing four video heads, the total number of heads on the drum would be six.

The audio signals are recorded by a process which JVC calls "Depth Multiplex." First, the two audio-channel signal carriers (whose frequencies are 1.3 MHz and 1.7 MHz) are recorded deeply into the tape's magnetic coating. Then the video signal, consisting of the luminance signal and the down-converted chrominance signal, is recorded on top of the audio signal in a shallower layer, as illustrated in Fig. 1. The video signal spectrum is identical to that of the regular VHS recording system, with the FM luminance (brightness) signal having a deviation or FM spread of from 3.4 to 4.4 MHz and the chrominance (color) signal modulated on a carrier having its center frequency at 629 kHz. During playback, the FM audio signals in the deep layer of the tape are read through the higher-frequency video information recorded on the surface layer.

Frequency distribution for the chrominance and luminance signals in a conventional VHS recorder is illustrated in the upper diagram of Fig. 2. In the lower diagram, the frequency allocation for the extra two audio signals is depicted separately, and it is clear that the video output-signal frequency spectrum remains exactly the same as it was in a conventional VHS VCR. As a result, video recordings remain perfectly compatible between VHS Hi-Fi and conventional VHS machines. Furthermore, the fixed audio head is re-

Fig. 3—Frequency response at -10 dB indicated recording level.



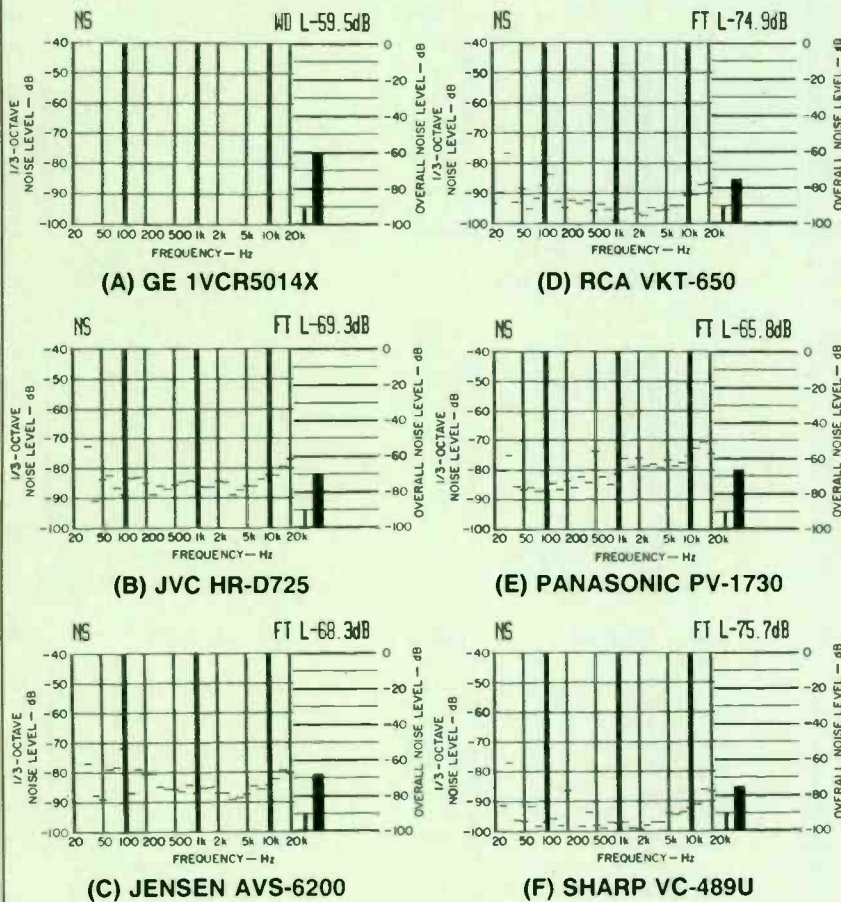
## TABLE I—MEASURED AUDIO PERFORMANCE

Specification	GE 1VCR5014X*	JVC HR-D725	Jensen AVS-6200	RCA VKT-650	Panasonic PV-1730	Sharp VC-489U
Freq. Resp., $\pm 3$ dB	47 Hz-11.5 kHz	20 Hz-20 kHz	20 Hz-20 kHz	20 Hz-25 kHz	24 Hz-18 kHz	45 Hz-21 kHz
S/N, re: "0 dB"	59.5 dB **	69.3 dB	68.3 dB	75.3 dB ***	65.8 dB	75.7 dB
Dynamic Range	60.0 dB	84.3 dB	83.3 dB	81.3 dB	76.3 dB	86.7 dB
2nd HD, 0 dB	0.25%	0.07%	0.05%	0.07%	0.21%	0.28%
3rd HD, 0 dB	0.99%	0.02%	0.02%	0.02%	0.05%	0.07%
Separation, 1 kHz	64.7 dB	53.7 dB	53.7 dB	66.4 dB	61.1 dB	70.1 dB
Wow and Flutter	0.39%	0.004%	0.008%	0.003%	0.1%	0.003%
Simulcast	Yes	Yes	Yes	Yes	Yes	Yes
Audio-Only Able	Yes	Yes	Yes	Yes	Yes	Yes

\*Conventional audio, \*\* With Dolby, \*\*\* Arbitrary 0-dB reference point (see text).

# VHS HI-FI

Fig. 4—Signal-to-noise ratio, re: 0-dB indicated recording level. (GE unit weighted, all others unweighted.)



**Despite predictions that VHS could not match the Beta Hi-Fi system, the VHS Hi-Fi decks I tested for this report performed magnificently.**

tained in the new VHS Hi-Fi setup so that older tapes can be played on any of the new VHS Hi-Fi machines. Conversely, recordings made on a VHS Hi-Fi VCR will include an audio track recorded by this extra stationary head so that audio (either mono, or stereophonic if a split, stationary head is used) is available if the tape is played on a conventional VHS deck.

The presence of the third, stationary audio head lends itself to other applications. For example, in future prerecorded tapes of foreign-language motion pictures, the pair of VHS Hi-Fi heads on the spinning drum might be used to record the original motion-picture soundtracks in stereo, while the "low-fi" stationary head could be used to dub mono or stereo audio tracks in

the local language of the country in which the tape is distributed.

In VHS Hi-Fi, the video heads have azimuth angles of +6° and -6°, while the angles of tilt for the extra pair of audio heads are +30° and -30°. Because of this difference, crosstalk—between audio and video signals and between audio signals on adjacent tracks—is effectively suppressed.

The technical specifications for VHS Hi-Fi read very much like those previously announced for Beta Hi-Fi. Frequency response is flat from 20 Hz to 20 kHz. Dynamic range is better than 80 dB. Harmonic distortion is less than 0.3%. Wow and flutter is a negligible 0.005% or less, and channel separation is greater than 60 dB. Frequency modulation improves the dynamic range of the audio signals, to greater than 60 dB. To further expand this range to the claimed 80 dB, VHS Hi-Fi uses a noise-reduction system which, in JVC's words, "is the most suitable for FM recording and playback." Specific details concerning this extra noise-reduction system have not been disclosed.

## Tests of the Six VHS VCRs

The six VHS machines tested for this comparison report were full-featured models from GE (not a VHS Hi-Fi), JVC, Jensen, RCA, Panasonic, and Sharp. It is no secret that most of the VHS VCRs manufactured in the world are made by a few Japan-based companies. While that is certainly true, it is *not* necessarily true that all of the machines made by a single company for other companies are identical. When a company buys a VCR from a manufacturer and puts its own name on it, that company may well have the OEM (original equipment manufacturer) firm customize the machine with features that the purchasing company feels will make the VCR more salable. Some companies who want to maintain higher levels of quality and lower return rates pay their suppliers more for tighter inspection and quality control during production. I would also like to point out that of the six VCRs I tested, I was careful to select machines that come from at least three different prime manufacturers.

As for the lab tests themselves, us-



# VHS HI-FI

ing my Sound Technology 1500A audio tester, I treated each machine as though it were a high-quality audio tape recorder. I ignored video capabilities entirely, other than to make certain that the VHS Hi-Fi audio recordings did not in any way interfere with picture playback on a video screen. I measured frequency response at nominal -20 dB level, as indicated on each machine's own level meters (Figs. 3A through 3F). I measured unweighted signal-to-noise ratios, relative to each machine's indicated 0-dB recording level (Figs. 4A through 4F). Then I measured third-order harmonic distortion versus recording level, up to +10 dB. In Figs. 5A through 5F, the dotted-line cursor has been set at 0 dB to measure third-order distortion at that point. In Figs. 6B through 6F, the cursor has been set at the signal level where overload (3% distortion) occurs. (There is no Fig. 6A, as automatic level control keeps the GE's signal level from reaching the 3%-distortion point.) In order to reach this high distortion level, it was necessary to raise the "0-dB" reference on the graphs by 10 dB for all but the RCA unit; the double vertical bar which normally marks 0 dB therefore marks +10 dB on these graphs. My figures for dynamic range (Table I) are the sum of these headroom figures and my previously obtained S/N measurements.

I also measured second-order distortion (Figs. 7A through 7F) since I found that this type of distortion was generally higher for VHS Hi-Fi machines than was third-order distortion. The cursor in Figs. 7A through 7F has been set to 0 dB to show distortion at that level. Wow and flutter was also measured and plotted (Figs. 8A through 8F), as was channel separation for each of the machines (Figs. 9A through 9F). For ease in comparing the machines, results of all these measurements for all six VCRs are summarized in Table I.

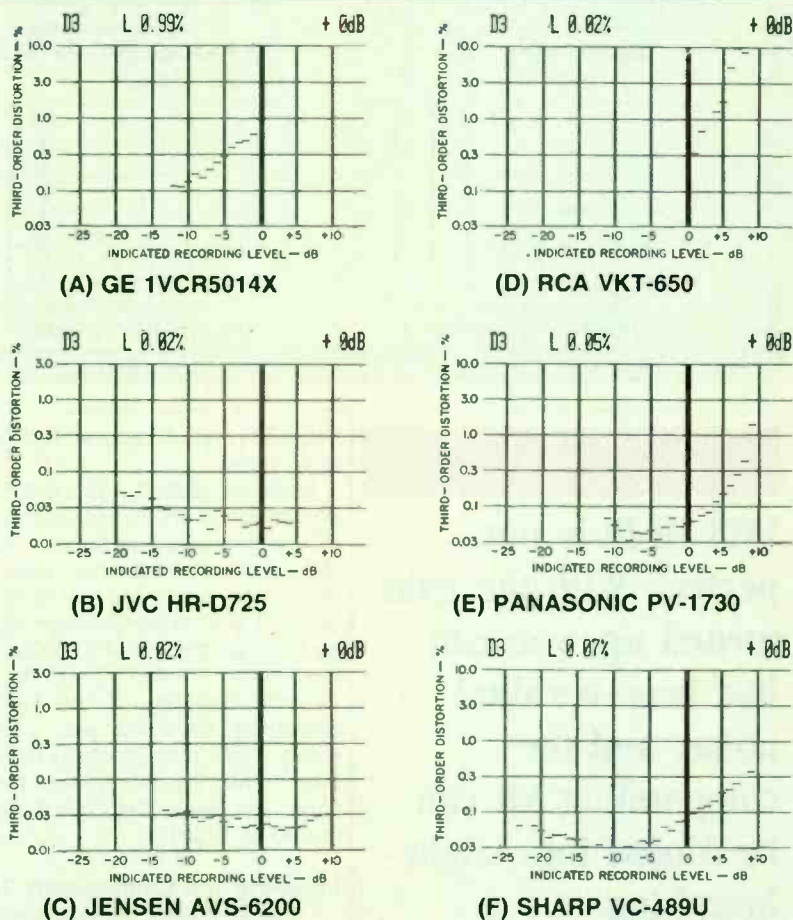
The need for a better audio system than that available from conventional, longitudinal audio tracks of a VCR is clearly apparent when you examine the results obtained for the General Electric model. This unit does quite well as far as signal-to-noise ratio is concerned, thanks to Dolby noise reduction, but its frequency response

(measured at the fastest, SP, speed) leaves much (about an octave) to be desired, as does its distortion level and, perhaps worst of all, its high level of wow and flutter. Notice, too, that dynamic range and signal-to-noise ratio are about equal, indicating little or no headroom above the 0-dB record level. In this case, an automatic level-control circuit acts as a sort of "limiter" to prevent the system from going deeper into tape saturation.

In terms of signal-to-noise ratio, even the poorest performing VHS Hi-Fi unit offered results about 6 dB better than did the non-Hi-Fi unit with Dolby. And as for dynamic range (which is really what counts here), improvement ranged from 16 dB to 26 dB for the five

**The need for a VHS Hi-Fi system is clearly apparent when you compare performance of video decks with Hi-Fi and those with conventional audio.**

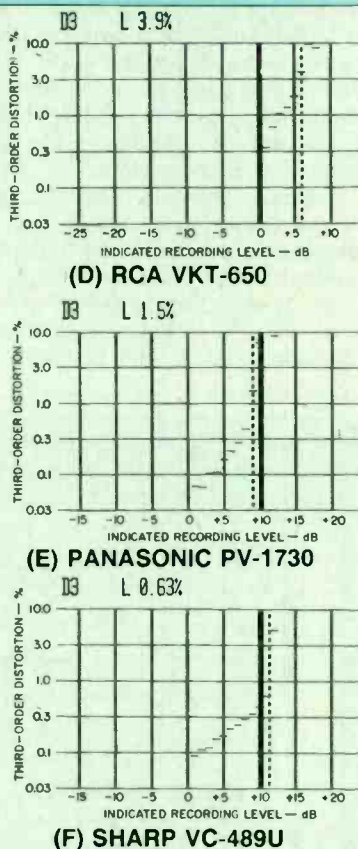
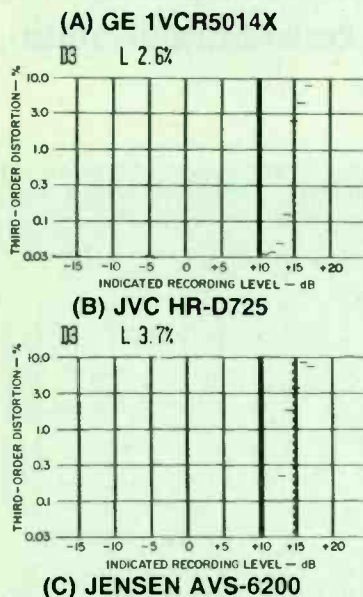
Fig. 5—Third-order distortion vs. indicated recording level, with cursor marking 0-dB point. (Note shifting scales.)



# VHS HI-FI

Fig. 6—Third-order distortion vs. indicated recording level at approximate 3%-distortion point (effective headroom limit). Note that double bar indicates +10 rather than 0 dB here, except for the RCA unit. Figures given for each model are headroom limits, to nearest full dB: (A) GE (not shown, see text); (B) JVC, +15 dB; (C) Jensen, +15 dB; (D) RCA (note 0-dB point), +6 dB; (E) Panasonic, +9 dB; (F) Sharp, +11 dB.

ALC circuit prevents overload. Headroom was therefore not measurable for GE unit.



**VHS Hi-Fi is not perfect. With the gain turned up, you can just hear residual noise, and the companding NR can be fooled into slight breathing.**

VHS Hi-Fi units compared with the non-Hi-Fi model.

While separation was more than adequate for all machines (including the GE model), wow and flutter of the non-Hi-Fi unit was intolerably high—nearly four times as high as that of the poorest Hi-Fi VCR and more than 100 times as high as the 0.003% measured for the best of the Hi-Fi units. As for frequency response of the Hi-Fi units measured, all of the results were flat within 3 dB from 20 Hz to better than 20 kHz, with the exception of the Panasonic unit. Its -3 dB cutoff point occurred at 18 kHz.

#### Listening and Compatibility Tests

I made several musical recordings using all five of the VHS Hi-Fi machines

and was able to play all of them back with complete compatibility on four of the five machines. The RCA unit gave me some problems with some tapes, while it tracked others perfectly. I also played a couple of prerecorded VHS Hi-Fi tapes and the same results were obtained. Again, the RCA had some difficulty, which I can only attribute to alignment problems. This unit did play back recordings made on it perfectly, however. The remaining four VHS Hi-Fi units showed no preference for their own tapes over those made on other machines, playing all of the tapes back with equally high fidelity, low wow and flutter and almost imperceptible background noise levels. The easiest way to convince yourself of the benefits of VHS Hi-Fi is to simply switch back and forth between the conventionally recorded (longitudinal) audio tracks and the FM (VHS Hi-Fi) tracks on any VHS Hi-Fi machine. I couldn't help thinking that perhaps the inventors of VHS Hi-Fi had two purposes in incorporating the stationary audio head and longitudinal tracks on these new machines. The first, of course, was for compatibility. The second may well have been to show prospective purchasers just how great an improvement VHS Hi-Fi offers over the conventional low-fi audio tracks of ordinary VCRs.

#### Six Audio Channels—If You Want Them

While I was testing and evaluating these VHS Hi-Fi units, *Audio Associate* Editor Bert Whyte pointed out something that had not immediately occurred to me. With a VHS Hi-Fi unit, it is possible to record six completely independent audio channels on videotape. Here's how. First, you hook a PCM processor up to a VHS Hi-Fi VCR's video input and output, while feeding two audio channels to the input of the PCM processor. Then you feed another pair of audio channels to the two hi-fi audio inputs of the VHS Hi-Fi VCR. Finally, after you make your recording, you can wind back the tape and do an audio *overdub* onto the deck's conventional longitudinal audio tracks. The reason this works, of course, is because the PCM processor's signal looks, for all the world, like a video signal. Since any "video" signal can be superimposed on the VHS Hi-Fi audio tracks,

they can be recorded along with the digital audio. Finally, the other two tracks go where the audio always went—on the low-fi longitudinal audio tracks. Just think about the possibilities with this six-track arrangement. It's fantastic—and it works. I tried it as soon as I finished my telephone conversation with Bert!

## Video Features

While it was not the purpose of my tests to evaluate video performance as such, I did feel that it would be useful to discuss some of the more usual video-related features of each machine so that you can compare them. These features, and their availability on each machine, are summarized in Table II. In case you are not familiar with some of them, here's a brief explanation.

Number of programmable events refers to the number of recording events that can be prescheduled on the machine. One of the chief virtues of a VCR is its ability to "time-shift," allowing you to record programs while you are away or otherwise engaged. The number "8" in Table II, for example, means that you can set up the machine to record eight separate events for specific periods of time, providing the tape doesn't run out.

Programmable period refers to the number of days in advance that the programming can be scheduled. Some machines allow you to program over only the ensuing 24-hour period, some for a week in advance, some for two or three weeks, and, believe it or not, the RCA VCR I tested lets you program for unattended recording one full year ahead (for those who take very long vacations, I suppose).

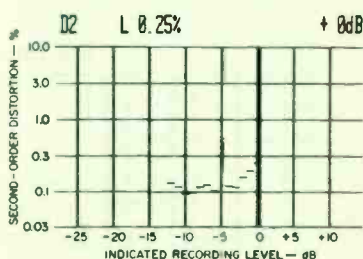
Slow motion is one of the special effects possible on many late-model machines, along with still-frame or freeze-frame viewing. It allows you to play back pictures at slower than normal speeds (or frame by frame) for close examination of picture content, particularly fast-action sequences. Viewable speed search, on the other hand, allows you to shuttle forward or backward at rapid speeds while simultaneously viewing the picture on the screen. It is analogous to cue-and-review features found on many audio cassette decks. In most cases, audio is muted during fast video search.

Total TV channels refers to the total number that can be accessed by the TV tuner built into the VCR. Even though a VCR may boast over 100 channels (regular TV channels plus cable channels), this doesn't mean that all those channels are accessible from the front panel. Usually, the panel has 14 or 16 channel-select buttons, each of which can be programmed to tune one of the channels available in your viewing area. If a full-function remote control is supplied with the unit, however, it may incorporate a 10-key numeric keypad which would allow you to access any channel number electronically.

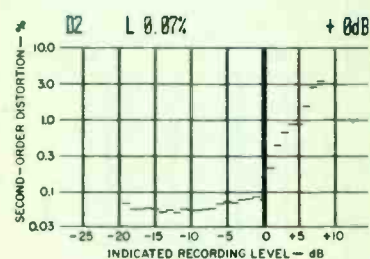
Instant record allows you to quickly get into the record mode by touching a

**The ability to record up to eight hours of high-fidelity program material on a single length of tape is certainly a plus.**

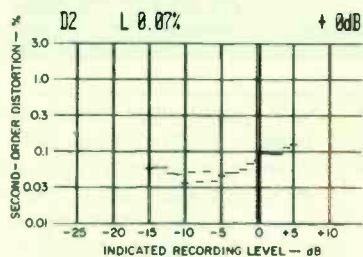
Fig. 7—Second-order distortion vs. indicated recording level, with cursor marking 0-dB point. (Note shifting scales.)



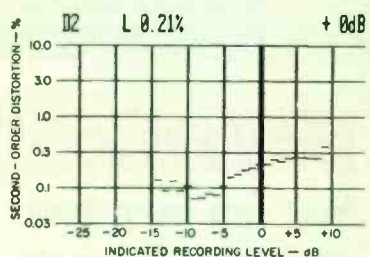
(A) GE 1VCR5014X



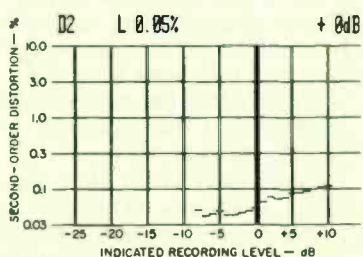
(D) RCA VKT-650



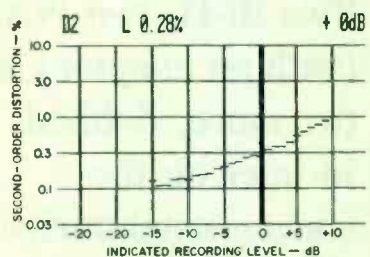
(B) JVC HR-D725



(E) PANASONIC PV-1730



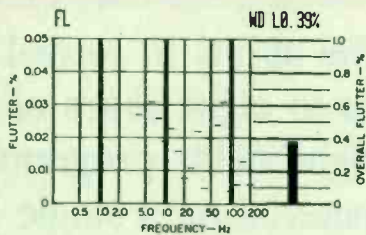
(C) JENSEN AVS-6200



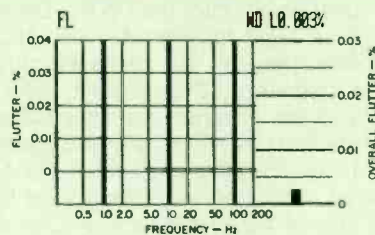
(F) SHARP VC-489U

# VHS HI-FI

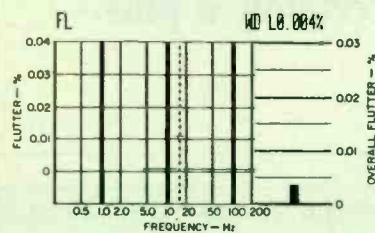
Fig. 8—Wow-and-flutter analysis. (Note shifting scales.)



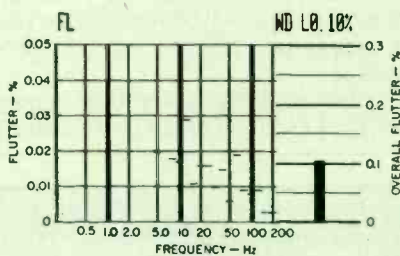
(A) GE 1VCR5014X



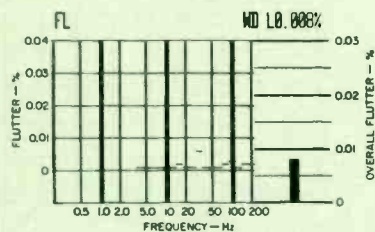
(D) RCA VKT-650



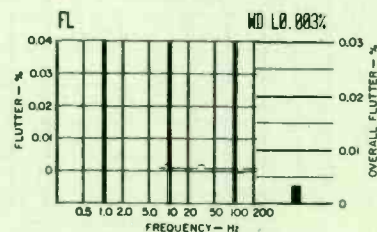
(B) JVC HR-D725



(E) PANASONIC PV-1730



(C) JENSEN AVS-6200



(F) SHARP VC-489U

**You can even have six audio channels: Two Hi-Fi, two PCM (with an adaptor), and two more, dubbed in later on the conventional tracks!**

single pushbutton. Recording then proceeds for 30 minutes, or for several 30-minute increments if you touch that switch more than once. The feature is useful if you are watching a TV program and suddenly decide that you'd like to preserve it on tape. You don't have to go through the lengthy conventional programming procedure, but can punch in the "instant record" button and then walk away from the set, confident that the machine will turn itself off after the specified number of 30-minute increments.

Most Beta VCRs offer Beta II and Beta III speeds. Many will play back videotapes made in the now-antiquated Beta I speed. VHS utilizes three recognized tape speeds: SP (Standard Play), LP (Long Play), and EP (Extra

Play). A T-120 cassette tape will record or play for two hours at the SP speed, four hours at the LP speed and six hours at the EP speed. T-160 tapes are also available and will provide up to eight hours of recording in the SP speed. Since VHS Hi-Fi audio performance is essentially the same at all operating speeds, you can record up to eight hours of high-quality stereo sound on a single videocassette using this new technique. That's more than you can record on a single tape in any cassette deck or, for that matter, on any open-reel machine operating at speeds of 7½ or 15 ips!

Auto tape rewind, program cueing, and memory rewind should all be familiar to audio enthusiasts, since they are completely analogous to features found on many audio cassette recorders. Auto tape rewind rewinds the tape at end of play. Program cueing allows you to access the start of the next program on the tape. Memory rewind causes the tape to be rewound to the 0000 point on the tape counter.

Video insert is really possible on all VCRs. It simply means being able to record new video scenes over old ones. Where it is listed as a special feature, however, the manufacturer has incorporated video insert in such a way as to eliminate the "noise bars" that usually accompany such video overdubbing. However, video inserts will erase the Hi-Fi audio track, and overdubbing Hi-Fi sound will erase the video, since both are essentially part of the same composite video signal. You can still use the conventional audio tracks after a video insert, and some decks let you overub those tracks. Of course, you can always re-record everything at once.

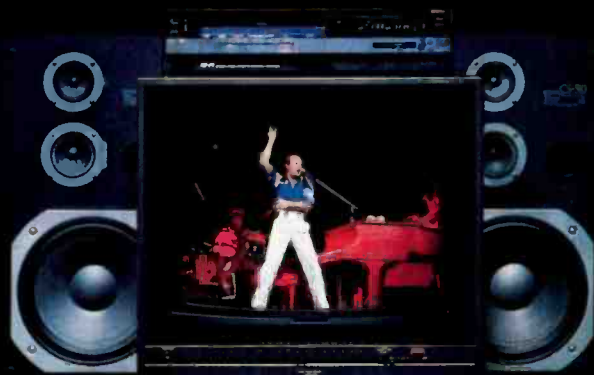
## Conclusions

Lest you think that VHS Hi-Fi is going to offer competition to digital tape recording, let me say that the audio reproduction that I heard using VHS Hi-Fi tapes (those I made and those that were prerecorded) is *not* "perfect." During very quiet passages of music, with my volume control set at the rather high level I prefer, you can still hear just a bit of residual noise. Then, too, remember that the VHS Hi-Fi system uses a special type of companding to

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**Q** Why do I need Hi-Fi video tape?

**A** The critical demands of today's sophisticated and complex Hi-Fi VCRs require a video tape of equal sophistication. This video tape must be virtually free from dropouts and jitters, have unsurpassed particle density, and deliver unparalleled uniformity and stability in picture and sound quality. Additionally, the cassette transport mechanism must be unerringly precise to insure proper transferring of the Hi-Fi audio, video, and control signals.

**Q** Why has TDK developed such a tape?

**A** As the world leader and innovator in home video tape, we knew it was our responsibility to develop the highest quality VHS and Beta video cassettes that would be completely compatible with any Hi-Fi VCRs. Just as we developed a video tape that made six-hour VCRs a reality. And with almost 50 years of magnetic media technology behind us, we knew that we could develop a TDK Hi-Fi video tape that would

deliver the kind of high-quality performance that has become synonymous with our name.

**Q** How is TDK Hi-Fi Video Tape able to deliver such a critical performance?

**A** For a tape to deliver excellent audio/video reproduction, it must have—among other factors—excellent signal-to-noise ratios in both chrominance and luminance. TDK has accomplished this by developing new super-refined, Super Avilyn magnetic particles that are thinner, shorter and more uniform than any others currently available. This allows them to be packed more densely for improved audio/video performance.

**Q** Can you be more specific?

**A** Our technical specifications show the benefits: Video S/N +4.5dB, chroma +5dB, audio frequency response +2dB, and sensitivity +1dB, compared to our Standard Reference tape. All of this adds up to crystal clear, life-like color reproduction. And with an audio frequency response of 20-20,000 Hz, plus total harmonic distortion of under 0.3% at 7 kHz, you've got to see and hear TDK Hi-Fi on your new Hi-Fi VCR to believe it.

**Q** What else should I know?

**A** In addition, TDK developed a new high density/durability binder system which facilitates optimum particle dispersion and delivers the lowest dropout rate in its class. Our ultra-smooth/flat base film and high-conductivity back coating, in conjunction with our super-precision-made SQ shell mechanism (built to tolerances 2.5 times higher than industry standards), provide for the smoothest running performance of any video cassette designed for Hi-Fi VCRs.

**Q** Can I use TDK Hi-Fi tape for special digital sources?

**A** Yes. Because of its surface smoothness, superior signal-to-noise ratios and its low modulation level, combined with an ultra-low dropout count, TDK Hi-Fi is ideal for PCM digital recording. With TDK Hi-Fi's unique features, PCM recordings can achieve their full potential.

For the finest in Hi-Fi VCR and PCM enjoyment, there's no better video cassette than TDK Hi-Fi.

**TDK**  
Don't just tape it. TDK it.

# VHS HI-FI

## TABLE II—AVAILABLE FEATURES

Feature	GE 1VCR5014X	JVC HR-D725	Jensen AVS-6200	RCA VKT-650	Panasonic PV-1730	Sharp VC-489U
No. of Programmable Events	8	8	8	8	8	8
Programmable Period (Days)	21	14	14	365	14	14
Slow Motion	Yes	Yes	Yes	Yes	Yes	Yes
Viewable Speed Search	Yes	Yes	Yes	Yes	Yes	Yes
Total Channels (TV + CATV)	139	139	139	133	139	139
Instant Record	Yes	Yes	Yes	Yes	Yes	Yes
Tape Speeds (R/P)	SP/LP/EP	SP/EP	SP/LP/EP	SP/LP/EP	SP/LP/EP	
Auto Tape Rewind	No	Yes	Yes	Yes	Yes	Yes
Memory Rewind	Yes	Yes	Yes	Yes	Yes	Yes
Program Cueing	No	Yes	Yes	Yes	Yes	Yes
Video "Insert"	No	Yes	Yes	Yes	Yes	Yes
Remote Control	Yes	Yes	Yes	Yes	Yes	Yes

get it up to that 80 dB-plus level of dynamic range. As with almost any companding system (and this happens to be a very good one), there are times when the system can be tricked. When that occurs, you can hear some slight breathing and pumping. A very severe test (which I tried) consisted of recording the sound of a bunch of jangling keys on VHS Hi-Fi videotape. This program material is about the most severe test to which you can subject any recording medium. Although the playback results were better than I have obtained using many cassette decks and even some top-grade open-reel recorders, they were still far from perfect.


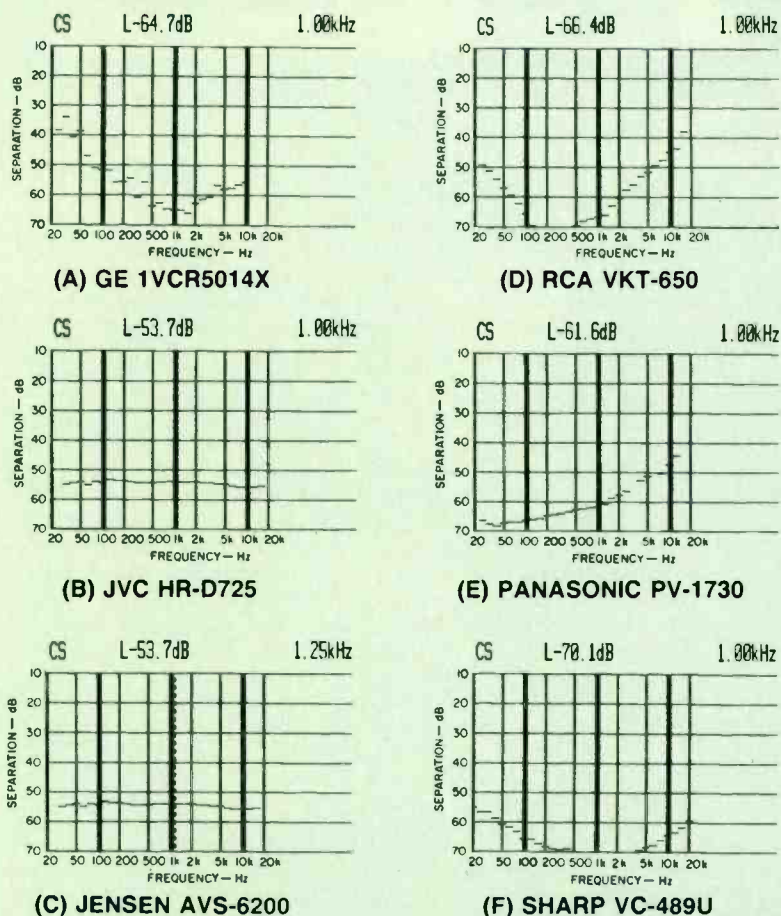
The ability to record up to eight hours of high-fidelity program material on a single length of tape is certainly a plus in favor of VHS Hi-Fi. And while the performance and sound is not quite as good as might be obtained with a digital PCM processor operating with a VCR for audio-only recording, remember that you've got a picture being recorded here at the same time! Sound quality for all of the hi-fi equipped machines was *better* than that obtained with LaserVision video-discs (which, themselves, are noted for good sound and excellent fidelity). In short, VHS Hi-Fi is the only way to obtain sound on videotape recordings that is good enough to listen to using a top-grade component system and a fine pair of loudspeakers—the only way, that is, besides Beta Hi-Fi. 

Fig. 9—Channel separation vs. frequency.





GX-N7

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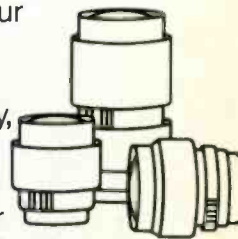


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**THE NEC VC-N895EU VHS HI-FI VCR.** This state-of-the-art VCR's features include true hi-fi audio; a 139 channel, CATV-ready PLL Quartz tuner; 14 day, 8 event programmable timer; 4 heads for clear special effects; stereo recording and playback with Dolby Noise Reduction; segment recording; variable speed control; automatic editing system; picture sharpness control; electronic tape counter and full function infrared wireless remote control.

The Paramount Home Video Videocassettes pictured are \$39.95 each suggested retail price and are supplied courtesy of Paramount Home Video.



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## 1

## NAKAMICHI BX-300 CASSETTE DECK

### Manufacturer's Specifications

**Frequency Response:** 20 Hz to 20 kHz,  $\pm 3$  dB.

**Harmonic Distortion:** Less than 0.9% at 200 nWb/m.

**Signal/Noise Ratio:** 64 dBA; 70 dBA with Dolby C NR.

**Separation:** 36 dB.

**Crosstalk:** -60 dB.

**Erase:** 60 dB at 100 Hz.

**Input Sensitivity:** 50 mV.

**Output Level:** Line, 1.0 V at 2.2 k-ohms; headphone, 5 mW at 8 ohms.

**Wow and Flutter:** 0.027% wtd. rms,  $\pm 0.048\%$  wtd. peak.

**Fast-Wind Time:** 80 S for C-60.

**Dimensions:** 16-15/16 in. (430 mm) W  $\times$  3-15/16 in. (100 mm) H  $\times$  9 7/8 in. (250 mm) D.

**Weight:** 12.3 lbs. (5.6 kg).

**Price:** \$650.00.

**Company Address:** 19701 S. Vermont Ave., Torrance, Cal. 90502.  
For literature, circle No. 90

The BX-300 is the latest addition to Nakamichi's BX series of lower-priced cassette decks. It has several features designed to attract the serious recordist: Three discrete heads; 50-dB, peak-responding meters; Dolby B and C NR; "diffused-resonance" dual-capstan drive, and a dual-speed, electronic fader.

Having three heads, of course, enables off-tape monitoring while recording, and allows the head designs to be optimized for their individual functions. Wide-range, peak-responding meters are really needed to cope with the improved dynamics of such new sources as Compact Discs. Dolby C noise reduction also does a better job of preserving the dynamic range of the source material than does Dolby B NR. Improved transport design brings greater clarity, with lower flutter and modulation noise. And the electronic "Master Fader" of the BX-300 solves the problem of getting both channels of a stereo level control to track each other closely, while its two speeds provide added flexibility in making smooth fades.

Gold designations give the BX-300's black front panel a subdued attractiveness, but require normal to fairly bright room light for easy reading. At the very left are the "Power" switch, "Timer Rec/Play" switch, "Pitch Control" and headphone jack. The "Pitch Control" pot is center-detented, and has a range specified as  $\pm 6\%$  of normal speed. The control is effective in playback only; this prevents off-speed recording, both by accident and on those very rare occasions when it might be desired.

Just to the right are four large, horizontal rocker bars for the main operating functions. From top to bottom, these are: "Rewind/Fast-Forward," "Stop/Play," "Pause/Rec" and "Master Fader" ("Up/Down"). All but the fast-wind bar have LED status indicators—red for recording, green for the rest.

The switching logic permits instant switching from any mode into stop, play or fast-wind modes, but not into recording. Pushing "Rec" puts the deck in record-standby mode, with the transport paused and record-level indicators working; recording only starts when you push "Play" thereafter. Holding in the "Rec" control during recording mutes the signal till the control is released.



The two "Master Fader" speeds are controlled by pressure on the rocker bar. A light tap starts a 4-S fade, while holding the bar in quickens the fade to 2 S. The status lights not only indicate the direction of fade but change brightness as the fade progresses to show what is happening. This control operates only during recording, and all fades are between full off and the limits set by the manual slide pots; there's no way to stop the control halfway. The "Master Fader" performs very well, and most users would probably use it regularly.

The line of controls just to the right of the rocker bars starts with a soft-touch "Eject" control. Below that are the LED-type, four-digit counter ("–999" to "9999") and its associated three controls, the "Reset" button and on-off switches for "Memory Stop" and "Auto Repeat."

The BX-300's counter memory has two useful and unusual features: Fast-winding will stop at "0000" from either direction or will keep going past that point if the fast-wind button is held in, with no need to switch the memory off. The "Auto

Repeat" function rewinds the tape back to its beginning (if the memory switch is off) or back to "0000" (if memory is switched on), replays the tape to its end, then repeats the cycle indefinitely until switched off.

With the cassette compartment door open, access for all tasks is very good; with the door/cover slid off, cleaning is a snap. The three-head configuration and the dual-capstan drive appeared rigid and well constructed. The BX-300 is also typical Nakamichi in offering ready access to the head adjustments when the cover is off. In my view, this makes an important contribution to getting and keeping maximum performance from a deck.

To the right of the cassette compartment are the vertical, LED-ladder level meters and the vertical-slider output- and input-level controls. The level meters cover the range from –40 to +10 dB relative to Dolby level and are peak-responding, both desirable features. Each channel ladder has 10 double-bar segments, with the best resolution (3 dB) between "+4" and "+10"; this seemed too coarse at first, but judgment was reserved for the results during the listening tests. The long vertical travel of the input and output level sliders provides good resolution for easy level setting. The side-by-side positioning and the medium friction of the left and right sliders made adjustments very easy, whether for two-channel or interchannel level changes.

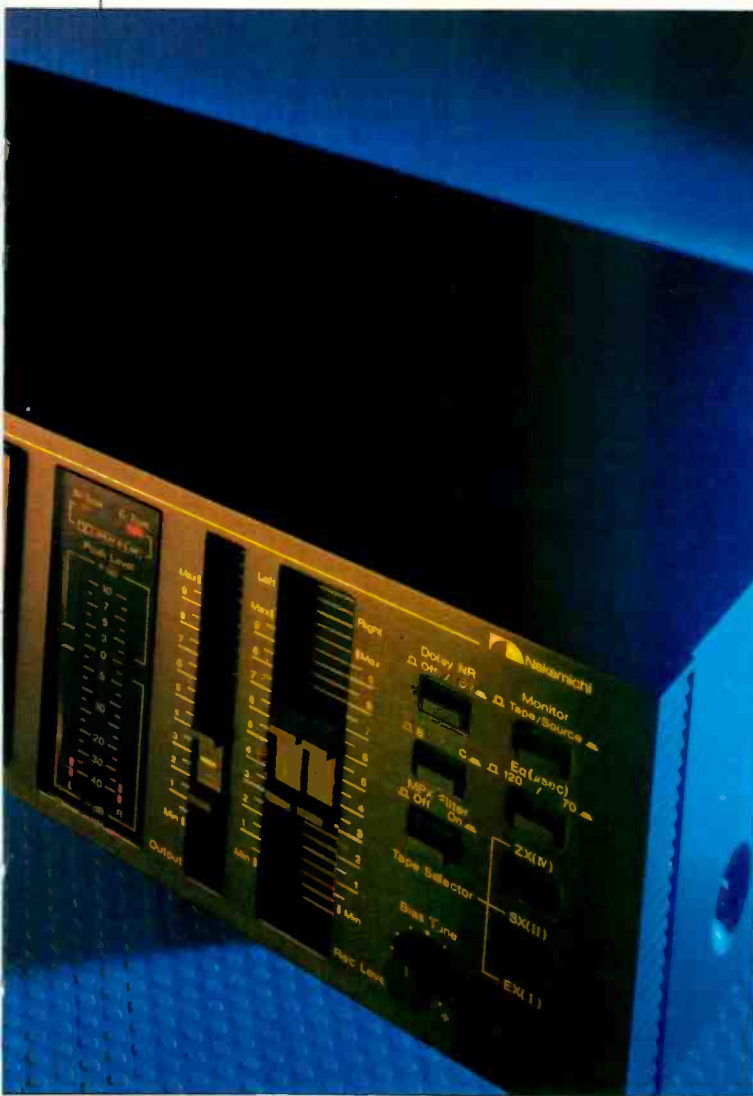
Just to the right are the switches associated with noise reduction: "Dolby NR" ("Off/On" and "B/C") and the multiplex filter. Indicators above the level meters remind the recordist which NR (if any) has been selected. At the bottom is the center-detented "Bias Tune" control, which greatly expands the number of tapes that will give optimum performance with the deck, particularly when Dolby NR is used.

At the very right, starting from the top, are the "Monitor" switch ("Tape/Source"), the "EQ" switch ("120/70") and the interlocked tape-selector buttons for "EX(I)," "SX(II)" and "ZX(IV)." Nakamichi continues to use their own tape-formulation designations for switch labels, but they have now added the IEC Tape Type numbers, which ought to minimize confusion.

The rear panel has line-level input/output phono-jack pairs (as with many modern decks, there are no microphone inputs) and a socket for the optional remote control. A look inside showed that most of the circuitry is on one large, horizontal p.c. board. The card is fairly well supported, but is a bit springy in spots. There are also a few small, vertical cards; the one for the power supply had two pigtail fuses. Most of the interconnections were made with multi-conductor cabling. The parts appeared to be of good quality, and all of them were identified by part number. The transport was quiet in operation, and I judged it to be of good construction. The box-chassis configuration made for considerable rigidity, even more so with the removed cover back in place.

#### Measurements

With the exception of some fringing-response boost at the lowest frequency and a little peak at the highest frequency, the playback frequency responses for both equalizations were within  $\pm 1.7$  dB. Tape play speed was very slightly high, about 0.1% fast. Playback levels seemed to be indi-



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The BX-300's performance was excellent: Outstanding frequency response, very low distortion, and the highest S/N I've measured with Dolby C NR.

cated correctly, as near as one could tell from the limited resolution of the level meters.

With the use of a pink-noise source and a 1/3-octave RTA monitor, the record/playback responses were checked both with and without Dolby C NR for approximately 50 formulations. The "Bias Tune" control was used to get the best responses, which resulted in the best Dolby NR tracking. The results were excellent with many tapes: BASF Pro I Super, Denon DX4, Fuji FR-I, Konica GMI, Maxell UD-XL I, PD Magnetics Tri-Oxide Ferro HG and TDK AD for the Type Is, and BASF Pro II Chrome, JVC DA1, Maxell UD-XL II and XL II-S, PD Magnetics 500 Crolyn HG, Scotch XSII, Sony UCX, TDK SA, SA-X and HX-S, and Yamaha CR for Type IIs. (The deck did not have quite enough bias to match Yamaha CR-X.) With the Type IV metal tapes, the best matches came with Fuji FR Metal, Maxell MX, Memorex Metal IV, PD 1100 Metal, Realistic Supertape Metal, Sony Metallic, TDK MA and Yamaha MR. (The minimum bias setting in the Type IV position was too high for metal tapes from BASF, Denon, Konica, Loran and Magnex.) The BX-300 showed the best Dolby C NR tracking among a large number of tapes for any deck tested to date.

All of the following detailed tests utilized the three Nakamichi formulations supplied with the unit. Because of the results of some previous special tests on Dolby C NR tracking, I made all record/playback responses with pink noise, limited to a band from 15 Hz to 27 kHz. Responses made with a swept sinusoid show "errors" that do not exist with music or music-like signals. Figure 1 shows the record/playback responses for the three formulations, with and without Dolby C NR, both at Dolby level and 20 dB below that. All of the responses are very flat, and the Dolby C NR tracking is excellent in all cases. Take note of the fact that the responses are more extended at 0 dB with Dolby C than without. Table I lists the -3 dB limit points found with a sine-wave test signal. They are all excellent, reflecting the flatness shown in Fig. 1.

Table II lists the results from several record/playback

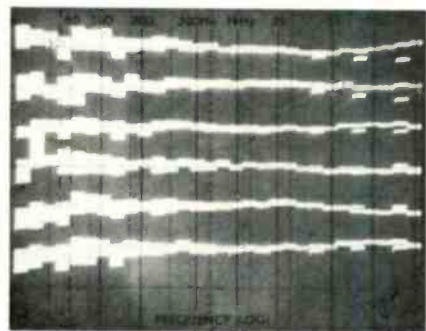


Fig. 1—Record/playback responses with (solid trace) and without (dashed trace) Dolby C NR. From top to bottom: Nakamichi EXII (Type I) tape at Dolby level,

Nakamichi SX (Type II) tape at Dolby level, Nakamichi ZX (Type IV) tape at Dolby level, EXII at -20 dB, SX at -20 dB, and ZX at -20 dB. (Vertical scale: 5 dB/div.)

Table I—Record/playback responses (-3 dB limits).

Tape Type	With Dolby C NR				Without Dolby NR			
	Dolby Lvl		-20 dB		Dolby Lvl		-20 dB	
	Hz	kHz	Hz	kHz	Hz	kHz	Hz	kHz
Nakamichi EXII	12.3	19.6	11.6	21.3	12.2	11.9	11.4	21.6
Nakamichi SX	14.1	19.7	13.2	21.1	13.9	11.3	12.4	22.0
Nakamichi ZX	12.2	21.1	14.1	21.1	12.6	15.4	12.7	21.9

Table II—Miscellaneous record/playback characteristics.

Erasure At 100 Hz	Sep. At 1 kHz	Crosstalk At 1 kHz	10-kHz A/B Phase Error	Jitter	MPX Filter At 19.00 kHz
60 dB	63 dB	-87 dB	15°	15°	-34.3 dB

Table III—400-Hz HDL<sub>3</sub> (%) vs. output level (0 dB = 200 nWb/m).

Tape Type	NR	Output Level						HDL <sub>3</sub> = 3%
		-10	-8	-4	0	+4	+8	
Nakamichi EXII	Dolby C	0.10	0.14	0.24	0.50	1.8		+5.7 dB
Nakamichi SX	Dolby C	0.07	0.13	0.32	0.95	3.0		+4.0 dB
Nakamichi ZX	Dolby C	0.04	0.08	0.14	0.27	0.60	1.7	+10.3 dB

tests, and these figures are all excellent, too. The phase and jitter figures are among the best I have ever measured, and the multiplex notch was exactly at 19.00 kHz. The bias in the output during recording was very low, bettered by very few decks. "Bias Tune" varied level at 10 kHz from +3.5 dB (minimum bias) to -1.7 dB (maximum bias) relative to flat response with SX (Type II) tape.

Third-harmonic distortion (HDL<sub>3</sub>) was measured for all three tapes from 10 dB below Dolby level to the point where the 3% distortion limit was reached (Table III). I call attention to the fact that the levels listed are the *output* levels. In the past, I had used record levels, as the recordist would see them in "Source." Because of compression at the higher recording levels, however, the output levels—as would be seen in "Tape"—are slightly lower, perhaps a dB or more at the 3% limit. The figures for SX are fairly good, those for EXII are better at the higher levels, and the performance with ZX is really excellent over the entire level range.

The signal-to-noise ratios for the three tapes, with and without Dolby C NR and with both IEC A and CCIR/ARM weightings, appear in Table IV. The results are consistently impressive, including those for the Type I tape. The metal tape, ZX, really shines here and in Table III, demonstrating that the BX-300 cassette deck takes full advantage of metal tape's superiority.

Further evidence along these lines is shown in Table V, which presents distortion versus frequency. The distortion figures are fairly low across the band, even at 0 dB. At -10 dB, distortion was difficult to measure at a number of points because it was so low—0.03% or less, which is 80 dB or more below the 200 nWb/m reference level.

Table VI lists various input and output characteristics measured at 1 kHz. The line-input impedance of 77 kilohms was measured with the slider two-thirds up. With the slider all the way up, the impedance dropped to 24 kilohms, still

This new addition to the Nakamichi line is now their lowest-priced three-head cassette deck and is a strong performer.

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

Tape Type	IEC A Wtd. (dBA)				CCIR/ARM (dB)			
	W/Dolby C NR		Without NR		W/Dolby C NR		Without NR	
	@ DL	HD=3%	@ DL	HD=3%	@ DL	HD=3%	@ DL	HD=3%
Nakamichi EXII	67.0	72.7	50.0	55.7	67.9	73.6	47.4	53.1
Nakamichi SX	71.3	75.3	54.5	58.5	72.4	76.4	52.0	56.0
Nakamichi ZX	69.7	80.0	53.2	63.5	71.1	81.4	50.8	61.1

**Table V—HDL<sub>3</sub> (%) vs. frequency with Dolby C NR.**

Tape Type	Level	Frequency (Hz)						
		50	100	400	1k	2k	4k	6k
Nakamichi ZX	0 dB	0.16	0.21	0.27	0.24	0.24	0.40	0.63
	-10 dB	0.06	0.11	0.04	0.03	0.03	0.02	0.02

**Table VI—Input and output characteristics at 1 kHz.**

Input	Level		Imp. Kilohms	Output	Level		Imp. Ohms	Clip (Re: Meter 0)
	Sens.	Overload			Open Ckt.	Loaded		
Line	48 mV	>31 V	77	Line Hdphn.	994 mV 1.0 V	850 mV 610 mV	2.1k	+16.2 dB 32

plenty high enough. The load for the headphone tests was 50 ohms; with the load at 8 ohms the output was 5 mW, matching Nakamichi's specification. Just holding the two channel knobs together, I was able to make a fade down from maximum for over 65 dB before the channel levels differed by more than 1 dB. The two sections of the output-level slider stayed within 1 dB for more than 80 dB down from maximum—certainly the best that I can remember. The output polarity was the same as the input in "Tape," but it was reversed in "Source." "Master Fader" times were 2 S and 4 S, as specified.

Tests on the LED-ladder meters gave imprecise results because of the poor resolution of the steps, and readings of "-9" (?), "-5," "0," "+4," "+7" and "+10" seemed too far apart in this important level region. The "-40" double-segments were always illuminated, and the first turn-on for "-30" was actually at about -27 dB, relative to zero turn-on. The other thresholds corresponded more closely to the scale markings, and the highest ones were very accurate. The meters' -3 dB points could not be read directly, but they were at about 22 Hz and 20 kHz. The response time of the meters was plenty short enough to meet peak-meter requirements, and the 1.6-S decay time was also to standard. The meters showed true peak detection with a test tone burst given a negative d.c. offset, but did not do so with a positive offset.

Using the supplied Nakamichi test tape, I measured flutter in playback to be 0.022% weighted rms and  $\pm 0.035\%$  weighted peak. In record/playback, the flutter was 0.028% weighted rms and  $\pm 0.043\%$  weighted peak with some cassettes, but slightly above specification at 0.035% weighted rms and  $\pm 0.055\%$  weighted peak with others, extremely good in any case. I detected no change in play speed (less than 0.01%) with line voltage anywhere from 110 to 130 V. Momentary speed variations were less than

$\pm 0.01\%$ . The fast-wind times for a C-60 cassette averaged 64 S, typical for many decks and much less than the 80 S specified. The pitch control, effective in play mode only, could set speed anywhere from -6.6% to +7.3% of normal tape speed, providing just a little more than a semitone (5.9%) in each direction. All changes in mode, including run-out to "Stop," required 1 S or less. Loose-loop take-up was actuated with each closing of the cassette compartment door.

### Use and Listening Tests

The owner's manual is basic and straightforward, rather undetailed, but there are good comments on setting bias and cleaning. The pushbutton switch action felt good, but at least medium-level lighting was needed to be certain of which selection had been made. I liked the rocker-bar transport switches, but I did feel a little frustrated, on occasion, when I couldn't punch in "Rec" from play or pause mode. Holding in "Rec" for record-mute was certainly easy, and it seemed natural after a couple of times.

I had some doubts about the ease of setting levels because of the low resolution of the meters, but the nature of music, and the way the meter segments' intensity varied with the dynamics of the performance, fairly well obscured the indication-level jumps. Peak holding would have been nice, but there was really nothing to fault in the meter dynamics.

Listening tests were run primarily with pink noise for NR-tracking checks and with dbx-encoded records from Sine Qua Non and Chalfont. As expected, the tracking was excellent over a wide range of levels. In setting levels for recording from records, I spent some time listening at very high levels—far above normal—to see where I would set maximum levels on the basis of a heard-distortion limit. I concluded that, for my ears, I had to keep even the shortest peaks from reaching the indications associated with the 3% limits measured earlier. All three tape types provided excellent sound, although the high-level limit was most obvious with SX. I thought the piano sound to be excellent in playback. In a recording of Ravel's "Bolero" (Morton Gould and the London Symphony Orchestra, Chalfont SDG301), there was a very slight loss in the impact of the tympani near the end of the piece, but this was only with the recording level on the high side and the listening level even more so.

The BX-300 is a very worthwhile addition to Nakamichi's BX series. Aside from a few special features, such as the "Master Fader," it does not have a collection of micro-processor-controlled conveniences for its medium-high price. Instead, it offers a number of things that the serious recordist will find more important: Outstanding record/playback responses with Dolby C NR with a number of different tapes, very low distortion (especially with metal tape), the highest signal-to-noise ratio (80.0 dBA) measured to date with Dolby C NR, and very low flutter. Mention should be made of the pitch control, the bias trimmer, the excellent level sliders and the wide-range peak-responding meters—quite good in practice, despite my criticisms. In its general price range, the BX-300 is unequalled when performance is the criterion. On this basis, it is worthy of comparison with any other deck at any price.

Howard A. Roberson

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## 2

## AUDIBLE ILLUSIONS MODULUS PREAMPLIFIER

### Manufacturer's Specifications

**Frequency Response:** 2 Hz to 100 kHz, +0, -1 dB.

**Maximum Output:** 55 V at 1% THD into 100 kilohms.

**THD:** 0.2% at 2 V into a 50-kilohm load.

**Phono Input Sensitivity:** 0.45 mV for 0.5 V output at 1 kHz.

**Phono Input Overload:** 1.2 V rms at 1 kHz.

**Phono Input Impedance:** 47 kilohms shunted by 100 pF.

**Phono-Section Gain:** 30 dB at 1 kHz.

**S/N Ratio:** 70 dB, IHF A-weighted, for 10-mV signal at phono inputs.

**High-Level Sensitivity:** 16 mV for 0.5 V output.

**Slew Rate:** 25 V per  $\mu$ S.

**Overall Gain:** 60 dB.

**Weight:** 9½ lbs. (4.3 kg).

**Price:** \$449.00.

**Company Address:** 1266 Leigh Ave., San Jose, Cal. 95126.  
For literature, circle No. 91





The Modulus is a low-cost, three-tube, vacuum-tube preamplifier built with special capacitors, a no-feedback line section, and remote power supply. These features underscore the unit's design goals: A simple circuit topology, sonic purity, and a suggested retail price under \$450. The assembled and tested Modulus has evolved from the company's earlier, inexpensive kit model, the Mini-Mite I, and offers higher gain and a rack-mount panel. For the determined audiophile in search of the best sonics, the Modulus could easily be the lowest-cost component in an "ultimate" system.

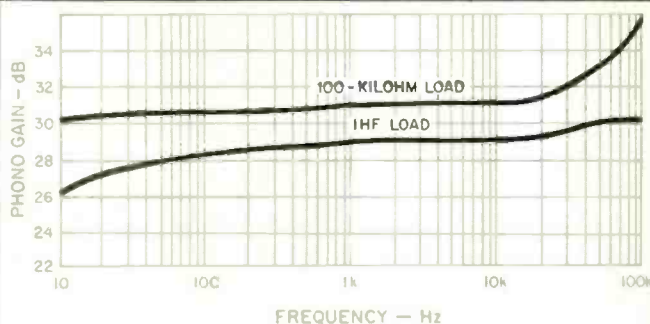
Moderate cost is achieved mainly through simplicity of circuitry and operating controls, a goal in itself for certain audiophiles. The Modulus has only one phono, one high-level and one tape input. Front-panel controls are limited to two large, black volume controls, one for each channel, and four pushbutton switches for "Power," "Phono/Tuner Select," "Source/Tape Select," and "Play/Mute" (a useful function, with separate volume controls). External switching would be necessary if one were to use more than one high-level source, such as a CD player and a tuner. The three 6DJ8 vacuum tubes comprise the Modulus's only active circuit devices in the audio path, further emphasizing its simplicity.

The preamp has two sections, the audio control module and a small, cubical, remote transformer unit with a 28-inch, nondetachable, four-conductor cord. The separation protects the unit's phono circuitry from transformer-induced hum. The control unit's aluminum, U-shaped chassis has an interlocking, U-shaped cover with ventilation slots to promote tube cooling. The cover is held on by four machine screws and threaded inserts. Although the sharp-edged, carefully milled 19-inch front panel is rack-mount length, it has a nonstandard 3-inch height. The Modulus's single, epoxy-glass p.c. board is well supported from the chassis bottom by eight threaded standoffs. Six pairs of input and output phono jacks (tape, tuner, and phono inputs, tape out and two pairs of main outputs) are in a line along the board's rear edge and emerge through matching holes in the rear panel. The circuit board has double-sided traces and component-designator silk-screening. Assembly quality and soldering is excellent, with no flux remaining on the board.

The quality of circuit-board components is high. Parts include Resista metal film resistors and Wonder Caps, well known to audiophiles. Some of the film capacitors paralleling electrolytics appear to have been afterthoughts, since there are no pads for them on the p.c. board. Each volume control is actually a dual-element (i.e., stereo) control, with only one section being used. Low-capacitance shielded cables connect these dual volume pots to the circuit board, but the shields, curiously, have been left unconnected at both ends.

#### Circuit Highlights

Circuit topology is simple and straightforward. Each phono preamp has two common-cathode stages, with overall negative feedback providing the RIAA equalization. By setting the phono gain (as measured at the tape outputs) to a low 29 dB and taking advantage of the high output swing available from the 260-V plate supply, the Modulus can



**Fig. 1—RIAA equalization error, for 100-kilohm and IHF loads. Note how the IHF load reduces overall output, especially at low frequencies.**

accommodate 0.85 V phono input and supply over 25 V to the tape out jacks. This output "headroom" is far in excess of the overload points of any amplifier or tape deck input. The relatively low gain of the Modulus's phono section (compared to the 34 dB or more of most preamps' phono sections, measured at the tape outputs) means that an external step-up device, either pre-preamp or transformer, must be used to interface most moving-coil cartridges.

The line-section amplifier uses each side of one dual-triode 6DJ8 in a common-cathode configuration with no feedback. To compensate for the relatively low phono gain, the line stage is run with a slightly higher-than-usual 23 dB of gain. This unusual gain structure was evident during use by one author whose fixed-output CD player was 15 dB louder over the speakers than his moving-magnet phono cartridge. Matching line levels to a high-output moving-coil cartridge produced a greater disparity. The volume controls had to be set to the 8:30 position (-35 dB attenuation) for the CD signal and to 2:30 (-5 dB attenuation) for the phono signal. Because there is no buffer at the tape outputs, the phono signal at that point was low. The unit inverts polarity in the high-level section, but not in phono.

The power supply features a solid-state, high-voltage regulator used with a minimum of filter capacitance. The manufacturer believes that a "fast" active regulator is sonically better than a large filter capacitor for supplying transient current needs. At first glance, one might not think a regulator was needed, since this single-ended, Class-A circuit has almost constant current requirements, regardless of signal level. Perhaps the regulator is used to reduce the subsonic "breathing" which tends to occur in non-feedback circuits like the Modulus's line stage.

Tube filaments are left on as long as the unit is connected to the a.c. to improve tube life. Turn-on and turn-off pulses are eliminated by connecting the main outputs to ground through reed-relay contacts for 40 S. This circuit does not operate if the owner plugs in the Modulus with its power switch turned on or if there is a temporary power-line volt-

Three-dimensionality, depth of image and spaciousness were remarkable. We began to enjoy the music and forget reviewing.

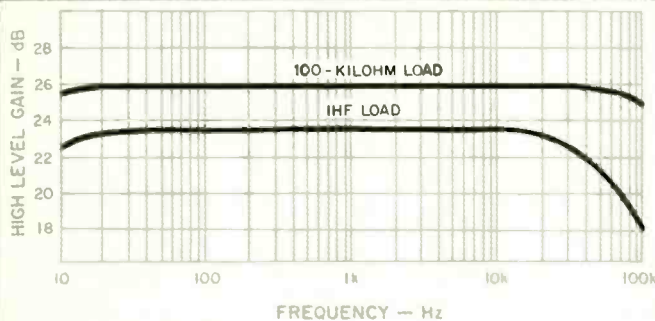


Fig. 2—Frequency response of high-level sections, with 100-kilohm and IHF loads.

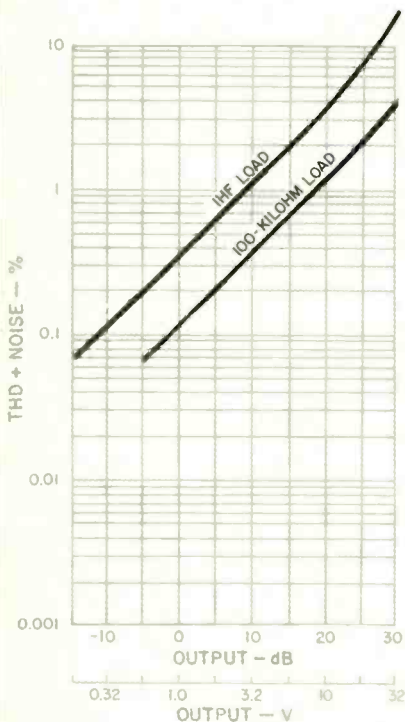


Fig. 3—Total harmonic distortion plus noise vs. output, for IHF and 100-kilohm loads.

age loss. Although the owner's manual warns about these problems, amplifiers and speakers could be damaged by the  $\pm 80$  V pulse we measured at the preamp's main and tape outputs when we suddenly interrupted the power.

#### Measurements

Input sensitivity of the phono stages measured 1.24 mV for 0.5-V output, and the input impedance was 47 kilohms,

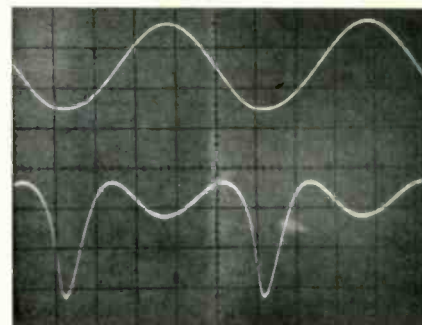


Fig. 4—Distortion analysis (upper curve); distortion products (lower curve) show mainly low-order harmonics, with second harmonic predominant. Input level for 3% THD was 72 V peak-to-peak

with almost 0 pF of capacitance. The A-weighted signal-to-noise ratio for the phono inputs was 74 dB below 5 mV input at 1 kHz.

Following the theory that simplicity preserves sonic purity, the Modulus does not use cathode-follower circuits or transformers to match the high-impedance output of its 6DJ8 tubes to a low-impedance tape deck input via the tape outputs, or to a low-impedance amplifier input via the main output jacks. As a result, several of the measurements proved to be load-sensitive. Figure 1 shows the deviation from true RIAA phono playback response. With the standard 10-kilohm, 1,000-pF IHF load, the Modulus displayed a low-frequency roll-off of 1.8 dB at 20 kHz. This IHF load represents a worst-case situation of combining one or more amplifiers' input impedance with interconnect-cable runs of 20 to 30 feet. With a 100-kilohm test load, approximating ideal-use conditions, the phono section response was a more acceptable +0.4 dB, -0.5 dB deviation from the RIAA curve. Maximum phono input also varied, from 1.48 V with a 100-kilohm load to 849 mV with the standard IHF load, because output swing into the heavier load was reduced.

This load sensitivity could also be seen in the line-section frequency response shown in Fig. 2. The Modulus had a +0, -0.9 dB, 20 Hz to 20 kHz frequency response measured with the IHF load, and  $\pm 0.1$  dB, 20 Hz to 20 kHz response with the 100-kilohm load. The signal-to-noise ratio of this section was 83.5 dB below a 0.5-V input, and its input impedance was 60 kilohms. Output impedance was 3.0 kilohms to tape out from phono, and 5.2 kilohms from main. Overall gain of the unit, phono-in to main-out, measured 52 dB, lower than the 75-dB boost found in those preamps which accept moving-coil cartridges without external step-up devices.

Total harmonic distortion plus noise (as measured by our Amber 3501 Noise and Distortion Measurement System) was, predictably, higher with the standard IHF load, as shown in Fig. 3. THD did not exceed 0.176% in the phono section (to tape out) and was no greater than 0.22% for the

How? With ceramics technology—Kyocera's innovative method of ensuring steady laser tracking—immune to vibrations. The bottom line: total purity of sound.

Why ceramics? They're rigid and inert, so they provide uncommon stability and resistance to mechanical vibrations from audio feedback. They're non-ferrous, so there are no chassis eddy currents to cause electrical hum.

The handsome ceramic-compound resin base of the DA-910 CD player is actually the

chassis—supporting and housing all components and isolating vibration. Resonance from the cabinet is almost non-existent.

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transformer to cut eddy currents, minimize flux leakage and improve voltage regulation. And instead of ferrous

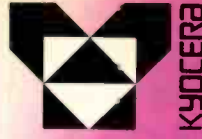
metals, we use 100% aluminum and zinc chassis construction including a diecast laser head and a precision disc drive mechanism.

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  - Full feature programmable keyboard entry. Even before Kyocera added ceramics, the DA-910 CD player provided remarkable purity. With ceramics, the results are truly astounding. Put it to the test at a selected Kyocera dealer now.
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The Modulus is inexpensive but well-made. It has a lot of personality, including a puritanical adherence to simplicity of circuit design.

line section, 20 Hz to 20 kHz, 0.5-V out. These distortion levels can be reduced by a factor of three by selecting associated equipment with input impedances greater than 50 kilohms.

Sine-wave distortion products proved to be primarily low-order, with second harmonic predominant (the classic "tube distortion"), as shown, at the 3% level, in Fig. 4. There is a debate as to whether this "benign" distortion is more preferable to the far lower levels achieved by solid-state circuits or more complex tube designs. Even though this tube nonlinearity produces inoffensive harmonics with sine-wave sources, it generates dissonant, nonharmonic, intermodulation products with music or other test signals.

#### Use and Listening Tests

The Modulus preamplifier operated well in both authors' home systems, with no turn-on transients. A load-capacitance-sensitive Shure V15 Type IV cartridge sounded more mellow (to author Clark) on the Modulus, until the preamp's nominal 0-pF phono input capacitance was brought up to the 150 pF found in his reference solid-state preamp. The Modulus's phono section gain was not high enough for most moving-coil cartridges, but proved effective with the Audio-Quest AQ-1.1SL high-output, moving-coil cartridge. The slightest trace of tube hiss was perceptible during quiet record passages with this cartridge, but could not be heard

with higher output moving-magnet types. The preamp's sonics did not change when using either 2 meters or 6 meters of Levinson RG58U coaxial interconnect cables driving the author's reference amplifier (which has a 75-kilohm input impedance).

When the Modulus drove this solid-state amp via short cables, the results were most pleasing. Sonic detailing, depth of field, bass response, and stereo separation ran a close second to Greenhill's reference preamp, which cost 10 times more than the Modulus! Keith Johnson's marvelous percussion record, *Dafos* (Reference Recordings RR-12), played with powerful dynamics, thunderous bass, and a wonderful sweetness in the tubular bells. In particular, Terry Herman's intimate jazz trio on *Blue Aranjuez* (Denon Compact Disc C38-7010) took on a spaciousness, depth of imaging, and three-dimensionality that was remarkable. We began to enjoy the music and forget reviewing.

In summary, the Audible Illusions Modulus is an inexpensive, well-made tube preamplifier with a lot of personality. It has been designed with a puritanical adherence to simplicity of circuit topology, at the expense of making its performance somewhat load-dependent. This component should appeal to audiophile and music lover alike, when properly interfaced to moving-magnet cartridges or high-output moving coils and amplifiers with high input impedances.

Laurence L. Greenhill and David L. Clark



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3

## LUXMAN DX-103 COMPACT DISC PLAYER

### Manufacturer's Specifications

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

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

**Total Harmonic Distortion:** Less than 0.007% at 1 kHz.

**Channel Separation:** 90 dB.

**Output Level:** Variable, 0 to 5.0 V; fixed, 2.0 V.

**Number of Programmable Selections:** 16.

**Wow and Flutter:** Below measurable limits.

**Dimensions:** 16½ in. (41.9 cm) W × 3¾ in. (8.57 cm) H × 13¼ in. (33.7 cm) D.

**Weight:** 15 lbs. (6.8 kg).

**Price:** \$999.95.

**Company Address:** 19145 Gramercy Place, Torrance, Cal. 90501.

For literature, circle No. 92



I have prided myself in the past with being able to figure out which of the prime suppliers of CD players was manufacturing which players for some of the smaller companies who don't quite have the capability to produce these complex machines on their own. I must confess that in this case, I wasn't able to figure out with whom Luxman had contracted to produce the DX-103. As you might expect with Luxman, they insisted upon having the CD player produced for

them be as distinctly different in layout from other CD players as Luxman amplifiers, tuners and other products are from those of their competitors. As a result, the DX-103 turns out to be somewhat different from the norm, both in features and in layout, if not in measured performance.

The DX-103 has one of the fastest access times I have ever measured, locating a desired "track" or selection on a disc in a matter of 2 to 3 S. Up to 16 music selections can be

# Virtuoso

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The DX-103 is somewhat different from the norm, both in features and in layout, if not in measured performance.

stored in its computer memory for playback in any selected order. A "Repeat" control allows an entire disc or the selections stored in memory to be repeated. Light-touch pushbuttons handle all control functions, and an optional wireless remote control (Model RC-3) can start, stop or pause the player and can move the laser pickup in fast forward or reverse or skip it ahead or back. To help you remember what's on the disc you've chosen to play, a "Scan" feature plays the first 10 S of each selection on the disc, in both the normal mode (when playing through an entire disc) or in the memory mode (when playing only selected tracks stored in the player's memory).

### Control Layout

The control layout of the DX-103, as mentioned above, is unusual. Oversized touch buttons near the disc-loading tray handle play, pause, fast-forward and fast-reverse functions, with illuminated indicators on the "Play" and "Pause" buttons. The "Power" and timer-start switches, stereo headphone jack and headphone level control (which also adjusts level from the rear-panel variable-output jacks) are to the left of and below the disc drawer. "Repeat," "Scan," "Disc" and "Data" indicator lights illuminate when the corresponding buttons or functions are operated. The "Disc" indicator flickers when power is first turned on or when the disc tray is sliding in or out; it stays on when a disc is properly in place. The "Data" light flickers when the disc's "Table of Contents" is being read; when that's been completed, this indicator stays on.

The display area to the right of the tray shows track number and index number of a disc, plus time elapsed from the track's beginning. This display also shows total time played on the disc or, at the touch of a toggling button, time remaining on the disc. A memory-play indicator at the extreme right of the panel illuminates when a selection recalled from memory is being played. Just below the display area are the "Skip" buttons, which shift the laser pickup to the start of the next or the current track. Ten small, numbered keys in this area of the panel are used to select tracks for playback, either during normal play or in the memory-play modes. By using these numbered keys, it is possible to select not only a track (selection) but an index number within a given selection, if the disc being played has such subdivisions encoded in it.

The lower row of touch buttons on the front panel include "Memory Call," memory "Clear," "Memory Write" (for storing desired selections to be played), "Repeat," "Scan" (described earlier), and "Time" (which causes the display to toggle between "time played" and "time remaining" on the disc being played). The rear panel of the Luxman DX-103 has two sets of output jacks: One is at fixed level, and the other varies in output level, set by the front-panel headphone level control.

### Measurements

Figure 1 shows frequency response for both the left and right channels of the DX-103. The vertical scale is 2 dB per division, and the sweep, from left to right, extends from 20 Hz to 20 kHz. Frequency response for the Luxman DX-103 was the most uniform I have ever measured for any CD

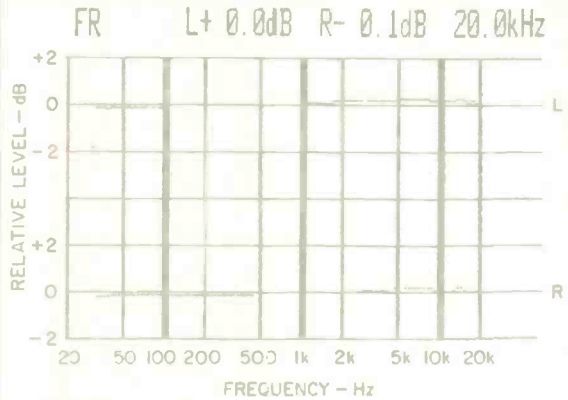


Fig. 1—Frequency response, left (top) and right channels.

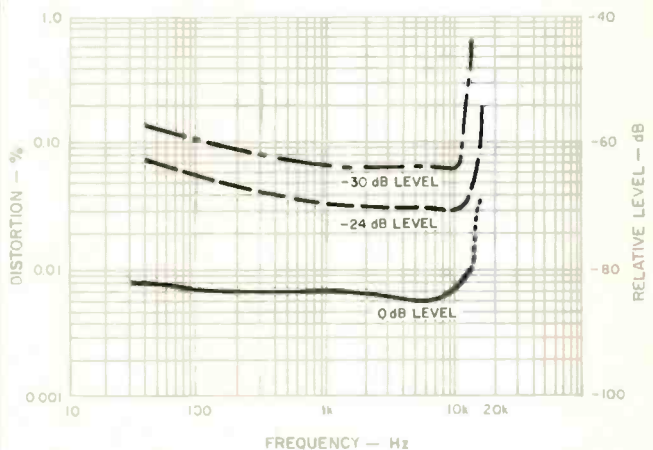
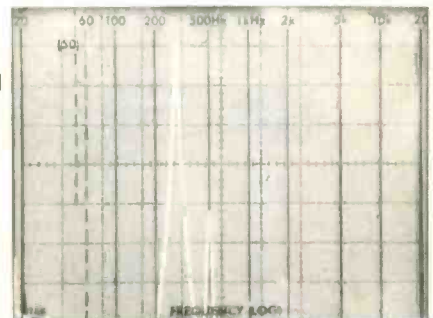


Fig. 2—THD vs. frequency at three output levels.

Fig. 3—Spectrum analysis of 20-kHz test signal (large spike) shows inaudible beat tone at 24.1 kHz (small spike), 44 dB lower.



Sound quality is above reproach, thanks to Luxman's highly regarded Duo-Beta feedback circuitry in the critical, final analog stages.

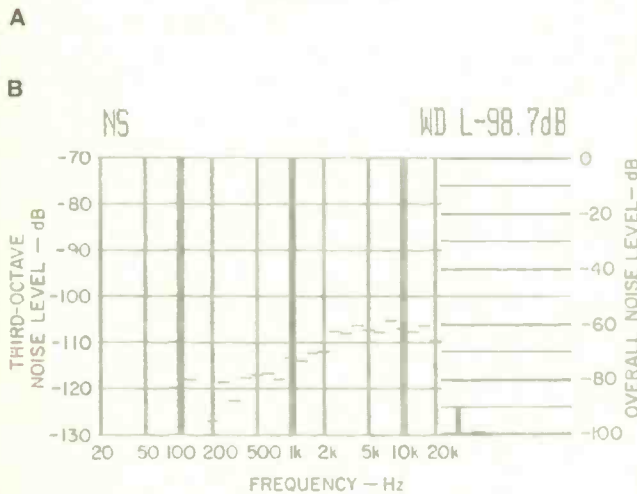
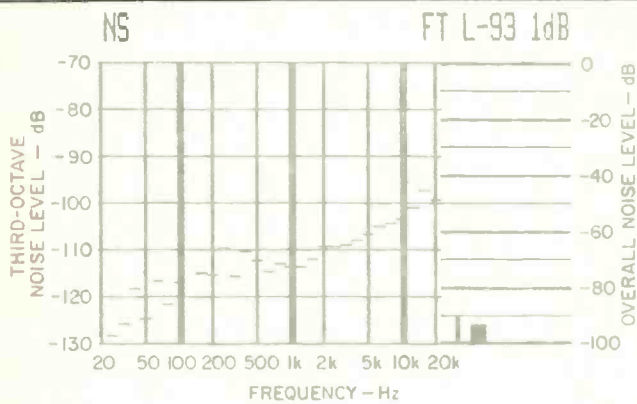


Fig. 4—S/N analysis, both unweighted (A) and A-weighted (B).

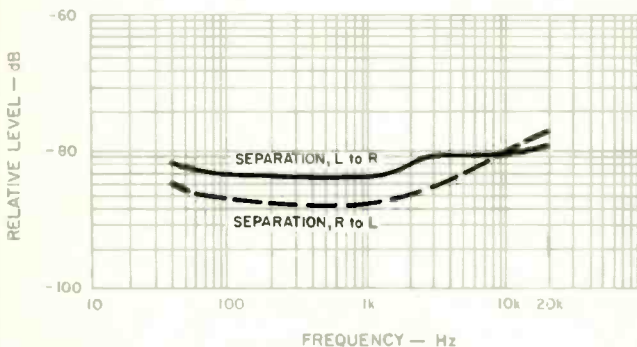


Fig. 5—Separation vs. frequency.

player, varying by no more than 0.1 dB from 20 Hz to 20 kHz. Harmonic distortion for maximum output varied from 0.005% to around 0.008%, depending upon the test frequency being measured. A plot of THD versus frequency up to around 10 kHz, measured at various recorded levels, is shown in Fig. 2. Above that frequency, I encountered the now-familiar rise in apparent THD. As can be seen on the spectrum analyzer (Fig. 3), however, this rise is not actually an increase in THD but rather is caused by a beat frequency occurring outside the range of hearing, above 20 kHz. In Fig. 3, a test tone of 20 kHz was used (the tall spike in the 'scope photo), and to the right of this primary tone can be seen a "beat" tone at approximately 24.1 kHz (interaction between the 44.1-kHz sampling rate and the 20-kHz tone being reproduced). This secondary tone was more than 40 dB below the desired 20-kHz tone and would therefore not be likely to cause any problems with wide-band amplifiers and wide-range tweeters.

Unweighted signal-to-noise ratio measured 93.1 dB (Fig. 4A); with an A-weighting filter included in the measurement, signal-to-noise ratio increased to 98.7 dB (Fig. 4B). At maximum recorded level, IM distortion measured 0.005%, increasing to 0.025% at -20 dB recorded level. Linearity was accurate to within 0.2 dB down to -80 dB. Stereo separation (Fig. 5) ranged from 80 dB at the low- and high-frequency extremes to around 87 dB at mid-frequencies.

Square-wave reproduction of a 1-kHz digitally generated square wave signal (Fig. 6) was typical of that encountered with CD players which use multi-pole, steep, analog filters following digital-to-analog conversion. The same was true of the reproduction of a digitally generated unit-pulse signal, as shown in the 'scope photo of Fig. 7. Negligible phase shift between a left-channel, 200-Hz test signal and a right-channel, 2-kHz test signal was observed in the 'scope photo of Fig. 8, though greater phase shift would have been evident at higher test frequencies. Perfect phase linearity in this test is represented by a positive crossing of the zero axis at the same time for both test frequencies.

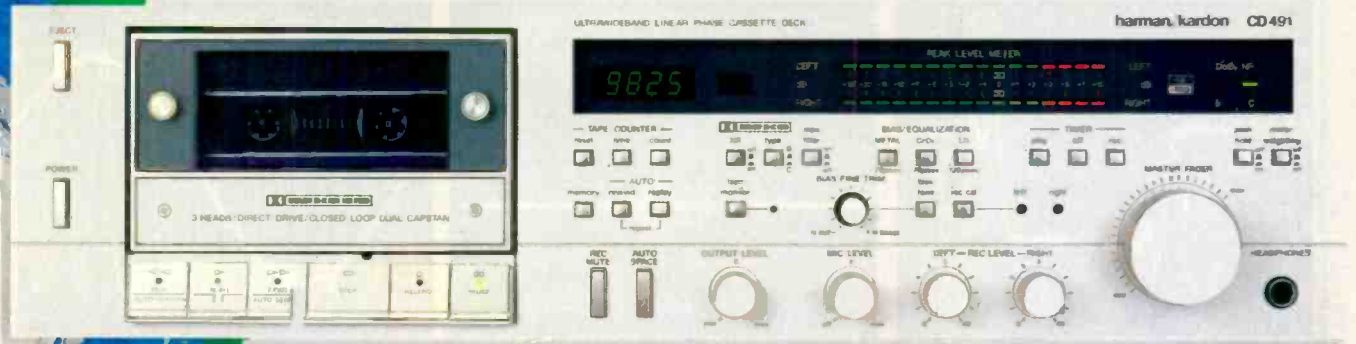
The Luxman DX-103 played completely through my special "defects" disc without ever mistracking or muting. This means that if you had a disc with an opaque scratch as long as 900 microns (slightly less than 1 mm), the player would ignore it completely. Similarly, surface dust particles as great as 800 microns in diameter would also be ignored by this excellent-tracking machine. The player was also quite acceptably resistant to external shock or vibration, remaining "on track" when I tapped lightly on its top and sides during the listening tests.

#### Use and Listening Tests

Despite the relatively great number of features found on the front panel of the DX-103, I found the player easy to use. The sample I tested was shipped without an owner's manual (that situation should, of course, be corrected by the time you read this), yet I was able to figure out how to program the machine for memory playback of chosen tracks and how to get all the other features to work properly.

The Luxman DX-103 puts out an even greater signal voltage than the already-high voltage levels produced by most other CD players. I can understand the need for high

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**SPECIFICATIONS:**  Frequency Response,  $-20\text{dB}$  (IFH std) All tape Formulations (No Ferrichrome position): 20Hz-24kHz  $\pm 3\text{dB}$ ; Meta: 20Hz-26kHz  $\pm 3\text{dB}$ .  
 Large Signal Response (0dB, with Dolby\* on, Metal Tape): 20Hz-20kHz  $\pm 3\text{dB}$ .  Wow-and-Flutter (NAE, WRMS): 0.025%.  Signal-to-Noise Ratio (Cr02) Dolby C; on: 75dB.  Total Harmonic Distortion, 1kHz, metal tape, Dolby\* level: 0.5%.

\*Registered Trademark of Dolby Laboratories, Inc.

## harman/kardon

Even without an owner's manual, I could easily figure out the DX-103's many features, including how to program it.

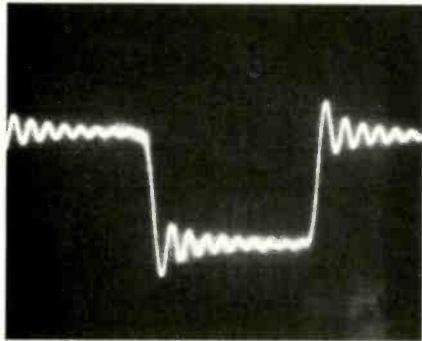


Fig. 6—  
Square-wave  
reproduction,  
1 kHz.

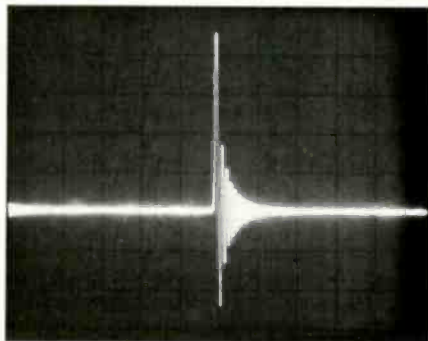


Fig. 7—  
Single-pulse test.

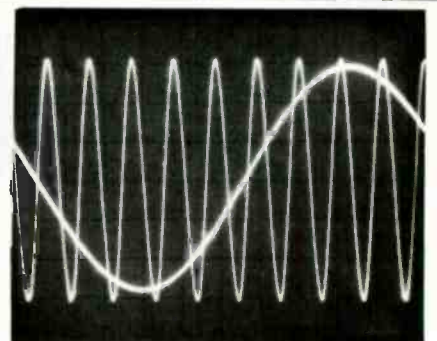


Fig. 8—  
Phase error check  
using 200-Hz  
and 2-kHz tones;  
see text.

output levels from CD players; their makers don't want the amplifiers with which they are used to become limiting factors as far as noise floor and hum levels are concerned. If CD players put out only as much voltage as tuners or analog tape decks, you might find yourself turning up amplifier volume levels (to be able to hear lowest-level sounds from CDs) to the point where residual hum and transistor hiss from the amplifier itself would become apparent. By providing a high output voltage (2 V or more, in most cases), the makers of CDs insure against such an occurrence. Just the same, the Luxman DX-103 can put out a whopping 5.0 V via its variable output jacks. If your preamplifier (or the high-level inputs to your integrated amplifier or receiver) can't handle that much input voltage without overloading its first stage, you had best switch to the DX-103's fixed outputs (which deliver a maximum of 2.0 V) or turn down the front-

panel gain control that sets the player's headphone and variable-output levels.

As for the sound quality delivered by the Luxman DX-103, it is beyond reproach. Luxman has taken the trouble to incorporate their highly regarded "Duo-Beta" feedback circuitry in the final, analog stages which precede the outputs of any CD player (the output signal, after all, is analog, not digital, or we couldn't feed it to our amplifiers). Many have suggested that the chief differences between the sounds produced by different players may well be caused by differences in those final, analog stages. Here, digital signals have been converted back to analog signals and must be amplified by analog audio circuitry much as they would be in any audio component. It is in this analog area that Luxman equipment has always been outstanding, and the DX-103 is no less so.

*Leonard Feldman*



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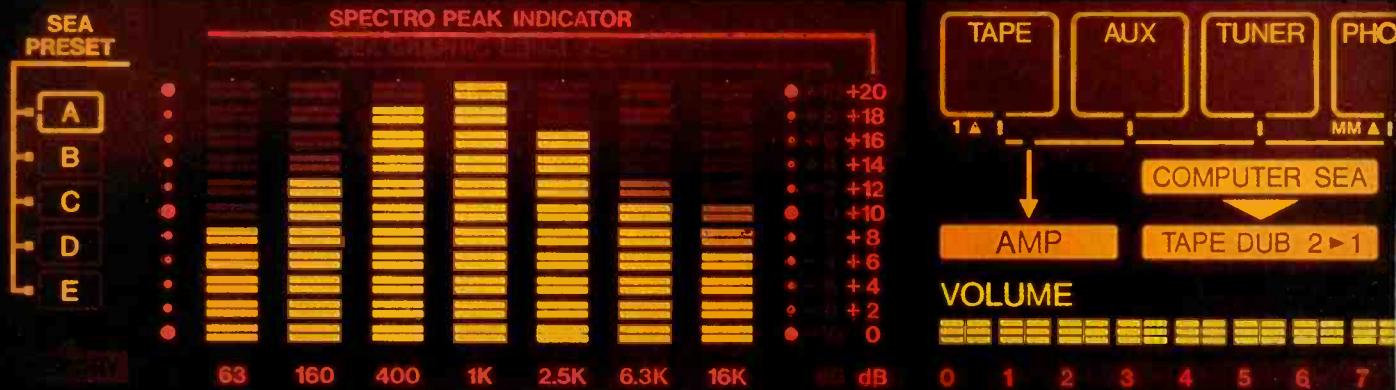


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Five equalized responses can be memorized for instant recall at a touch.



And an infrared wireless remote control makes it possible to adjust equalization from your armchair without sacrificing sound quality.

In a further refinement, JVC engineers opted for an LSI to handle electronic switching for both channels at

seven different control frequencies. The result—electrical loss and tonal

degradation never enter the picture.

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**SPECIFICATIONS**

**AMPLIFIER SECTION**

Output Power  
100 Watts per channel, min. RMS, both channels driven into 8 ohms, from 20Hz to 20kHz, with no more than 0.007% total harmonic distortion.

Signal-to-Noise Ratio (\*66IHF/DIN)

Phono—80dB/66dB  
Video/Aux/DAD/Tape—100dB/67dB

RIAA Phono Equalization

± 0.5dB (20Hz -20kHz)

**S.E.A. SECTION**

Centre Frequencies—63, 160, 400, 1k, 2.5k, 6.3k, 16kHz  
Control Range—± 10dB

**FM TUNER SECTION (\*78 IHF)**

50dB Quieting Sensitivity  
Mono—14.8dBf Stereo—38.3 dBf

Signal to Noise Ratio (IHF-A Weighted)

Mono/Stereo—82dB/73dB

The R-X500B puts an advanced microcomputer in charge of the digital synthesizer tuner and references it to the accuracy of a quartz oscillator, making it highly versatile and easy to use. The microcomputer lets you preset 15 AM and 15 FM frequencies, scan them all for 5 seconds each, read out aerial signal strength in 5dB increments, plus much more.

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It is the attention to engineering detail and craftsmanship evident in the R-X500B which separates every JVC hi-fi component from all others. JVC makes changes in design for the sake of improvement. Not just for the sake of change. And the result is the difference between excellent and average. See, and hear, this difference at your nearest JVC dealer.



## 4

## BRÜEL & KJAER TYPE 4003 AND TYPE 4007 STUDIO CONDENSER MICROPHONES

### Manufacturer's Specifications

**Type:** Air condenser, internally pre-polarized backplate. Type 4003, low-noise; Type 4007, high-intensity.

### On-Axis Frequency Response:

Type 4003, 20 Hz to 20 kHz,  $\pm 2$  dB; Type 4007, 20 Hz to 40 kHz,  $\pm 2$  dB.

### Phase Matching Between Microphones:

From 50 Hz to 20 kHz.

Type 4003,  $\pm 10^\circ$ ; Type 4007,  $\pm 5^\circ$ .

### Sensitivity at 250 Hz:

Type 4003, 50 mV/Pa, unloaded ( $-26$  dBV); Type 4007, 2.5 mV/Pa, unloaded ( $-52$  dBV).

### Equivalent Noise Level:

Type 4003, 15 dBA typical, 17 dBA max.; Type 4007, 24 dBA typical, 26 dBA max.

### Harmonic Distortion:

Type 4003, 1% at 135 dB peak SPL; Type 4007, 1% at 148 dB peak SPL above 100 Hz.

### Maximum Sound Pressure Level:

Type 4003, 154 dB peak SPL at or below 4 kHz; Type 4007, 155 dB peak SPL above 200 Hz.

### Power Supply:

Type 4003, 130 V, from Type 2812 two-channel power supply; Type 4007, 48 V, phantom power per DIN 45 596.

### Audio Output:

Type 4003, balanced, transformerless, line level from XLR-3 male jack on Type 2812 power supply; Type 4007, balanced, transformer isolated, microphone level, from XLR-3 male jack on microphone.

### Weight:

5.3 oz. (150 grams).

### Dimensions:

6½ in. (165 mm) L; cartridge diameter, Type 4003, ⅝ in. (16 mm); cartridge diameter, Type 4007, ½ in. (12 mm).

### Price:

Type 4003 (inc. diffuse-field grid, power-supply cable, windscreen and clamp), \$705.00; Type 4007 (inc. audio cable, windscreen and clamp), \$765.00; Type 2812 power supply for 4003, \$1,085.00.

### Company Address:

185 Forest St., Marlborough, Mass. 01752.

For literature, circle No. 93





Brüel & Kjaer is a Danish firm which has produced condenser microphones for use with their well-known line of sound measuring instruments since 1959. Now there are B & K Studio Microphones as well, of which two (the Type 4003 and Type 4007) are reviewed here.

Brüel & Kjaer's *instrumentation* microphones are optimized for frequency response and polar pattern, but not for low noise level. They are suitable for recording relatively loud instruments at close distance. In contrast, these *studio* microphones are optimized for dynamic range, frequency, and phase response and are specifically intended for music recording. They are pre-polarized, charged-backplate types which have metallic diaphragms for optimum response, corrosion resistance, and stable output with temperature changes.

Those who have not used Brüel & Kjaer sound instruments may have some difficulty in understanding the differences in acoustical properties of the various studio microphone types. B & K publishes an instruction manual for the microphones which gives much detail not included in the sales brochure. I will try to offer a brief, simplified explanation below.

The Studio Microphones are omnidirectional, pressure-sensing types, same as the instrumentation models. Cardioid capsules are not presently available; thus, the B & K mikes are not suited to X-Y coincident-microphone stereo pickup. Applications are therefore limited to spaced-microphone stereo pickup, as in classical music, or close miking of instruments in multi-channel pop-music recording.

There are four B & K Studio Microphones. They differ in capsule size (16-mm diameter for the Types 4003 and 4006, 12 mm for the 4004 and 4007) and in power supply (130 V for the 4003 and 4004, 48-V "phantom" power for the 4006 and 4007). In order to evaluate both capsule sizes and powering options, I tested a pair of Type 4003 (16-mm capsule, 130-V supply) and a pair of Type 4007 (12-mm capsule, 48-V supply) microphones.

These microphones are ultra-high quality, omnidirectional condensers whose specifications complement the dynamic bandwidth of such new-technology recording systems as digital and direct-to-disc. They should also be of interest to amateur and professional recordists who have high-quality open-reel recorders. Some of the high-end cassette recorders will also benefit from higher quality microphones.

The prices of these microphones are high compared to those in past reviews, but since the microphone is the controlling "filter" in most recording systems, I believe that it is wise to spend more on microphones than on the recorder.

### Basic Characteristics

My rule of thumb on microphone capsule size is that condenser microphones 16 mm and smaller in diameter potentially offer uniform frequency response and polar pattern to 15 kHz. This is true of both mikes under review.

However, small microphones may have high electrical noise, which reduces dynamic range. Brüel & Kjaer has achieved a low (15-dBA) noise level in the 16-mm Type 4003 (and 4006). Thus, the specifications show excellent acoustical response for all musical applications, but low enough noise for distant miking of classical music. The 154-

dB SPL limit of the Type 4003 results in a dynamic range of  $154 - 15 = 139$  decibels, adequate for any recording and playback system known today. The noise levels of the 12-mm Type 4007 (and 4004) are higher (24 dBA) than that of the 16-mm microphones. However, the very high maximum SPL of the 12-mm models results in a wide dynamic range: For the 4004, using the same power supply as the 4003, maximum SPL is 168 dB, resulting in a dynamic range of 144 dB (168 - 24 dB). The Type 4007 tested here has a maximum SPL of 155 dB because of its lower power-supply voltage.

The 4003 and the other 16-mm model are furnished with removable, gridded caps which offer two choices of acoustic response: The bright plated cap yields flat axial (0°) high-frequency response. The response to a diffuse field (as well as the 90° response) is rolled off above 5 kHz. In a typical, somewhat live room, a microphone is exposed to a diffuse field when it is more than a few meters from a musical instrument. A diffuse field is one in which sound reaches the microphone from many, random, directions. In other words, the sound which is reflected from many room surfaces is equal or greater in intensity to the direct sound from the instrument. Thus, the bright cap is properly used only for close miking (within about 1 meter or less), with the mike pointed at the instrument or vocalist.

The black-gridded cap modifies the response so that the diffuse (which resembles the 90°) response is essentially flat to 15 kHz. In contrast, the axial (0°) response is specified to have a 6-dB peak at 12 kHz with the black cap. Thus, the 4003 or 4006 microphone with the black cap is properly used in a diffuse field, at a distance from sound sources. A good method is to point the mike at the ceiling because response to direct sound at 90° is flat, and response to the randomly reflected (diffuse) sound is also flat.

With the 12-mm cartridge of the 4007 (and the 4004), both the axial and diffuse responses are essentially flat, and so no removable gridded caps are provided. However, because of both the higher noise level and higher SPL tolerance of the 12-mm models, referred to earlier, these microphones are billed as High Intensity models, properly used close to the sound source.

As mentioned above, I tested both 130-V and 48-V models. The Type 4003 is powered by 130 V from B & K's Type 2812 power supply, to which it is linked by a special 15-foot cable. (Cable extensions up to 45 feet may be used in many circumstances.) This higher voltage to the microphone preamp results in a higher SPL capability than the lower voltage model has, and a transformerless, balanced output specified as being at line level. When used with a transformerless input circuit, flat response and low distortion are assured down to below 20 Hz.

The Type 4007 operates on "phantom" power, supplied through the regular microphone cable, at a nominal 48 V. That figure represents the open-circuit output of the power supply, and is dropped to a lower value by a series resistor in the power supply. The actual voltage at the microphone therefore depends on the value of this resistor and the microphone's own current draw. Despite an applicable DIN standard, there is considerable variation in these characteristics among the various makes, and sometimes between

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While expensive, these new B & K mikes are ultra-high quality condensers which will complement any high-end recording system.

different models of a given make. Brüel & Kjaer offers no 48-V power supply of its own, but I was informed by its U.S. headquarters that the microphone should ideally receive 36 V. (Unfortunately, this information is not in the instruction manual.) I would caution users to check that the voltage at the mike is 36 V,  $\pm 10\%$ , in order not to compromise performance of these very high-quality microphones. To calculate if a particular power supply will be adequate, use 3.5 to 4.0 mA per mike as the current at 36 V. I hope that B & K will soon offer a 48-V phantom supply as an accessory.

The Studio Microphone capsules are not user-removable from the preamp bodies, which is different from the design of the B & K instrumentation mikes and other commercial condenser microphones. So, if the capsule is damaged, as sometimes happens with Sound Level Meter microphones, you cannot replace it in the field. Also, this limits future interchangeability with newly designed capsules. A cardioid capsule is an obviously desirable accessory.

#### Measurements

Each Studio Microphone comes with a calibration chart showing complete measured data. The accuracy is unquestionable, as the Brüel & Kjaer laboratory in Copenhagen is comparable to the lab at our National Bureau of Standards. Therefore, much of my work consisted simply of verifying this data. The calibration chart is a plus to professional users who have equipment for measuring frequency response, such as real-time analyzers, TDS systems, or a strip chart and oscillator such as I have. Thus, a B & K Studio Microphone can serve as a reference in microphone and loudspeaker testing in the field.

I must emphasize that I did *not* evaluate new, randomly selected microphones. These were microphones from the West Coast regional demo stock. The mikes showed evidence of being used, as some dust was seen on the diaphragms with a magnifying glass. B & K is currently loaning mikes for studios to try before buying, so both new and demo stocks are quite short at this time. This reflects present demand for these mikes for professional recording, and B & K is now setting up a dealer network.

As mentioned above, B & K provides no power supply for its 48-V models, leaving that responsibility to the user. The only such supply I had available, an AKG, had too much resistance for these microphones, yielding only 27 V at the mikes. I therefore powered the Type 4007 in these tests with four 9-V batteries in series, connected to the center top of a UTC HA-108X line transformer, which was set for 200:200 ohms. Thus, with low series resistance, there was certain to be nearly 36 V at the microphone. The UTC transformer is very well shielded, has flat response from about 10 Hz to 50 kHz, and will handle up to +20 dBm levels in the audio frequency range without distortion.

The 4003 was powered by the 2812 power supply. This is a totally transformerless, line-level output system. Since the 4003 has response down to 5 Hz, many input transformers with small cores may introduce distortion due to magnetic-core saturation on high-level, low-frequency tones, such as organ-pedal notes at 16 Hz. I found that the "line-level" output of the 4003 ( $-20$  dBV at 94 dB SPL or 1 Pa) was about 20 dB too low for any of my line inputs, but 30 dB

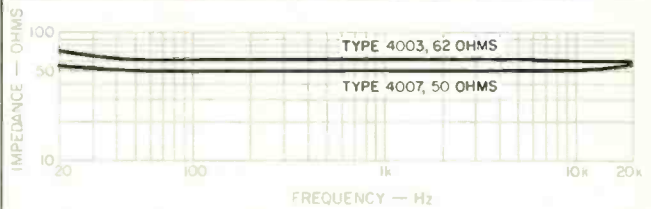


Fig. 1—Impedance vs. frequency (balanced output mode).

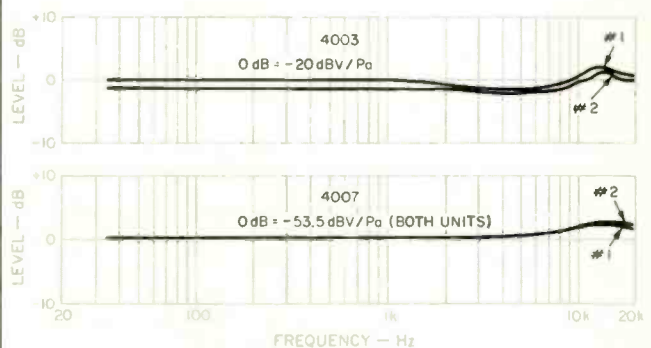


Fig. 2—Axial frequency response.

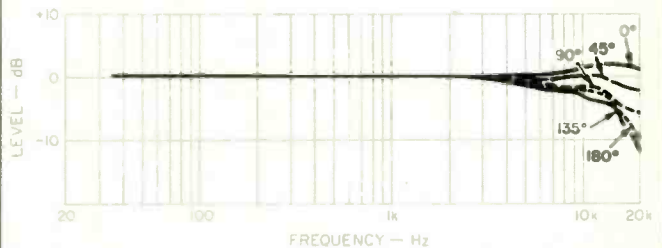


Fig. 3—Frequency response vs. angle, Type 4007.

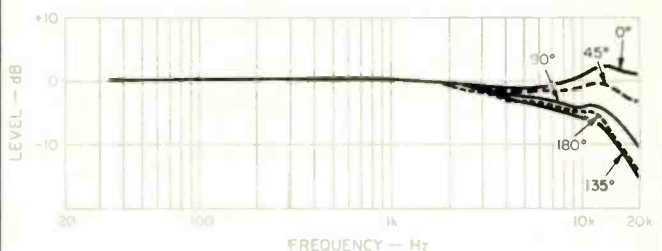


Fig. 4—Frequency response vs. angle, Type 4003 with bright gridded cap.

Each Studio Microphone comes with a calibration chart showing complete measured data, and the accuracy is unquestionable.

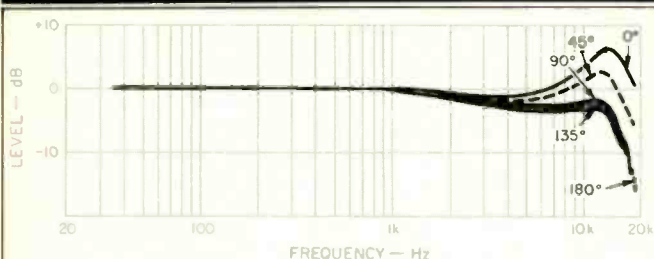


Fig. 5—Frequency response vs. angle, Type 4003 with black gridded cap.

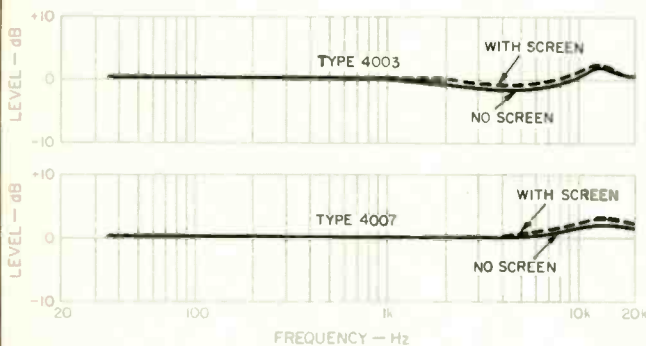


Fig. 6—Effect of windscreens on axial response, Type 4003 with bright gridded cap and Type 4007.

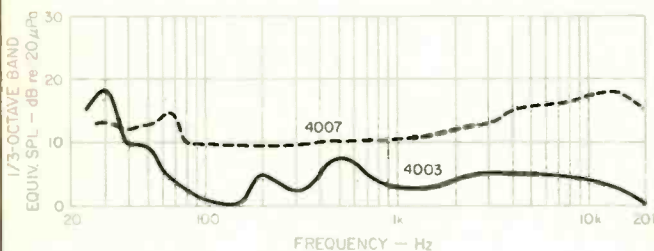


Fig. 7—Noise spectra for Type 4007 (overall noise level, 24 dBA, 26.5 dB unweighted) and Type 4003 (overall noise level, 14 dBA, 21 dB unweighted).

higher than appropriate for low-impedance microphone inputs. From time to time, I had trouble with hum ground loops between the 2812 supply and my mike preamps, so I opted to use a 30-dB pad plus an HA-108X transformer (200:200 ohms) for frequency response and listening tests. Thus, the 4003 and 4007 were each tested with a transformer and, at equivalent audio output levels, into standard balanced, low-impedance microphone inputs. There was very little possibility that the very large HA-108X transformer core saturated during testing or music recordings.

The measured impedances versus frequency are shown in Fig. 1. These are the impedances seen by the primaries of my isolation transformers, without the resistive pad on the 4003. The 50- and 62-ohm impedance values, when used with unloaded 150/250-ohm inputs of domestic preamps, might possibly cause higher noise in any input stages which require a 150- or 250-ohm termination for minimum noise. Also, mismatch can upset the frequency response of some preamps. Note that most Japanese-made microphones I've reviewed measure 600 ohms. In my opinion, equipment manufacturers should not have to design for a 10-to-1 range of microphone impedances. Fortunately, my isolation transformers added resistance in series with the microphones, so the test preamp and tape recorders saw about 150 ohms. The mikes easily met their noise specifications with this added resistance.

Figure 2 shows that all four mikes conformed to their frequency response specs. Frequency responses of the two pairs matched closely, and only the 4003s showed a 1.5-dB difference in output levels. The flat trend of the 4003's axial response curves reflects the use of the "close-miking" bright grid.

Open-circuit output levels of the 4007s were 1.5 dB below nominal, and the 4003s measured +4.5 and +6 dB re: nominal value. The transformerless output of the electronically balanced 2812 necessarily has its midpoint grounded, whereas a transformer balanced output can be floating. So, if I had measured the 4003s with an unbalanced input, the output levels would be 6 dB lower, conforming to specifications. In my music recordings, I used a 30-dB pad with the 4003s, with calculations based on -20 dBV output level, so I am convinced that the 6-dB difference is simply an artifact of measurement technique.

Figure 3 shows that the 4007 has essentially flat response to 15 kHz over its front hemisphere (0° to ±90°). The diffuse-field response may be assumed to be similarly flat.

In contrast, the 4003's response with the bright grid is flat only from 0° to ±45° (Fig. 4). The 90° (and diffuse-field) responses roll off above 5 kHz. Figure 5 shows how the black grid flattens the 90° (and diffuse) response to 15 kHz, while the on-axis response peaks at about 14 kHz.

Figure 6 shows how the windscreens increase the high-frequency output of the Type 4003 and Type 4007 by about 1 dB over a broad range. This contrasts with most of the larger, "Nerf-ball" windscreens, which cause about 1.5 dB of loss at 10 kHz. B & K has stated in previous publications that windscreens protect condenser microphones from dirt and corrosion, and I recommend that they be used on the Studio Microphones at all times.

Noise measurement was most difficult because, even

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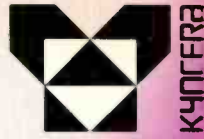
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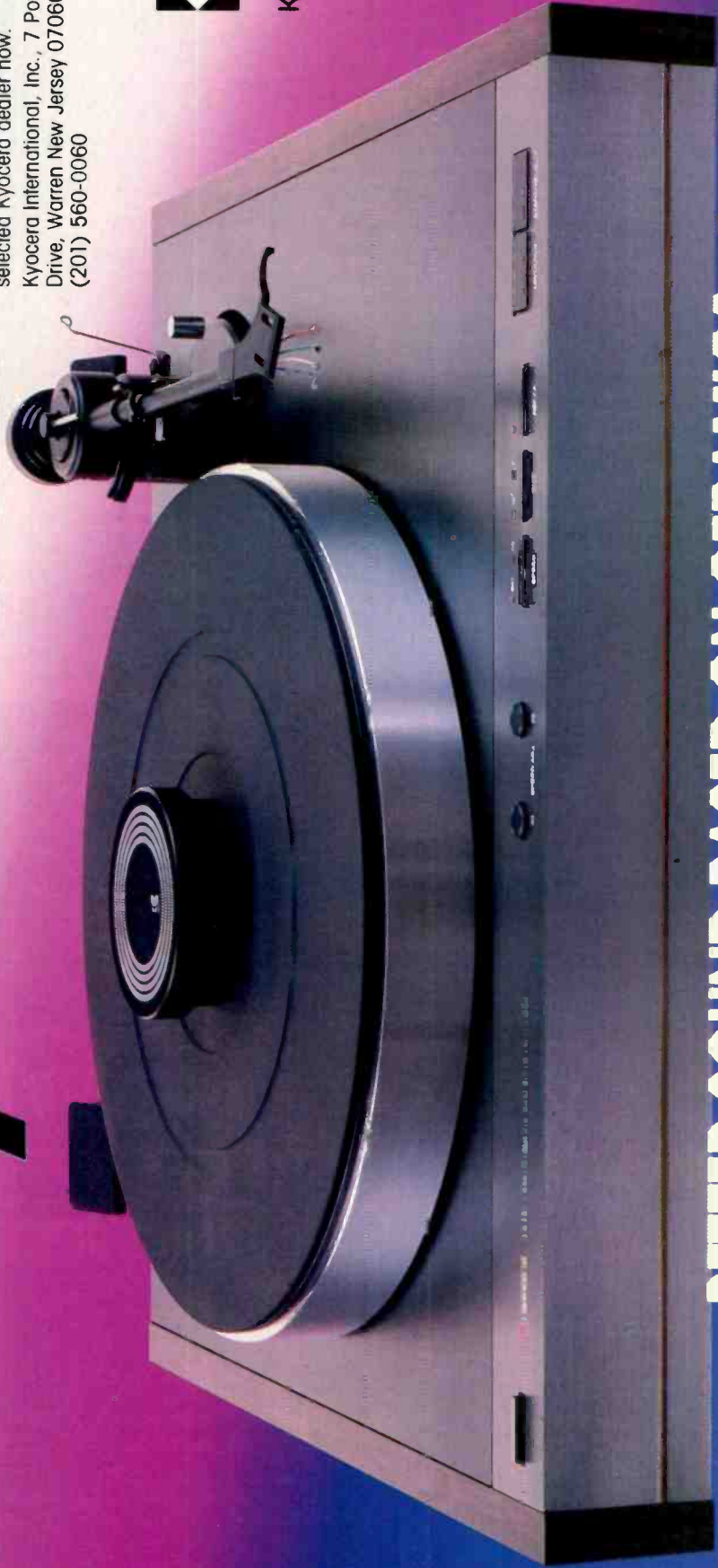
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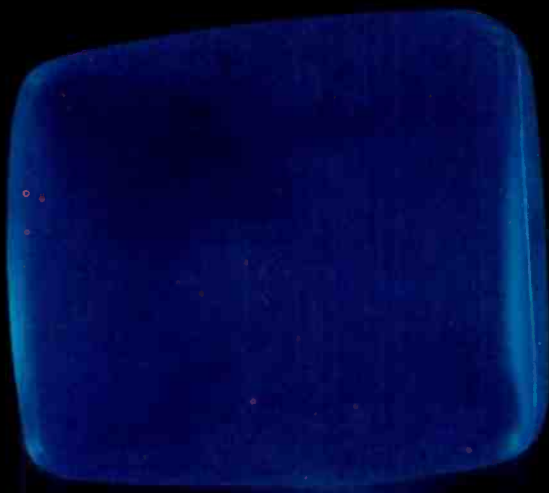


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Using a pair of 4003s, spaced about 6 inches apart, a festive church concert produced excellent imaging and exciting ambience.

though I used a sound-attenuation box with about 40 dB of loss, the very low noise level of the 4003 meant that the tests had to be conducted at night, when outside ambient noise was at a minimum. Figure 7 shows the  $\frac{1}{3}$ -octave noise analysis of the 4003 and 4007. The 4003's equivalent noise level was 14 dBA, well within the 17-dBA specification. Unweighted noise was a very low 21 dB. Previously, I had thought that only a microphone with a 1-inch diaphragm could have this low a noise level. (As explained in the September 1978 issue, I use an old RCA tube amplifier, Type OP-6, for noise measurements. This amp band-limits noise to a range from 30 Hz to 15 kHz and, according to my latest test, measures less than -130 dBm equivalent input noise level. In 1978, I asked readers to write us of a solid-state preamp with equivalent or lower noise; we are still waiting for an answer.)

Phasing, as measured with an EMT-160 polarity tester, was pin 2 plus, in accordance with EIA specifications, for both models. Because of the extended low-frequency responses of the 4003 and 4007, their windscreens do not entirely cure breath pop or wind noise which is manifest as a very low-frequency thump. Low-frequency noise is also heard if one moves either microphone rapidly without a windscreen. Thus, the Studio Microphones should not be used as hand-held vocalist's microphones; there are plenty of cheaper mikes to serve this purpose. The Studio Microphones were found to have negligible vibration or shock sensitivity. Magnetic hum pickup of the 4003 was about 20 dB less than that of my comparison mike, a Nakamichi CM-700 with omnidirectional capsule. The 4007 showed only about 2 dB higher hum pickup than the 4003, even though the 4007 has a transformer and the 4003 does not.

While making hum and noise tests, it was imperative to ground the chassis of the 2812 power supply to avoid hum. Unlike B & K instrumentation-mike power supplies, the 2812 has no provision for a three-wire grounded power cord. I found that sometimes a grounded cord was needed and had to substitute a clip lead. I hope that this problem will be taken care of.

#### Use and Listening Tests

Voice pickup quality of the 4003 with bright grid, the 4007, and a Nakamichi CM-700 with the omni capsule were quite similar for any orientation of the microphones.

The 4003s were used to record a festive concert and church service in the large 1,000-seat sanctuary of my local Methodist church. Empty, the reverberation time is 2.5 to 3.0 S, but with a full house for this service, acoustics were less live. The 4003s were mounted vertically about 6 inches apart, according to suggestions from a Brüel & Kjaer field engineer, and located off-center at the front of the nave seating area. The black grids were used, because the musical instruments of a brass quintet were about 10 feet away in the chancel, and a bell choir was about 20 feet away in the transept. Organ pipes were in the front and back of the church, and the choir in the front. A Revox open-reel recorder was in a remote control room, requiring the 2812 power supply outputs to connect to house mike lines about 200 feet long. The 2812 chassis was not grounded, but perhaps should have been, because I had to play with



the grounding of the two HA-108X isolation transformers plus the two 30-dB pads located at the Revox. I used the Revox's low-impedance mike inputs. Without the transformers for isolation and balancing, hum was clearly audible.

I listened to the tape in my acoustically dead listening room over my modified and equalized Altec 604C 15-inch coaxial speakers. Several years ago, I had tried Nakamichi omnis, spaced at 10 feet, for recording in the church, but imaging was poor and the ambience or room sound was annoying. With the closely spaced B & K 4003s, the imaging was excellent and the ambience exciting rather than annoying. The pre-service brass music was brilliant in the highs and well imaged in spite of the unfavorable position of the mikes, off-center of the ensemble and only 4 feet from the floor (so as to be inconspicuous). The bells were crisp and well defined in space in spite of their distant location. During the processional ("O Come All Ye Faithful"), the brass and organ were playing at maximum level, the congregation of 1,000 was singing, and the choir was singing as it marched down the aisle. The bass sound of the organ seemed about an octave deeper and more full than on any previous tape. The brass was clearly heard above the singing, which seemed to fill my listening room, similar to the live listening experience. The overall result was a dazzling recording which I have used several times as a demo tape to impress people with the sound of the B & K mikes and my playback equipment.

I was able to compare the above tape with one made a year earlier with coincident Nakamichi CM-700 cardioids on

**Table I—Specifications of Type 4004 and Type 4006 microphones.**

**Sensitivity at 250 Hz:** Type 4004, 10 mV/Pa, unloaded (-40 dBV); Type 4006, 12.5 mV/Pa, unloaded (-38 dBV).

**Harmonic Distortion:** Type 4004, 1% at 148 dB peak SPL, below 20 kHz; Type 4006, 1% at 135 dB peak SPL, above 100 Hz.

**Maximum Sound Pressure Level:** Type 4004, 168 dB peak SPL, at or below 4 kHz; Type 4006, 143 dB peak SPL, above 200 Hz.

**All Other Specifications:** Type 4004, same as 4007, except audio output, power supply and price same as 4003; Type 4006, same as Type 4003, except audio output, power supply and price same as 4007.

With the organ playing at maximum, the bass sound seemed about an octave deeper than on any previous tape.

a 14-foot-tall stand. The musical instruments, musicians, and program were essentially the same. The exciting ambience of the singing was lost with the Nakamichi mikes. Imaging of the brass quintet was little improved by the more favorably situated cardioids. The brass sound was brilliant and quite similar to that from the B & K mikes, reflecting that both mikes have 16-mm capsules. The congregational singing was poorly defined by the cardioids, and the firm bass of the B & K tape was missing in the Nakamichi tape. So, my first-rate recording of 1983 became second-rate by comparison to the 1984 tape.

The 4003s were then used to record a string quartet in a neighboring Presbyterian church, with similar placement of the mikes—6 inches apart on a low stand. Again, the black grids were used and the strings sounded brilliant and well imaged. Of course, this tape did not reveal the outstanding bass response of the 4003s. At no time was any microphone noise evident.

Owing to a shortage of timely concerts, plus the success enjoyed with the 4003s, I had no opportunity to record with the 4007s. Besides, these are best used for multi-channel miking of pop music, which I never do. This I leave as an exercise for the reader. Since the 4007s are miniature versions of the 4003s, sound quality should be equal or better. Noise level is low enough for pop recordings or for most uses in close-miking instruments. With either model of phan-

tom-powered mike, low-frequency distortion could be encountered if the integral transformers become saturated. Obviously, for low-frequency, high-intensity sound pickup, the 130-V, transformerless models are best.

#### Conclusion

The Brüel & Kjaer Studio Microphones are easily the best I've tested in seven years of reviews for *Audio*, but are also the most expensive ones. The treble sound was not noticeably better than that of a low-cost 16-mm microphone, the Nakamichi (but note that the latter microphone is no longer on the market). My comparison recordings with brass instruments were not very well suited to revealing differences at 10 kHz or higher. The extended bass response was very noticeable, compared to my reference, so I think that the 4003 is quite superior for recording pipe organ; the spacious room sound was quite impressive.

It is obvious that these omnidirectional microphones are suited to close miking of musical instruments, but the very low noise level of the 4003 makes it ideal for distant miking of soft classical music, such as string quartets. Initially, I thought that the omni pattern would make these mikes useless for single-location stereo pickup, but with 6-inch spacing, stereo imaging was excellent.

I can highly recommend the B & K Studio Microphones for most all music recording applications. *Jon R. Sank*

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Specifications	Ohm Walsh 1	Ohm Walsh 2	Ohm Walsh 4
Frequency Response	48 Hz to 18kHz ± 4dB	45Hz to 16kHz ± 4dB	32Hz to 17kHz ± 4dB
Weight	24 lbs.	29 lbs.	63 lbs.
Sensitivity	87dB at 1 meter with a 2.83 volt input	87dB at 1 meter with a 2.83 volt input and all controls at maximum	87dB at 1 meter with a 2.83 volt input and all controls at maximum
Finish	Genuine walnut veneer	Genuine wood veneer, walnut and oak standard. Scandinavian rosewood and black or white lacquer on oak finishes available on special order.	Genuine wood veneer, walnut and oak standard. Scandinavian rosewood and black or white lacquer on oak finishes available on special order.
Inputs	Press connectors accepting "banana plugs" or bare wire up to 12 gauge	Press connectors accepting "banana plugs" or bare wire up to 12 gauge	Press connectors accepting "banana plugs" or bare wire up to 12 gauge
Controls	None	2 — low and high frequency each with 3 positions	3 — low, high and perspective each with 3 positions
Power requirement on Music	20 watts minimum/90 watts maximum	30 watts minimum/120 watts maximum	50 watts minimum/500 watts maximum
Impedance	8 ohms	4 ohms	8 ohms
Price per Pair	Under \$595	Under \$995 Depending on finish	Under \$1895 Depending on finish

# 5

## SONY CDP-610ES COMPACT DISC PLAYER

### Manufacturer's Specifications

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

**Dynamic Range:** Greater than 95 dB.

**Channel Separation:** Greater than 90 dB.

**Harmonic Distortion:** Less than 0.003% at 1 kHz.

**Output Level:** Fixed, 2 V rms across 10 kilohms; variable, up to 2.0 V rms across 50 kilohms; headphones, 29 mW across 32 ohms.

**Power Consumption:** 30 watts.

**Dimensions:** 17 in. (43.1 cm) W  $\times$  4 $\frac{1}{4}$  in. (10.6 cm) H  $\times$  12 $\frac{7}{8}$  in. (32.7 cm) D.

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

**Price:** \$850.00.

**Company Address:** Sony Dr., Park Ridge, N.J. 07656.

For literature, circle No. 94



Call it a second-generation CD player, or even a third-generation player. Whatever you choose to call it, Sony's CDP-610ES Compact Disc player offers convenience features and performance which are obviously a result of their experiences with the Models CDP-101 and CDP-701 introduced well over a year ago. Considerably less expensive than the top-of-the-line CDP-701, and even less expensive than the very first Compact Disc player I tested, the CDP-101, the newest addition to the line actually falls midway between the two other models in terms of its capabilities and user features.

According to Sony, the CDP-610ES uses the same laser diode, the same digital-to-analog converter LSI, and the same error-correction circuitry as their top-of-the-line CDP-701ES. Control features include "Automatic Music Sensor" (AMS), which enables you to skip from song to song at the touch of a button; an index search function which locates specially coded index points within a selection, enabling the player to begin play at those points, and two-speed cue and review—not unlike that found on some analog cassette decks—which allows you to scan forwards or backwards while listening to the disc's contents at reduced level and correct pitch.

Packaged with the CDP-610ES is an infrared, wireless, remote control which offers 10-key direct-access track selection and—a feature I've never seen on a CD remote before—control of the variable line output level. This may prove to be the most desirable feature, since the wide dynamic range found in many CDs often takes listeners (and loudspeaker systems) by surprise with sudden, ear-shattering crescendos. Being able to quickly adjust listening level, without having to run across the room to the player, could prove to be most beneficial to your ears and to your equipment from time to time!

This player also has a repeat mode similar to that on Sony's earlier machines; it can be used to automatically repeat an entire disc, an individual selection, or any musical passage between any two points you designate on a disc.

Sony has elected to stay with an all-black front-panel finish for this unit. A "Power" switch, a "Timer" switch (for use with an external timer), and a headphone jack and level control are to the left of the disc drawer. The motorized drawer emerges to accept a disc when a pad on its front surface is touched, and is closed by a second touch of the same area. The drawer will also close when the "Play" button, just to the right, is touched, which also begins play. A "Pause" button is just below "Play"; both buttons incorporate status-indicator lights. The "Automatic Music Sensor" buttons (which advance the laser pickup forward or back by one track for every push you give them), "Index" buttons, and the manual fast-search buttons occupy the remaining space below the large display area.

The display itself tells you a great deal more about what's happening with the player than was the case with the Model CDP-101. Both "Track" and "Index" numbers illuminate, as do the words "Disc" (when a disc is inside the player and is revolving), "Scan" (when the laser is searching for the track or point you have specified), "Minute" and "Second." The time display can show either elapsed time within a track or remaining time on the disc, depending upon the setting of a

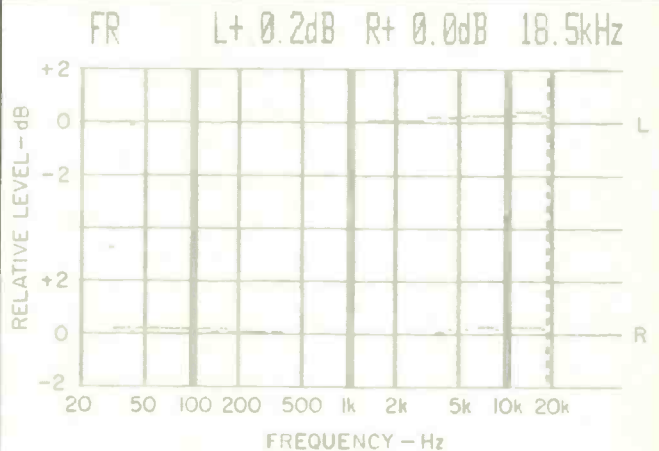


Fig. 1—Frequency response, left (top) and right channels.

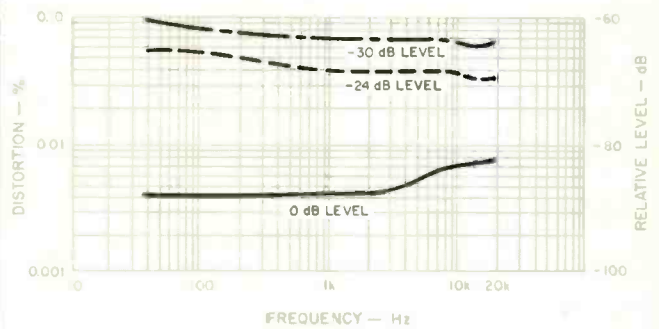


Fig. 2—THD vs. frequency at three recorded levels.

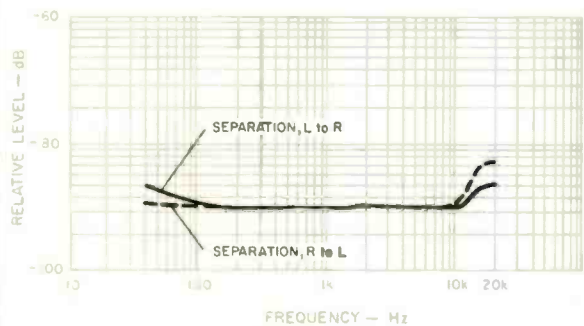


Fig. 3—Separation.

Of greater importance is the ability of a CD player to track properly, and the 610 plays all the way through the Philips "defects" disc.

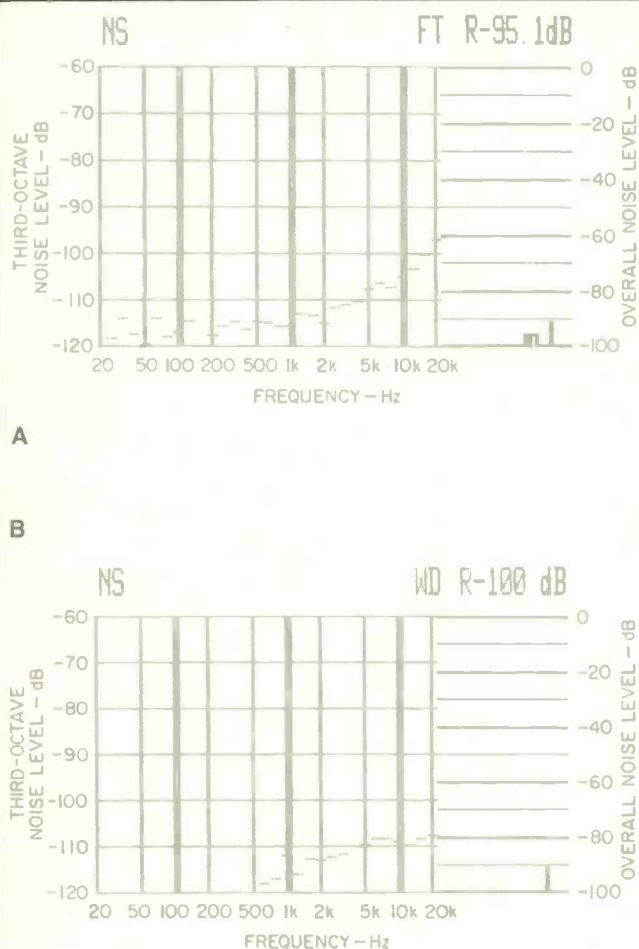


Fig. 4—Analysis of signal-to-noise ratio, unweighted (A) and A-weighted (B).

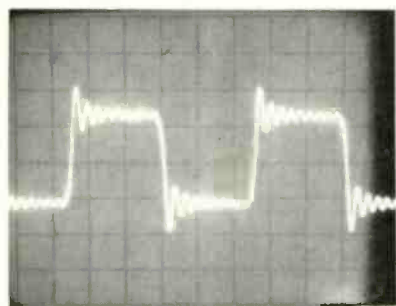


Fig. 5—Reproduction of 1-kHz square wave.

toggle touch-pad located to the right of the display area. Other controls at the right end of the panel include a "Stop (Reset)" button, a variable line-output level control, four "Repeat" programming buttons (whose functions were described earlier), and an "Auto Pause" button which, when depressed, causes the player to pause after playing a track.

The hand-held remote control houses a 10-number key pad, a "Clear" key, and a "Start" key in addition to all the function keys and buttons already described. The remote control can be used to directly access a given track by number without having to touch the "Automatic Music Sensor" keys over and over again to bring the laser pickup to a high-numbered track.

The rear panel of the CDP-610ES is equipped with two pairs of output jacks (fixed and variable) and with a "Beep" switch. With the "Beep" switch on, a sound is heard every time you send a command from the remote control, giving audible verification that the command was received and is being executed. I found after a few minutes of operation that I was able to "trust" the machine (and its remote control) and was grateful that Sony had provided a means for turning off the reassuring beep. I never turned it back on again during all of my lab and listening tests—and I never missed it either.

The rear panel of this unit also incorporates that "mysterious" multi-pin connector, about which I've received numerous inquiries from readers and others who own earlier Sony CD players that were equipped with the same connector. By now I have some pretty good clues as to what the ultimate purpose of this connector will be. Suffice it to say that the words "computer control" and "digitally generated graphics and pictures" come to mind, though all Sony will say at this time is that this accessory connector will be "used to extend the utility of this Compact Disc player by providing for the connection of optional equipment which will be available in the future. . . ." Okay, Sony, if you want to play it cagey, that's all right with me. I can wait till you spring the next surprise on us!

#### Measurements

Figure 1 is a plot of frequency response for both stereo channels, extending from 20 Hz to 20 kHz. The vertical scale has been purposely expanded to 2 dB per division to disclose minor deviations from flat response. In this case, they were minor indeed, never exceeding +0.4 or -0.2 dB at any frequency within the audible range.

Figure 2 is a plot of harmonic distortion versus frequency for three different output levels. As is true in any digital system of this kind, THD rises with *decreasing* recorded levels, rather than the other way around. Thus, at 0 dB recorded level (maximum), THD ranged from a low of 0.004% at low and mid-frequencies to a high of 0.0075% at 20 kHz. At -30 dB recorded level, THD ranged from around 0.07% to just under 0.1%.

The CDP-610ES exhibited one of the most accurate linearity characteristics I have yet measured for any CD player. Linearity was within -0.3 dB even at 80 dB below maximum recorded level, and it was absolutely accurate down to 70 dB below maximum output level. Separation characteristics, plotted in Fig. 3, were virtually identical for

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While differences between CD players still remain fairly subtle, the 610 does show a slight sonic improvement over the earlier CDP-101.



both channels except at the extreme low and high ends of the spectrum. Typically, separation measured around 88 dB over most of the useful audio range.

SMPTE-IM distortion measured 0.002% at maximum recorded level, increasing to 0.014% at a -20 dB recorded level. CCIF (twin-tone) IM, using 19- and 20-kHz signals (which combined produced a "0-dB" output level), measured 0.0019%, increasing to 0.0056% at -10 dB level. As in previous tests of CD players, signal-to-noise analysis was conducted both without and with an A-weighting network. Results are shown in Figs. 4A and 4B. Overall signal-to-noise ratio measured 95.1 dB, unweighted, and precisely 100 dB A-weighted.

Square-wave reproduction of a 1-kHz, digitally generated square-wave test signal, shown in Fig. 5, was typical of that encountered with CD players which utilize multi-pole, analog, low-pass filters (in this case, eleventh-order filters are used) in post-D/A circuitry. The same holds true for the reproduction of a digitally generated unit-pulse signal, shown in the 'scope photo of Fig. 6. The usual phase displacement between a 200-Hz, left-channel test signal and a 2-kHz, right-channel test signal is obvious in the 'scope photo of Fig. 7. For perfect phase linearity, positive crossing of the zero axis would occur at the same time for both test signals, and that is clearly not the case here.

Purists will argue interminably about the sonic merits or demerits of this or that CD player design, but when you get right down to it, the sonic differences between players remain fairly subtle, at best. What I believe to be of far greater importance is the ability of a CD player to track properly, to utilize as much of the error-correction capability as was "built into" the Compact Disc standards developed by Philips and Sony, and to withstand mechanical shocks and vibration any piece of equipment is likely to undergo during normal use.

With these points in mind, I subjected the Sony CDP-610ES to the usual tests which employ my special Philips "defects" test disc (the one with the ever-widening opaque wedge, the black "dust" dots of increasing diameter, and the simulated fingerprint smudge). The CDP-610ES joins the ranks of those very few players that were able to play through that entire disc without so much as a single mute or a single moment of mistracking. It came as no surprise, after these tests were completed, to find that the player was also highly resistant to mistracking caused by blows to its top and sides.

#### Use and Listening Tests

Over the course of several weeks, I had an opportunity to listen to the CDP-610ES for a considerably longer time than I usually devote to a single piece of equipment I review for

*Audio.* I not only came to appreciate the superb sound quality delivered by this machine (yes, I *could* hear a slight sonic improvement compared with the CDP-101), but I became rather attached to it because of its excellent human engineering and especially the speed with which it accessed any track on a disc. Now that I have a few discs with indexing, I greatly appreciate the ability to access the indexed locations on those discs as well.

In addition to trying out some of my old CD favorites (so that I can compare them with how they sounded on earlier machines), I make it a practice to try out several newer CDs each time I get my hands on a new player. A few that sounded especially great on the Sony CDP-610ES were Telarc's *Malcolm Frager Plays Chopin* (CD-80040) and *Bach on the Great Organ at Methuen*, played by Michael Murray (CD-80049), as well as Denon's *Bach: Concertos in D Minor and A Minor* (38C37-7064). Listening to any one of these masterfully recorded CDs simply reinforces my faith in this new medium as well as my conclusion that the Sony CDP-610ES ranks very high indeed in the growing list of superior, second- and third-generation CD players.

Leonard Feldman

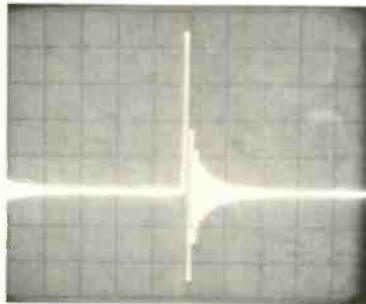


Fig. 6—Reproduction of single pulse.

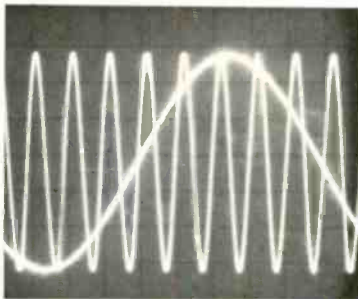


Fig. 7—Phase error check using 200-Hz and 2-kHz tones; see text.

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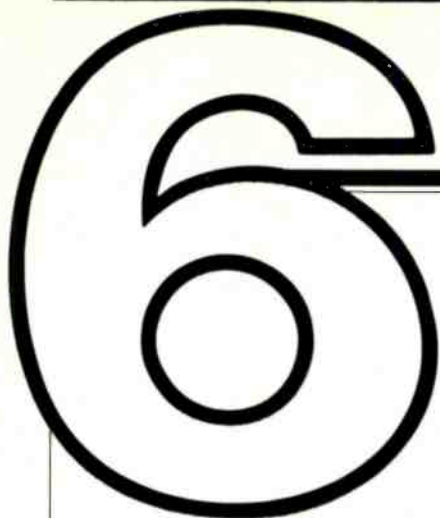
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## HEYBROOK TT2 TURNTABLE AND TONEARM

### Manufacturer's Specifications Turntable

**Drive System:** Belt.

**Motor Type:** Synchronous.

**Speeds:** 33 $\frac{1}{3}$  and 45 rpm.

**Speed Drift:** Less than 0.1%.

**Wow & Flutter:** Less than  $\pm 0.1\%$ ,  
DIN peak weighted.

**Rumble:** Better than  $-73$  dB, DIN B  
weighted.

### Tonearm

**Type:** Pivoted straight tube with non-  
detachable headshell.

**Effective Mass:** 12 grams without  
cartridge.

**Nominal Length:** 9 $\frac{1}{8}$  in. (231.8  
mm).

**Effective Length:** 8.3 in. (210.8  
mm).

**Stylus Overhang:** 18 mm.

**Cable Capacitance:** 100 pF, max.

### General Specifications

**Dimensions:** 17 $\frac{1}{2}$  in. (44.5 cm) W  $\times$   
14 $\frac{1}{4}$  in. (36.2 cm) D  $\times$  6 $\frac{1}{4}$  in. (15.9  
cm) H with dust cover closed.

**Weight:** 26 lbs. (11.8 kg).

**Price:** \$679.00 with Heybrook tone-  
arm; \$498.00 without tonearm.

**Company Address:** c/o D'Ascanio  
Audio, 11450 Overseas Highway,  
Marathon, Fla. 33050.

For literature, circle No. 95



The Heybrook TT2 is a splendid example of the English renaissance in simple, high-performance, belt-drive turntables equipped with floating sub-chassis for effective isolation of the platter and stylus from external vibration. The TT2 makes a positive impression as soon as it is unpacked, thanks to its unusually heavy weight (26 pounds) and remarkably solid construction. "Solid," in this case, is not a metaphor. Much of the TT2 is a solid block of dense wood.

In most floating-chassis turntables, the "base" is a decorative shell surrounding an interior space only partly filled by the motor and suspension elements. Reasoning that this interior volume is potentially a resonant acoustic cavity, Heybrook simply eliminated the interior. The entire base is sculpted from a single, 3-inch thick block of laminated chipboard and high-density particleboard, with just enough space cut away to accommodate the motor

assembly and the T-bar on which the platter and tonearm are mounted. The turntable wiring is routed through pre-cut channels in the wood. Extra space is cut away beneath the tonearm to accommodate a looped signal cable and to allow installation of different tonearm mounting boards.

The platter and tonearm are securely mounted on an unusually massive and rigid die-cast aluminum T-bar that minimizes the possibility of unwanted relative motion between platter and stylus. This assembly floats on three tapered coil springs that provide isolation from the vibration of the motor (which is rigidly mounted in the base) and from any external vibration reaching the turntable through its base. The springs are relatively short and stiff, but the combined weight of the inner and outer platters (nearly 6 pounds), bearing assembly, and T-bar is enough to ensure a desirably low suspension frequency of approximately 5 Hz for the system.

Measured wow and flutter was 0.03% unweighted and 0.18% DIN peak weighted. That's superb performance.

One rarely mentioned advantage of this type of floating suspension is that it blocks the acoustic feedback caused by the dust cover. In many turntables the large, thin dust cover acts like a sail, efficiently intercepting sound waves in the air and coupling their vibrations into the turntable system. (I have reduced the acoustic sensitivity of some turntables by as much as 20 dB by simply closing their dust covers and placing pillows on them.) But in a floating-subchassis design, like the Heybrook, the dust cover's microphonic vibration is coupled only into the base, where it remains isolated from the platter and stylus.

The TT2 can be purchased with a blank tonearm mounting board or with Heybrook's own arm installed (the version I tested). The instruction booklet describes how to readjust the suspension to accommodate tonearms of differing weights, in order that the drive belt will be correctly centered on the crown of the pulley. The instructions also devote considerable (and well-deserved) attention to a subject some turntable designers neglect: Routing and fastening the tonearm cable in a semicircular loop to minimize its tendency to conduct external vibration and defeat the floating suspension. The signal cables of Heybrook's own tonearm are relatively thin and flexible for this reason.

The thoughtful design of the TT2 extends even to its rubber feet, of which there are three rather than the usual four. Three feet provide an unconditionally stable platform, while objects mounted on four feet often can be made to rock.

Aside from the extra effort that installing your own tonearm may require, the amount of time and labor involved in setting up the TT2 is about average for turntables of this type. The important first step, one that must be done by either the dealer or customer, is to remove the inner platter, inject oil into the main bearing, and reinstall the platter and shaft. The only awkward part of the process is installing a cartridge in the arm, since the headshell is not detachable. (An optimum combination of rigidity and low mass is obtained by omitting the usual headshell plug-and-socket fitting, with its potential for loss of low-level information.)

As in many turntables, the counterweight assembly turns on a threaded shaft to balance the arm and set the vertical tracking force. But the assembly is unusual in two respects: First, there is no calibrated dial, so you must use an external gauge when setting the tracking force. Second, the counterweight is in two sections—after finding the correct setting, you rotate the two halves against each other to lock them on the threads so that their position (and the tracking force) cannot be changed accidentally.

Similarly, the threaded anti-skating weight has no calibration scale. The instruction booklet advises using a test record to find the best anti-skating adjustment. This is good advice with any turntable, since the amount of skating sidethrust is not a fixed percentage of the tracking force, but can depend on the shape of the stylus tip.

#### Measurements

The following measurements were made by my colleagues Alvin Foster and J. K. Pollard of the Boston Audio Society.

The turntable speed, which is not user-adjustable, was unaffected by variations in power-line voltage from 75 to 130 V and was 0.3% fast. The speed change from 33 to 45 rpm is accomplished by lifting off the outer platter and moving the drive belt to the larger of two pulleys on the motor shaft. The measured wow and flutter was 0.03% unweighted and 0.018% DIN peak weighted (superb performance).

Because of the inertia of the heavy platter, the low-power synchronous motor takes nearly 10 S to bring the turntable up to speed. However, once it is running, the drive system is more successful than many other belt-drive units at the task of maintaining a precisely constant platter speed despite small variations in drag. There was no change in speed under a 10-gram load, which means that the TT2 is completely safe for use with Dust Bug-type disc-cleaning devices. This also implies that the TT2 is unlikely to exhibit "dynamic wow" due to the varying drag of the stylus in heavily modulated grooves.

The thin, felt platter mat does little to suppress metallic platter ringing, but happily there is relatively little ringing in

the heavy, two-part aluminum platter anyway. Users who wish to suppress LP-disc microphonics and the last vestige of platter resonance should experiment with soft-rubber mats and spindle clamps to press the record down into uniform contact with the mat.

In our informal test of a turntable's isolation from acoustic and structure-borne feedback, we turn up the preamp volume control while tapping the table to observe the resulting boomy hangover. The TT2's performance was exemplary: The tapping produced only a slight thump with no audible feedback hangover, even with the volume control at maximum.

While the floating suspension provides outstanding immunity to vertical impulses, the closely spaced springs tend to encourage rocking motions of the suspended arm/platter system. Therefore, for best results the TT2 should not be located where any lateral or rocking motion can be transmitted to it. The manufacturer recommends placing the TT2 on a relatively lightweight shelf or table, presumably on the theory that a low-mass shelf will not transmit vibration efficiently to the relatively high mass of the TT2.

Spectrum analysis of the lateral and vertical rumble, using an unmodulated test disc, yielded excellent results, with levels below -60 dB at most audible frequencies. There were no peaks traceable to motor vibration; below 30 Hz, the rumble spectrum appeared to consist solely of groove noise amplified by the infrasonic tonearm/cartridge resonance, indicating that the turntable has little or no rumble of its own. With the brush of a Shure V15 Type IV cartridge engaged to damp the arm resonance, the rumble spectrum remained below -50 dB at infrasonic frequencies; with the brush raised, the rumble spectrum peaked at -35 dB around 5.5 Hz.

The measured capacitance of the tonearm's 1-meter signal cable was 143 pF in each channel. The arm's hydraulically damped cueing had a smooth and gentle action, with no sideways drift of the arm as it rose or descended. But as often happens when the cueing lever is on the floating subchassis rather than being mounted on the base, the entire platter/arm assembly tended to bounce slightly when the

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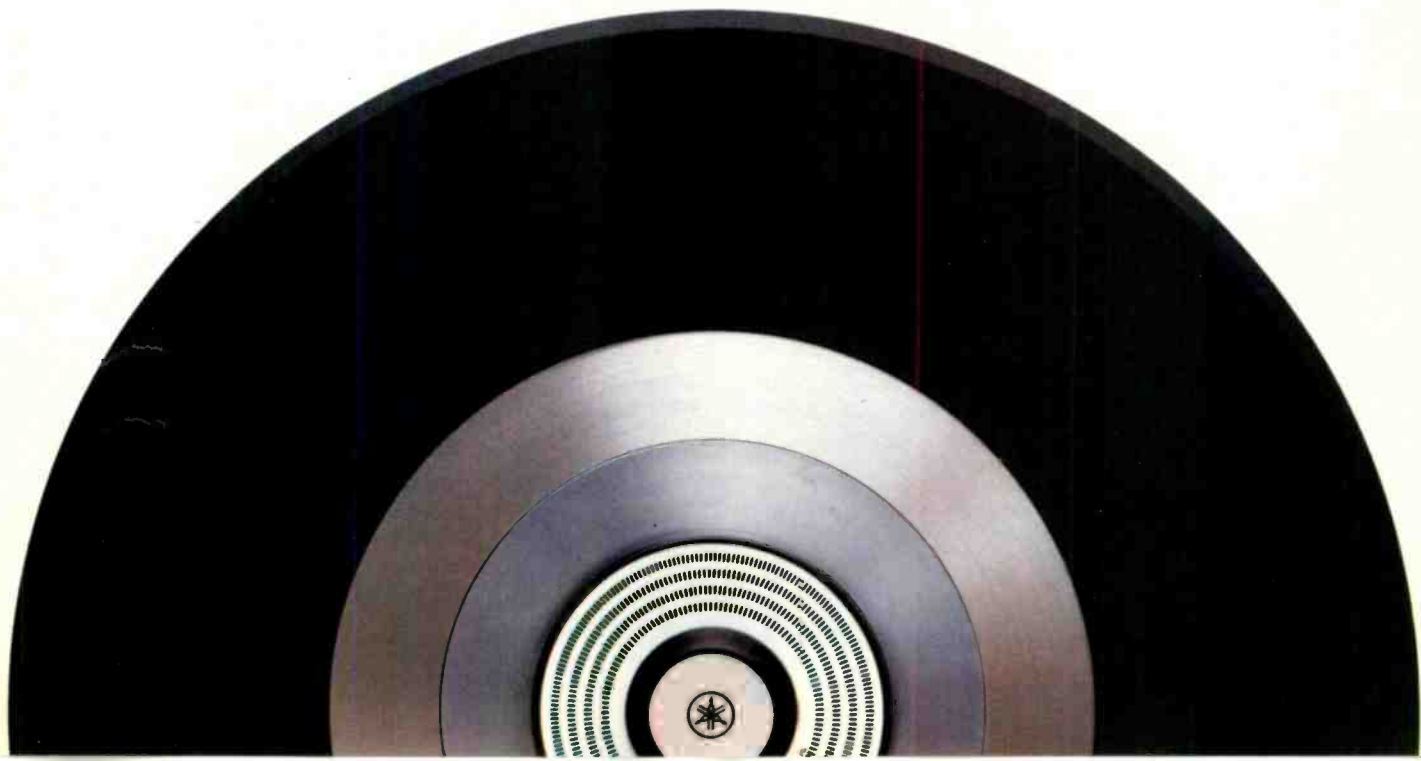
unaffected by sudden vertical acceleration (such as from record warp). It has optimum mass/minimum resonance to provide maximum performance from any type of cartridge. And unique twin pipes to resist flex and provide the widest signal separation possible.

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Like a great ocean liner,  
the TT2 imparts a sense of  
total stability, serenely  
undisturbed by its  
surroundings.

lever was moved; and this may change the location of the stylus on the record.

Since the Heybrook tonearm has little pivot friction and no provision for damping, arm/cartridge resonance can produce exaggerated cantilever deflection (with a consequently large variation in the effective vertical tracking force) in response to warps and record surface irregularities. We use a strain-gauge cartridge to observe these effects. The variation in tracking force was 0.7 gram peak-to-peak on a visibly flat record, increasing to 0.9 gram on a mildly warped disc.

Therefore, with the Heybrook arm (as with other undamped arms), some form of damping should be added when high-compliance cartridges are used, unless the stylus assembly has significant internal damping of its own. An alternative approach, without damping, would be to use a medium-compliance cartridge so that the resonance frequency falls well above 10 Hz; the resonance won't then be stimulated either by disc warp signals (which generally fall below 5 Hz) or by external vibrations passing through the suspension's 5-Hz mechanical filter.

#### Use and Listening Tests

In listening tests (employing a Gold-ring cartridge with moderate compliance and some internal damping to help control infrasonic resonance), the Heybrook TT2 was a pleasure to use and a joy to hear. Like a great ocean liner, it imparts a sense of total stability and reliability, serenely undisturbed by what is going on around it. Stable and transparent are the words that come to mind to describe its sonic performance. Stereo images are precisely focused without wander, and the wealth of low-level detail appears to be limited only by the groove noise and rumble of the record itself. With the TT2's virtually total freedom from rumble and acoustic feedback, the sonic benefits of techniques like low-noise pressing and Direct Metal Mastering are especially clear. *Peter W. Mitchell*

*Peter W. Mitchell is a freelance writer (specializing in the fields of audio, video and microcomputers) and a consultant providing design advice and technical writing to NAD and other manufacturers.*

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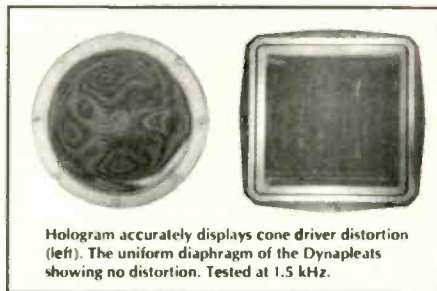
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Hologram accurately displays cone driver distortion (left). The uniform diaphragm of the Dynapleats showing no distortion. Tested at 1.5 kHz.

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## NITTY GRITTY 1.0 AND VPI HW-16 RECORD CLEANERS

**Company Addresses:** VPI, P.O. Box 159, Ozone Park, N.Y. 11417. For literature, circle No. 96  
Nitty Gritty, 4650 Arrow Highway, #F4, Montclair, Cal. 91763. For literature, circle No. 97

No cult can be successful without ritual purification, and this is as true of analog-record worship as any other primitive religion. The benefits of purifying records can, however, be more tangible than purifying most other idols. A professionally cleaned record does sound different from one cleaned with a hand-held brush. No combination of brush and fluid alone can properly remove the fine microdust in the bottom of the record groove where the stylus makes contact. This type of cleaning takes a strong vacuum, and very close contact.

Without such a vacuum, many brushes simply remove the larger surface particles, or move the dust around without removing it. This is often true even of the best carbon-fiber brushes and otherwise excellent hand-held cleaners. Hand cleaning is also something of a lottery; it is extremely difficult to use most brushes with just the right stroke to remove as much dust and dirt as possible. The effectiveness of most brushes varies sharply with pressure, and humans lack the built-in pressure sensors of torque wrenches. Brushes are generally not wide enough to cover the entire record when used at the angle where they are most effective.

The problem with professional cleaners, however, has been their price. Few audiophiles are willing to pay more than \$500 for a machine to clean their records even if this does mean substantially better highs and upper midrange, far fewer ticks and pops, longer record life, more detailed and stable imaging, a lower noise floor, and better tracking. Even fewer are willing to make regular visits to the few



stores which still offer professional record cleaning services.

Enter the Nitty Gritty and VPI record cleaners. Nitty Gritty has a series of machines ranging from the basic Nitty Gritty 1.0, at \$239, to the Nitty Gritty Professional, at \$639. The basic difference is in finish, vacuum power, manual or power turning of the record over the vacuum, and application of the record cleaning fluid on one or both sides. VPI now has two models, the HW-16 (\$355) tested here, and the professional HW-17 (\$650).

The Nitty Gritty 1.0 is particularly interesting because it is the cheapest unit on the market. It also, however, is the most basic. You must put the record on a spindle, apply the fluid to the top with a brush, turn the record over, and manually rotate it over the vacuum intake. This is not a particularly difficult or time consuming process, but it can be a bit awkward. The record is not supported at the outer edges, you must be careful to saturate the brush before you begin, and you must then apply fluid to the brush with a very light hand to avoid pushing down on the record or having the fluid spill over the label.

In contrast, the VPI has a rotating platter which supports the entire record, and you simply apply the fluid and bring down the lid, which has the vacuum intake built in. This is a simpler process, although it costs more, in-

volves a noisier and larger machine, and means the record grooves do touch the platter of the cleaning machine. I cannot quite bring myself to call the ergonomic trade-offs a "wash," but the advantages of the VPI HW-16 over the Nitty Gritty 1.0 are limited, and the Nitty Gritty 2.5+ has power rotation and an automatic scrubbing arm for \$379.

Both machines give excellent results. I compared them by listening to a wide variety of music from records they had cleaned and by using a computer program which compared noise level over time by octave. Both machines yielded massive improvements in noise and musical detail over the best hand brushes I have tested. Both compared well to discs cleaned on a Keith Monks professional record cleaning machine.

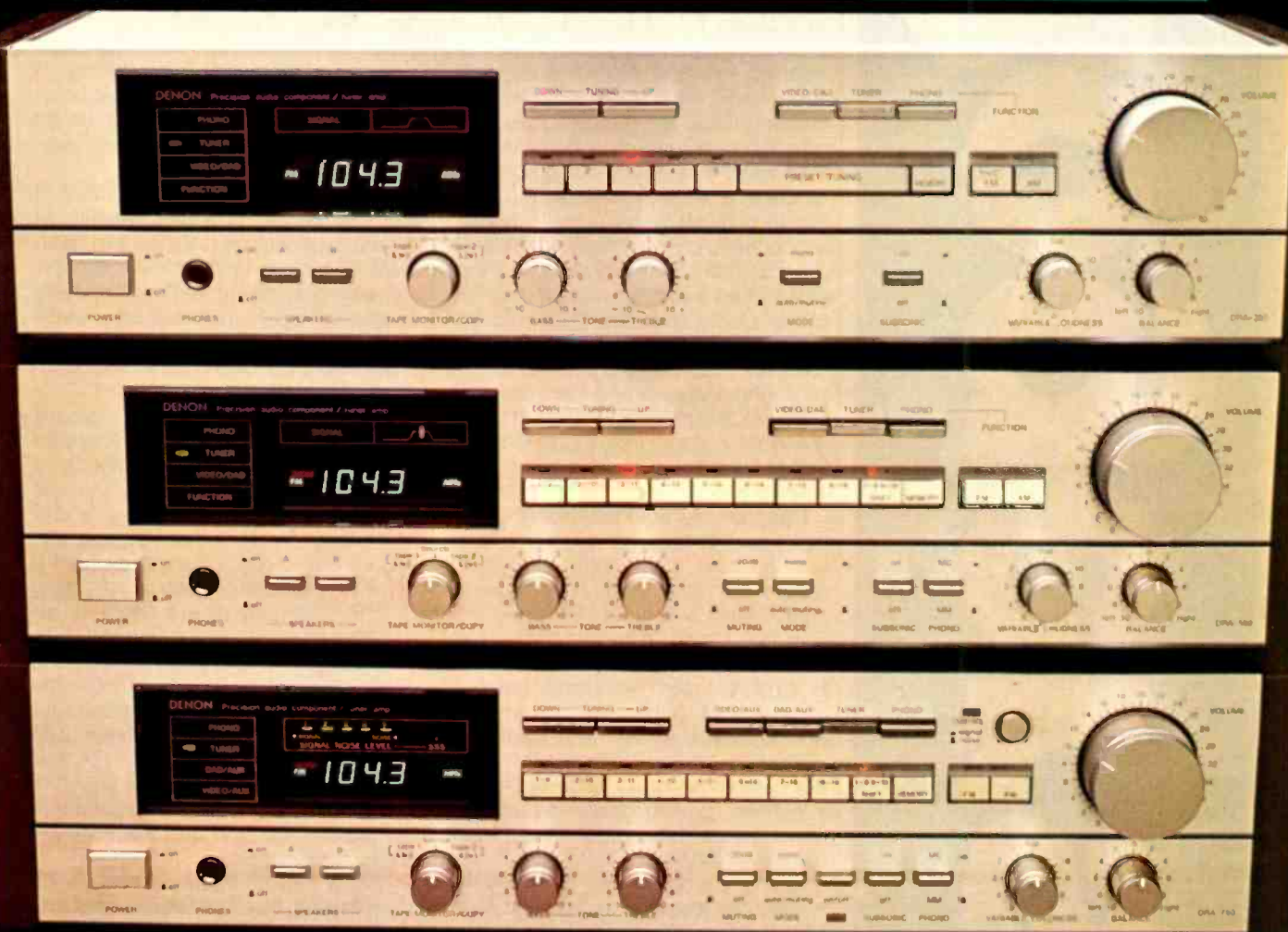
I should note that a true believer will notice significant differences in the noise spectra produced by the Nitty Gritty, VPI, and Keith Monks and that the Keith Monks cleans the record more consistently. The differences are not, however, uniform, and they seem to vary with record thickness, shape, and flexibility. They also are very minor. I confirmed this with a simple test. I would clean a record on one machine, listen, and then clean it on another. None of the three machines made records noticeably noisier, although they did cause slight shifts in the frequency balance of the noise

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A good record cleaner should mean better highs and upper midrange, fewer ticks and pops, longer record life, and lower noise.

floor. Use of a hand brush did make the record slightly noisier, and all three machines made records cleaned by hand brushes more detailed and musical, as well as improving their noise floors. The real issue is which model you find easiest to operate and most convenient to put in your home at the price you can afford.

If anything, different brands of record cleaning fluid made far more difference than different brands of record cleaning machine. The PS Audio Sonipure, LAST, and Nitty Gritty record cleaning fluids all produced quieter results than any mix of alcohol and distilled water that I could come up with—although a 20% to 33% alcohol solution in distilled water is quite good. I cannot defend my ranking on technical grounds, but I felt the Nitty Gritty Purifier fluid had a distinct edge in terms of sound clarity over the PS Audio and that it outperformed the LAST. Much, however, may depend on the particular contaminants present in your area. The dust and pollution "fallout" in a city like Washington, D.C. is different from that of New York City or a home in the country.

I also should note that both the Nitty Gritty and VPI record machines, even with no fluid at all, produced better results than any hand-held brush or combination of a hand-held brush and fluid that I tried, provided that the record was cleaned with a fluid every 4 to 8 plays. I don't like using too much of any fluid (other cult priests and priestesses disagree), and I also tend towards occasional moments of inertia. Dry cleaning is quick and effortless.

Further, professionally cleaned records mean you need to pay much closer attention to the rest of your cleaning process. You can hear the differences much more quickly. Again allowing for differences in cult practices, I recommend that you take the following four steps:

(1) Clean new records with First fluid from Nitty Gritty. Budget, European and jazz records often come with crud in the grooves that ordinary cleaning fluids won't remove. First audibly improves the detail and sound-stage delineation of many records. If it has a drawback, it is that some records don't benefit from such cleaning. You can hear the hiss, miking problems, etc.

better after you use First. This, however, is an argument for better records, not against First.

(2) Use the LAST stylus cleaner. While the Discwasher stylus cleaner works reasonably well, and the Signet and Audio-Technica fluids work very well under most conditions, the LAST cleaner consistently removes the kind of black coating on the stylus that no other cleaner I have tried removes—at least not without extensive effort and repeated checks with a microscope. I also feel far more confident that I can use a minimum of fluid and safely avoid putting a stiff brush to my delicate cantilevers.

(3) Use Stylast stylus treatment. I find that Stylast provides virtually all the sonic benefits of LAST record treatment, at far less cost and with far less difficulty in applying it. These benefits consist of better upper-octave detail and broader, if unpredictable, improvements in tracking and sound-stage reproduction.

(4) Use a carbon-fiber record sweep, if your turntable suspension permits it. A Hunt, Garrard, Signet, or Audio-Technica record sweep (a tone-arm-like device that cleans the record as it plays directly in front of your stylus) will not clean a record, but it will solve the problem of records attracting dust as they play or are handled, regardless of how they are cleaned. (Unfortunately, the lowest-mass unit—the Garrard—must be imported from the U.K.) Even then, such devices are for high-torque turntables or those with stable suspensions like the SOTA and VPI. Sweeps will degrade the sound of low-torque or delicate-suspension turntables—the Linn and the Pink Triangle, for example.

I know that all this may seem a bit complicated, but it generally takes less than two minutes a record, and believe me, it pays off. If you are a true audiophile (and this can be defined as someone whose records cost more than the total cost of their hi-fi system), you will be amazed at how much better every record will sound and for how much longer you can keep your records—particularly those irreplaceable ones of great performances which are badly made—alive.

Thus endeth today's lesson on ritual purification. *Anthony H. Cordesman*



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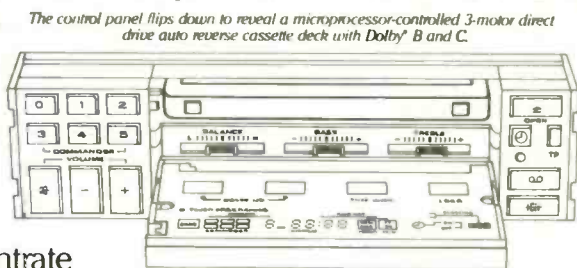
cost \$2,000 to \$3,000.

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# ROCK/POP RECORDINGS

MICHAEL TEARSON  
JON & SALLY TIVEN

## A TOAD BY ANY OTHER NAME

### Box of Frogs

Epic BFE 39327, \$8.98.

Sound: B- Performance: B

These days silly retreads like Frankie Goes to Hollywood and The Smiths pass for progressive New Wave music. In the midst of this flim-flam, that old blues outfit, The Yardbirds, has reformed under the monicker Box of Frogs, boogying their way across the airwaves à la ZZ Top. Their new guitarist isn't Beck, Page, or Clapton, only Ray Majors (ex-British Lions), but just

that their strength lies in the riff-oriented blues standards genre, so they've written plenty of their own for this album. Noteworthy guitarist Rory Gallagher gives a kick in the pants to "The Edge" and "Into the Dark" but the outstanding song on this record is the moody "Two Steps Ahead." Not far from the cowboy-rock sound of Tom Petty, this tune is the best composition, the most atmospheric, and boasts the most effective guitar parts of the bunch. Beck's Spanish-flavored licks complement the vocal and lend a

### Breaking Hearts: Elton John

Geffen GHS 24031, \$8.98.

Sound: B Performance: B+

Much to my surprise, *Breaking Hearts* is as fine an album as any Elton John has made. He displays real zest here and sounds like recording this album was one of the real good times in his life.

It has sure helped him to be reunited again with the band he used in his early days as a star. Although Davey Johnstone, Dee Murray and Nigel Ols-

Illustration: Rick Tulka



in case you remembered back that far, Beck does make a guest appearance on four cuts. Non-Yardbirds also present include ex-Medicine Head singer John Fiddler, Rory Gallagher, ex-Beck sideman Max Middleton, and legendary British pianist/accordionist Geraint Watkins. Albums like this win or lose based on their list of stellar players. The Yardbirds connection is kept active with producer/bassist/songwriter Paul Samwell-Smith (the original musical director of the group), Chris Dreja (rhythm guitarist), and drummer Jim McCarty, all of whom have managed to turn out performances far better than they ever did with the original group. The result is a satisfying blues record, without anything particularly trendy or psychedelic.

The album gets off to a rollicking start with a boogie number graced by Beck's guitar. "Back Where I Started," with its modest arrangement, tasty harp and guitar fills, sounds like an outtake from Johnny Winter's equally credible recent LP. The Frogs know

slightly off-center flavor to the wholesome melody line. Despite the celebrated soloists who appear here, it's the voice producer Samwell-Smith plays up, doing an excellent job with a clean vocal sound. He has been paying the rent producing Cat Stevens and Carly Simon during the time since The Yardbirds' demise, and it's interesting to note how well this experience has served him and the group.

All in all, it's fun to see these guys taking their stage gear out of mothballs and once again readying themselves for the rock world. Album two should be more telling—they'll have to find themselves a permanent guitar player who can live up to the legends who preceded him. Granted that there's nothing here to add anything but a renewal lease to the The Yardbirds' Historic Building status, Box of Frogs doesn't do anything to deface the landmark. The Byrds, Spirit, CSN&Y, and The Animals can't say the same, and Deep Purple should be so lucky.

Jon & Sally Tiven

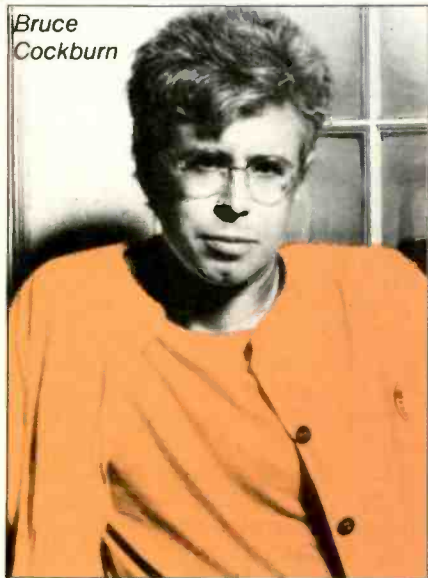
son may not be the greatest players in the world, together they generate a special affinity for John's music, and they always deliver their best work on his records.

Then there is the contribution of lyricist Bernie Taupin who has written words for a vast majority of Elton's tunes ranging over a 15-year span that has been intermittent only in later years.

Elton John



Bruce  
Cockburn



*Breaking Hearts* is an album of sturdy, committed pop music that is mostly on the upbeat side, giving old El a chance to rock out a bit. The slower songs, notably the hit "Sad Songs Say So Much," give the album balance and depth.

The irony of it all is that, now that Elton John is doing terrific work again and even selling well, he is not likely to ever have the kind of impact he made as the wildly flamboyant dresser and performer he was through most of the '70s. That's entertainment for you: Last year's Elton John has become this year's Liberace. *Michael Tearson*

**Walkin' the Razor's Edge:** Helix  
Capitol ST-12362, \$8.98.

Sound: C Performance: D

This is as generic a metal album as you are likely to hear. Forgettable songs, the usual playing and posing, plus the requisite red cover and black outfits. Consider yourself warned.

*Michael Tearson*

**Stealing Fire:** Bruce Cockburn  
Gold Mountain/A&M GM-80012,  
\$8.98.

Sound: B+ Performance: A

Nobody has ever accused Bruce Cockburn (pronounced Co-burn) of taking an easy way out or of making things simple for himself or his music.

He has always dared to write from his heart and conscience. With a rare gift for poetic expression and impact, plus a truly adventurous musical vision, Cockburn composes bracing and challenging songs which owe precious little to formulas. His one previous American hit song, "Wondering Where the Lions Are," is actually a good example of his work.

The new album, *Stealing Fire*, is an even better example. The songs are vibrant and cinematic, with warm and charismatic performances all joined by excellent recording which lets the rich detailing shine.

The album carries a constant thread of endangered grace. At the opening, "Lovers in a Dangerous Time" clearly signals the theme. "Maybe the Poet" expands on it, naming the poet in the modern world as a teller of more truth than the ruling system. "Sahara Gold" and "Making Contact," each adds to the motif of lovers and heat and passion which all leads to the violent conclusion of the side. This last is a scene of love gone sour and disastrously wrong, as it asks who put the bullet hole in "Peggy's Kitchen Wall." Answers never come easily and often not at all in Cockburn's vision.

Side two's songs are a Third World cycle mostly written during an early '83 trip through Nicaragua. Themes here are revolution and revenge, violence and hope for better and fairer times. Not exactly the stuff of Tin Pan Alley.

One common element that runs throughout Bruce Cockburn's many albums is the class he imparts to every record he makes, from the creative problem of songwriting to his superb musicianship (he is a guitarist of surprising power, sensitivity and subtlety,

often all these at once). True, some of his albums are more memorable and better than others, but *Stealing Fire* is one of his best, most focused.

Lovely as it is, *Stealing Fire* is neither party music nor easy listening, although it may function well as either. It is serious stuff to be absorbed on reflection. Cockburn's music has always had this extra level of commitment, and this is what makes him uncommonly special and valuable.

*Michael Tearson*

**Guitar Slinger:** Johnny Winter  
Alligator AL 4735, \$8.98.

Sound: B Performance: A-

Johnny Winter's first album for Bruce Iglauer's Chicago blues label is one of his best. It sounds like Johnny had one of the times of his life cutting this one.

There are times when a blues album can definitely sound like the musicians are only going through the motions.

And then there are times when magic happens and it is much, much more.

*Guitar Slinger* is one of those. Winter's guitar is tough, biting, nasty, often eloquent. So is his singing. There have been times when



Johnny Winter

Southside Johnny has taken his Jukes back to basics. The slick stuff of past albums is replaced by a more straightforward approach.

Winter has been so far in left field he has sounded like a jerk, but here, all is under control.

It runs from blues fast, slow and medium through some New Orleans funk. Hot chops and tasty licks prevail.

Production by Winter, Iglauer and Dick Shurman is suitably simple and clean, from the "if it ain't broke, don't fix it" school. *Michael Tearson*

**In the Heat:** Southside Johnny & The Jukes  
**Mirage 90186, \$8.98.**

Sound: C+ Performance: C-

After a disastrous album produced by Nile Rodgers, Southside Johnny has taken his Jukes back to a more basic approach. He's produced this new one with his guitarist, songwriter and all-around right-hand-man Billy Rush, and the slick stuff is replaced by more straightforward approaches.

The basic, seemingly insurmountable problem facing Southside Johnny & The Jukes is the same one that has hounded them ever since they moved out from under the tutelage of Bruce Springsteen and his erstwhile lieutenant, Miami Steve Van Zandt. Southside Johnny Lyon and Billy Rush just do not write songs which are as good as Southside is a singer or the Jukes are a band. The proof here is that the best cuts are both from outside sources. Alex Call's "New Romeo" isn't any great shakes either, but at least it has some real hooks. The best shot comes last, on Tom Waits's "New Coat of Paint" which closes the album. This one is a real blues, and you can feel how much more relaxed both Southside and the band are with the form. Johnny sings and the band plays with more authority here than at any other time in the album. It makes you want to hear them play more blues.

There's nothing really wrong with *In the Heat*. There's just not enough heat from it either. *Michael Tearson*

(*Editor's Note:* It's always been my opinion that Johnny & The Jukes was a blues band, as in Chicago Blues Band, and that Bruce and Miami simply muddled that music. So, yes! More blues.—E.P.)

**Chequered Past**  
**EMI America ST-17123, \$8.98.**

Sound: B+ Performance: B+

As their name suggests, the members of this group have been affiliated with important groups of yore. With Nigel Harrison on bass, Clem Burke on drums (both from Blondie), ex-Sex Pistol Steve Jones on guitar, ex-Iggy Pop cohort Tony Sales on guitar, and former Detective and Silverhead frontman Michael DesBarres at lead-vocal mike, the record-buying public is supposed to expect a Supergroup of the punkish kind. Cute marketing idea, and an enjoyable disc, but the sound of the group is far closer to corporate rock



*Chequered Past*

than garage band. Following the path already trod by Billy Idol, this album is a streamlined model of tamed, distorted guitars (Jones never sounded so adroit on Sex Pistols or Professionals LPs) and adept but heavily footnoted vocals (a Robert Plant here, a Billy Idol there). Don't get us wrong—DesBarres has a credible set of pipes and he goes for some interesting notes when he's not too busy projecting sexist-rock attitudes.

From the gist of these tracks ("Let Me Rock" in particular), the group is apparently aimed at blowing Billy Squier's Led Zep impression out of the water. Vocally, D.B. has Billy beat, but the drums on this record are a mite thin for the genre—Burke's playing has always been most effective when he does his Keith Moon impression. When forced to lay down a steady backbeat, Burke comes off as strictly ordinary. Alas, Steve Jones' trademarked guitar riffing without the traditional Paul Cook fill suffers a bit, as the two of them performed more like a rhythm section than as a guitarist and a drummer. These are minor complaints, as overall the record is highly enjoyable.

What we have here are five veterans of several different rock genres pooling their talents—which have usually been utilized in a left-wing fashion—in a genre which is decidedly more middle of the road. This is Midwestern-style pop rock with which John Cougar would be comfortable, and it is amusing and satisfying to hear those who are somewhat out-the-window lending their slightly more individualized technique to this homogenized marketplace. It's certain that with success *Chequered Past* will get a little more outrageous, and closer to the punk roots from which they came. In any case, they are a band groomed for success and they probably deserve it. Above all, their debut album is musically solid, entertaining, and very promising. *Jon & Sally Tiven*



*Southside Johnny*

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Peter Wolf's new album never slips into feeling scattered or disjointed. It's like a puzzle which keeps exposing new delights.

**Lights Out:** Peter Wolf  
EMI-America SJ-17121, \$8.98.

Sound: B — Performance: A —

To be honest, I really wasn't expecting to like the solo album Peter Wolf would record after his departure, under less than amicable circumstances, from the J. Geils Band. Frankly, I expected a shallow piece of soul/pop formula. Quite to my delight and surprise, *Lights Out* has happily turned out to be a strong and eclectic platter of vinyl delights.

Some of it does conform to what kind of stuff I expected: Numbers like the first single, "Lights Out," which Peter cowrote with R & B legend Don Covay; "Crazy," which opens side two, and the neo-Motown "Baby Please Don't Let Me Go." But the stylistic range is much broader. There is the funky, hip-hoppy "Oo-Ee-Diddley-Bop" complete with scathing effects and very topical words delivered half-rapped, half-sung. There is the spacey, weird, funny "Mars Needs Women." There is the relatively simple but thoroughly modern "I Need You Tonight." There is a pretty, mid-tempo ballad, "Pretty Lady," which features guest vocals by Mick Jagger. And for a complete change of pace, there is the smoky nightclub sound on the chestnut "Gloomy Sunday." This is a lot of ground to cover, but the album never slips into feeling scattered or disjointed. It's more like a box puzzle that keeps opening in different ways to expose new delights.

Coproduction of the album and coauthorship of most songs with Wolf

has fallen to Boston funkster Michael Jonzun. Between the two, *Lights Out* has emerged with an excellent big sound and enviable clarity throughout.

But some songs are flawed. "Baby Please Don't Let Me Go" does get tiresome by the end of its 4:03, reminding me how vintage-Motown hits rarely went past 3:14. The added repetitions on the way out just go on too long. "Here Comes the Hurt" and "Poor Girl's Heart," to name two, just aren't top-level songs. Still, a minor clinker or two does not deter from the high spirits that prevail.

*Lights Out* is one classy album from an artist who knows his roots well, cherishes and constantly regenerates himself from them, while keeping up with new developments. It could be that the really stellar part of Peter Wolf's career is only now beginning, with his departure from J. Geils.

Michael Tearson

**Camouflage:** Rod Stewart  
Warner Bros. 25095, \$8.98.

Sound: B — Performance: B —

Rod Stewart has become the living embodiment of what the rock star should not become. He lives the life of the elitist playboy, his musical sensibility changes with fashion, and he has publicly revealed himself to be something other than a lovely guy. Still, given the opportunity and due to an accident of birth, he can sing up the proverbial storm. No amount of Scotch and cortisone seems to do any damage to those classic pipes—but his musical taste and rock 'n' roll instincts

have been virtually demolished. As a result, *Camouflage* is a mixed bag of generally ugly arrangements, mediocre material, and disjointed musical ensembles.

The big deal about *Camouflage* is that it heralds the return of Jeff Beck to this historic vocalist/guitarist combo, although the presence of this guitar master is more a mercenary punctuation mark than a sign of magic. The three solos he contributes are more or less to rescue otherwise lifeless arrangements, and the playing he does is noteworthy more for his sound than for melodic brilliance. As on the Tina Turner album, Beck's major contribution is to lend his name rather than chops. This is not the worst offense, however, as Stewart descends far lower to do battle with the classic Free tune "All Right Now," which features a laughable vocal and a rhythm track that has nothing to do with the song.



Rod Stewart

The one bright moment amongst all this mush, Stewart's cover of "Some Guys Have All the Luck" is as close as he comes to a soulful performance. The original songs on side two are almost completely dismissable, as Stewart's songwriting abilities are best exploited when he is collaborating with composers who are strong in their own right. This isn't the case here. There's no Ronnie Lane, Martin Quittendon, or even a Carmine Appice to bring life into these self-important lyrics.

But during those few moments of "Some Guys Have All the Luck" it's almost worth it. Let's hope it's his next single.

Jon & Sally Tiven



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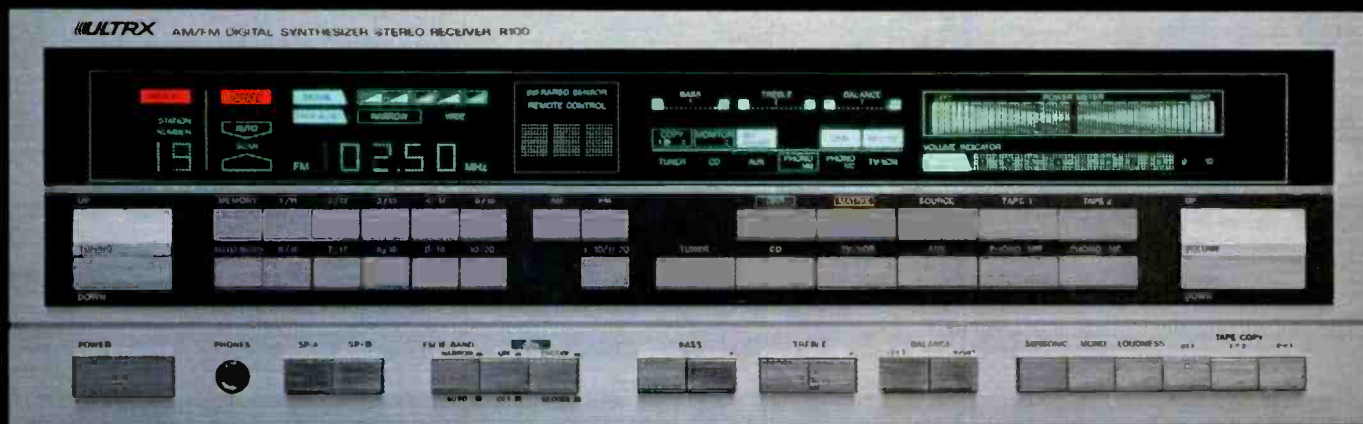
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## PICTURES FOR AN EXHIBITIONIST

### Tattoo You: The Rolling Stones Toshiba-EMI CP35-3032.

Those Glimmer Twins sure can produce. Whether or not you are a Stones fan, if you like rock and are a connoisseur of sound reproduction, you *must* own this CD. It is a sparkling, alive, clear-as-crystal digital recording of *Tattoo You*, the 1981 album that helped shore up The Rolling Stones' reputation as the "world's greatest rock-'n'-roll band" and initiated their hugely successful concert tour the year of its release.

The Glimmer Twins, in case you are unfamiliar with the pseudonymical bent of The Rolling Stones, is the *nom de studio* of Mick Jagger and Keith Richards, who are not only responsible for the care and feeding of the gutsy, blues-based Stones rock sound, but who run it through its studio tricks and make it sit up and beg as well. On this originally analog recording, recently transferred to CD (here reviewed as a Japanese import though it should now be available in the States), Mick and

Keith are once again assisted by associate producer and recording engineer Chris Kimsey.

From the moment Keith Richards' dazzling guitar breaks into those three fat, shimmering electronic notes that fill both left and right channels (with a slight skew to the right), things get started and they never stop. Drums and bass kick into gear in the phantom center, Mick's rough vocals slip into mid-ground, and "Start Me Up" takes off at a steady rock clip. The production on this album opener is as straightforward as this tough little gem of a rock cut. It isn't fancy, but it's clean and solid. Spatial presencing is remarkable, and textures and aural detail are used with surprising subtlety, considering that subtlety is not the first word that comes to mind when listening to this great, chunky, basic rock instrumentation. This subtlety shows up on "Start Me Up" in effects like the clearly presenced light, steady, percussive accent that appears faintly but deliberately in the right-hand channel and is answered by an even fainter



percussive line in the left. This is an unexpected, delicate touch that holds its own while Mick and company rock away with drums, bass, guitars, and vocals at full throttle in the aural center. And don't forget the handclaps. I'm a handclap fan, and the crisp, happy claps that drive the musical action forward with brio are captured precisely.

In running the gamut with The Stones—whether reproducing Mick in his falsetto mode on "Worried About You," Bill Wyman's meaty bass runs, Charlie Watts' steady-ready-go drum work, Ron Woods' and Keith's mutually supportive, alternately blazing and gentle guitars—this CD really shows what the digital medium can do for solid, well-produced rock arrangements. There's very little fancy synthesizer work or complex electronic studio fussing here. However, The Stones do get to blow out their tailpipe whatever yen they've got for electronic dabbling on "Heaven," an atmospheric, sensual ballad of the type The Stones often use on an album to balance off their heavy rockers. This one features Mick's electronically treated high voice floating eerily in space, coming from all directions at once, double tracked, answering itself, fading and swelling. It becomes a ghostly presence that is simply riveting. Supporting these floating, other-worldly vocals are delicate, distantly tinkling masses of chimes. These are also recorded to sound like a directionless presence, and subtle synthesizer-produced wind effects swirl under and through the whole. Especially intriguing is the sharp, stretched



Illustration: Rick Tulka



inflection given to the sibilants in Jagger's voice which cut through the misty clouds of sound like a glittering razor slicing through gauze. In contrast, the foundation of these atmospherics is a rock-steady rhythm section with an almost Latin beat.

Jazz great Sonny Rollins is along for this ride, although nowhere is he credited on this CD's liner booklet, which does, however, contain the lyrics to all 11 cuts in both English and Japanese. Rollins' strong tenor saxophone enhances several songs on this disc, most notably the easygoing "Waiting on a Friend," one of The Stones' big hits off this album.

If you have even a glimmer of interest in The Rolling Stones or in anything of what you've read above, get this CD. That's all. *Paulette Weiss*

**Schubert: Impromptus; Schumann: Davidsbündlertänze; Brahms: Klavierstücke.** Rudolf Firkusny, piano.

**Sugano Disc SCD 83001.** (Available from Supersounds Ltd., 2210 Wilshire Blvd., Suite 315, Santa Monica, Cal. 90403.)

**Schubert: A-Minor Sonata; Janáček: In the Mist; Debussy: Estampes.** Rudolf Firkusny, piano.

**Sugano Disc SCD 83002.**

Okihiko Sugano is well known in Japan, both as an audio critic and recording engineer. A few years ago, many American audiophiles were exposed to his recordings on the Audio Lab label, so his reputation as an engi-

neer stands out. Recently, Sugano founded a new label expressly for CDs, and the first two releases are piano-solo albums by the renowned Czech, Rudolf Firkusny. These discs present Firkusny largely playing a variety of middle-European music.

The piano is a 9-foot Hamburg Steinway Model D, and the recordings were made in a moderately live, extremely quiet concert hall. The microphone technique employed by Sugano presents the instrument in a moderately close perspective; there is clear articulation, with enough room sound to give the music warmth. The instrument is beautifully regulated, and there is never a harsh sound. Come to think of it, it is unlikely that Firkusny could make a harsh sound if he wanted to!

Firkusny is a pianist's pianist. He elucidates all this music in the most satisfying manner, and technique is never exploited for its own sake. His palette of colors at medium and low pianistic levels is more varied than we normally hear, and one's parting thought, after listening to these discs, is that music, rather than pianism, has transpired.

Most of this music has not yet appeared elsewhere on CD, and much of it will be a long time in coming. These discs are highly recommended.

*John M. Eargle*

**Beethoven: The "Archduke" Trio.** Claude Frank, piano; Leslie Parnas, cello; Emanuel Borok, violin.

**Sine Qua Non 79005-2.**

This is the first CD I have heard from the Sine Qua Non label, and this recording of the great "Archduke" Trio of Beethoven certainly must be regarded as a technical and artistic success.

The performance is virtuosic, with rich tonal production from all concerned. The recording was produced and engineered by my former colleague in the classical division of RCA Records, Max Wilcox. Max used three Schoeps MK2 omnidirectional mikes in a spaced array. The violin is heard in the left channel, cello in the right channel, with the piano in the phantom center channel. The work was recorded in the chapel of Wellesley College in Massachusetts on a Sony PCM-1600 digital recorder.

Max knows how to get a good piano

sound, having produced a great many of the late Artur Schnabel's recordings. He shows that he hasn't lost his touch, as the piano in this recording is exceptionally natural-sounding, very clean, with crisp transients. The violin and cello are also quite smooth, with a notable lack of stridency. The instrumental balances are excellent, and the perspective affords a lot of presence in the warm acoustics of the Wellesley Chapel. *Bert Whyte*

**Mozart: Piano Concertos No. 15 (K. 450) and No. 21 (K. 467).** Academy of St. Martin-in-the-Fields, Neville Marriner; Alfred Brendel, piano. **Philips 400 018-2.**

Perhaps because pianist Alfred Brendel is not a "flashy" personality with a glamorous image, he is not as highly regarded by the general concert-going public as some of the more flamboyant piano virtuosos. To the more musically astute, Brendel is often referred to as a nonpareil—a pianist's pianist of enormous talent.

In his traversal of these Mozart Piano Concertos, Alfred Brendel's performances are insightful and deeply expressive. His touch is ever so clean and precise. Articulation is never a problem, and he can be fleet-fingered or produce massive chords of crushing sonority. Neville Marriner and the forces of the superb Academy of St. Martin-in-the-Fields furnish their usual sympathetic accompaniment.

*Alfred Brendel*



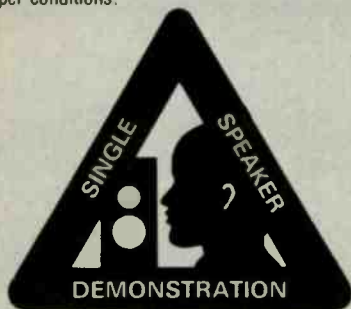
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## #3

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Ever notice how many "experts" you suddenly run into as soon as you decide to buy a hi-fi or improve your existing system? Every "underground" magazine has found the single component that is better than all the rest. Every "slick" magazine has found all the components that represent good value and are worth considering. Every salesman has the perfect component for you and can spend hours telling you about it. Even your friends offer "expert" advice (because they've read the magazines and talked to all the salesmen.)

If they're all "experts", why do they all disagree? The truth is that it takes more than enthusiasm and the ability to pontificate to make one an expert. Most self-proclaimed experts lack any consistent method of evaluating equipment on a musical basis (you know the type, "The bass is a little better on this speaker, but if you really want highs..."). But, more disturbingly, they lack a basic understanding of the hierarchy of a hi-fi system and proper system set-up. In short, their evaluations are based on faulty observations of equipment used under improper conditions.



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The Chandos CD of Symphony No. 2, by Sibelius, has fine sound and a good balance between orchestral definition and acoustics.

The sound is extremely good, very clean, with the piano transients having a sharp attack. However, the high strings are a bit on the bright side. Philips has adjudged this sound good enough to include the andante of Concerto No. 21 on one of their CD samplers. This andante has become very familiar to many people as the *Elvira Madigan* theme. *Bert Whyte*



*Sir Alexander Gibson*

**Sibelius: Symphony No. 2.** The Scottish National Orchestra, Sir Alexander Gibson.

**Chandos CHAN 8303.** (Available from Harmonia Mundi, P.O. Box 64503, Los Angeles, Cal. 90064.)

Chandos continues to impress me, not only with their wise choice of repertoire, but with the consistent high-quality sound of their recordings.

The Sibelius Second Symphony is hardly venturesome programming, but with all the off-beat music Chandos records we can't begrudge them an occasional foray into the standard repertoire. Besides, Sibelius' Second Symphony may be an old warhorse, but it is always interesting and certainly has one of the most exciting and triumphant finales in all of music.

In matters of performance, Sir Alexander and his Scottish National Orchestra do surprisingly well, better than many more prestigious orchestras. Their ensemble playing is excellent, as is their string and woodwind intonation. The brass section plays lust-

ily (if slightly ragged at times) in the great fanfares of the finale. In his interpretation, Sir Alexander may not reach the level of inspiration of a Sir Colin Davis and the Boston Symphony Orchestra, but it is an honest, straightforward reading, free of fussy mannerisms.

The sound is fine, with a good balance between orchestral definition and the spacious acoustics. I must say, however, that this recording did not seem to have the openness and lucidity of some other Chandos recordings I have heard. Nonetheless, dynamic range was quite wide, and the blaring brass fanfares of the finale made a glorious sound! *Bert Whyte*

**Arnold Bax: Tone Poems.** The Ulster Orchestra, Bryden Thomson.

**Chandos CHAN 8307.** (Available from Harmonia Mundi, P.O. Box 64503, Los Angeles, Cal. 90064.)

I first made my acquaintance with the tone poems of Arnold Bax when I was in my teens, and was much enamored with their lush romanticism and brilliant orchestration. My two favorites were "The Garden of Fand" and, most especially, "Tintagel."

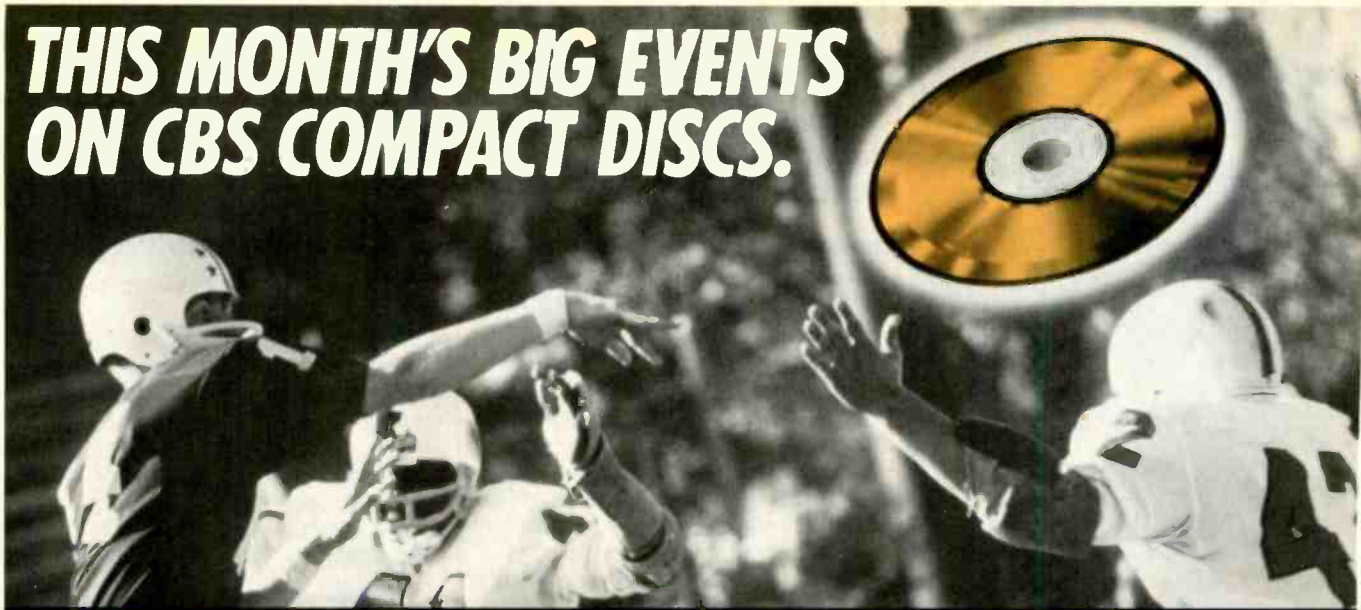
On this CD, the "Garden of Fand" is recorded along with "November Woods," "The Happy Forest" and "Summer Music." Bryden Thomson conducts my home-town orchestra—the Ulster Orchestra of Belfast, Northern Ireland.

This music is unabashedly romantic, with more than a hint of mysticism. There is a dreamlike quality to it, and the rich orchestration definitely has echoes of Debussy as well as some Wagnerian chromaticism. It has its exciting moments as well, notably in "Fand."

Of all things, the first performance of "The Garden of Fand" took place in America in 1920, with Frederick Stock conducting the Chicago Symphony Orchestra. Bax eventually became Sir Arnold Bax, "Master of the King's Music," and his music had the good fortune to be championed by the doughty Sir Thomas Beecham.

Happily, this is a superb recording of these Bax tone poems. There is a clean, highly detailed sound couched in a lovely, warm, spacious ambience. String tone is pleasingly smooth as are

# THIS MONTH'S BIG EVENTS ON CBS COMPACT DISCS.



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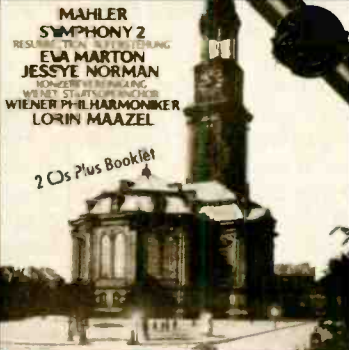
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Bryden Thomson



the woodwinds. Brass is full and brazen and well-projected. Percussion is sharply accurate, with high definition. Dynamic range is wide, and, in this kind of scoring, the total absence of noise helps preserve the softer, more delicate and subtle shadings of the orchestration.

I hope I am not being insulting to my home-town forces when I say that the excellent playing of the Ulster Orchestra somewhat surprised me!

I understand that Chandos is issuing another Bax CD that will include my beloved "Tintagel." *Bert Whyte*

Conducted by Thomson, this is a superb recording of the Bax *Tone Poems*. It has clean, highly detailed sound couched in a warm, spacious ambience.

**Mozart: Symphonies Nos. 40 and 41, "Jupiter."** The Staatskapelle Dresden, Herbert Blomstedt.  
**Denon 38C37-7022.**

There is certainly no shortage of recordings of the Mozart Symphonies No. 40 and No. 41, "Jupiter," and, in fact, at this early point in Compact Disc history, there are already duplications of these works.

Be that as it may, these particular recordings are interesting in that they give us a chance to hear what caliber of sound is being recorded behind the iron curtain—in this case, East Germany. This was a Denon collaboration with VEB Schallplatten, and one wonders if the East German company has any digital recording equipment of its own.

Herbert Blomstedt conducts the Staatskapelle Dresden and turns in good, idiomatic performances distinguished by some excellent playing, especially in the strings and woodwinds.

The sound is really quite nice, and the orchestra is well-detailed in a large-sounding, quite reverberant hall. Good internal balances here and a convincing stereo perspective. Sound is quite clean, although the high strings have a slightly edgy sound in fortissimo passages. It would be interesting to know what percentage of this excellent sound is due to Japanese or East German expertise. *Bert Whyte*

**Debussy: La Mer; Prélude à l'après-midi d'un faune; Danses sacrées et profanes.** Saint Louis Symphony Orchestra, Leonard Slatkin.  
**Telarc CD-80071.**

There is no doubt that in works like "La Mer," "The Afternoon of a Faun" and "Dances Sacred and Profane," there is much delicacy in Debussy's scoring which greatly benefits from digital recording. Very often these works have been marred by the assorted intrusions of vinyl disc noises. At

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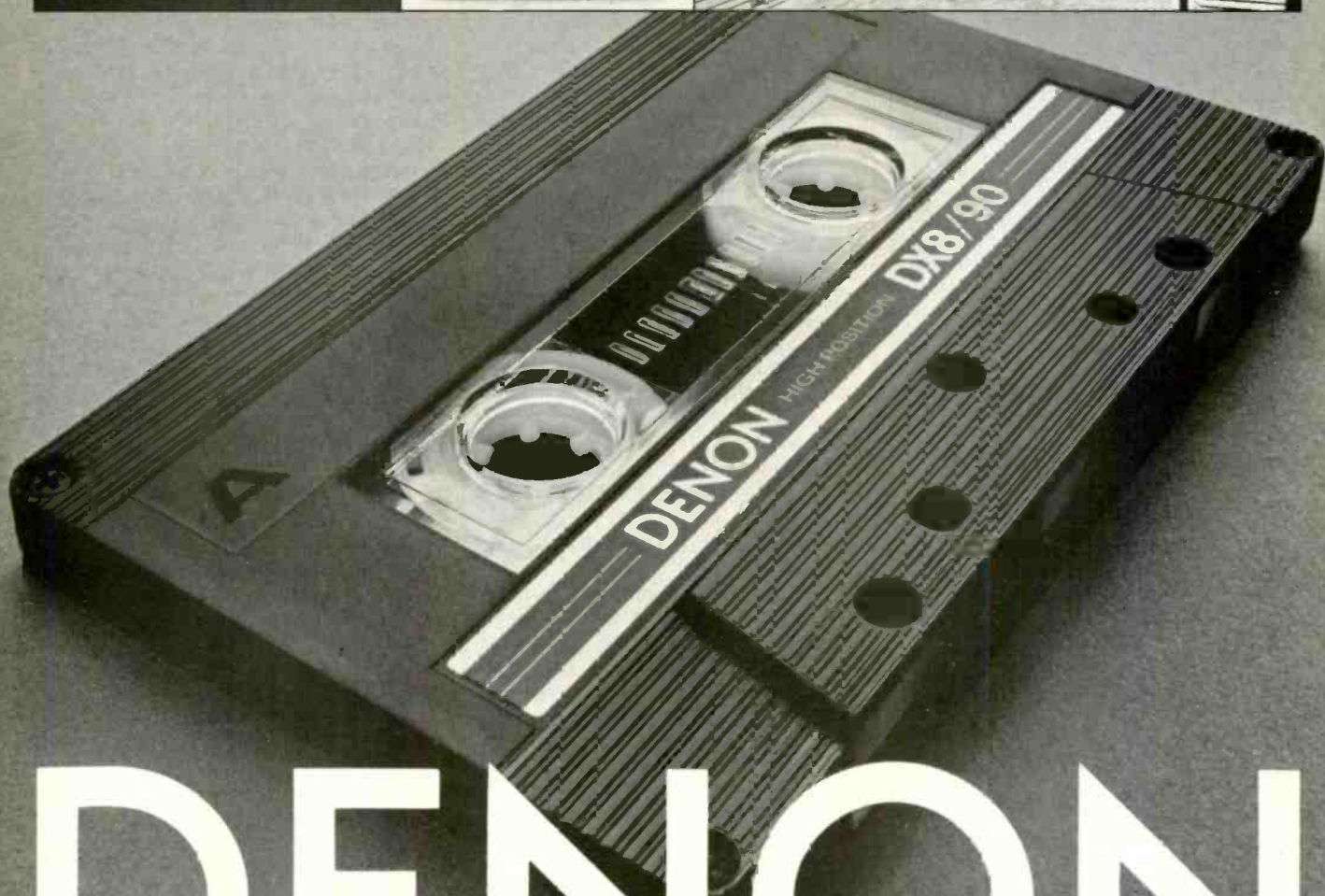
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*Nikolayeva Plays Bach* is a good CD for loudspeaker testing. Transient accuracy and attack are outstanding, and the bass register is especially sonorous.

the other end of the dynamic scale, it is reassuring to know that the sonic violence of the storm in "La Mer" can be accommodated in all its unbridled fury.

Leonard Slatkin's performance of "La Mer" may not have the insight of a Pierre Boulez or a Toscanini, but the ferocity of his storm gives away very little. Furthermore, he has the benefit of some inspired playing from the underrated Saint Louis Symphony Orchestra and the splendid sound provided by Telarc. The felicitous acoustics of Powell Hall balance nicely with highly detailed sound from every orchestral choir. There is a lushness and smoothness, too, in the string sounds which greatly add to the atmospheric qualities in all these works. Dynamic range is in no way compressed, and some of the climaxes in the storm are massive. In all, a superior performance with a sonic verity to match. *Bert Whyte*

### **Nikolayeva Plays Bach** **Victor Company of Japan VDC-503,** digital source.

More J. S. Bach, this time some exceptional solo-piano transcriptions of works such as the famous "Toccatina and Fugue in D Minor," which usually is played on the organ. Among other works are "Wachet Auf" and a marvelous traversal of the "Fugue in G Minor" (BWV 578).

The piano sound is utterly crystalline, recorded on the JVC DAS 90 digital recorder. The piano is recorded quite close-up, in a rather dry acoustic environment.

Madame Nikolayeva has a wonderfully clean touch, and every note is completely articulate. With virtually no wow or flutter from the JVC digital recorder, pitch is exceptionally true and the pure tone of the piano is a revelation. The bass register is especially sonorous. Transient accuracy and attack are outstanding. A particularly good CD for loudspeaker and system testing. *Bert Whyte*

### **Infidels: Bob Dylan** **CBS CK 38819.**

This is Dylan's passionate, poignant 1983 album, the one that convinced us all that the grand old man of pop was alive and thrashing around in

the '80s. It was digitally remastered from the original analog by CBS.

*Infidels* is a splendid choice for CD reproduction, containing as it does the silences and spaces of spare rock instrumentation and sensitively understated performances. Dylan assembled some musical champs for this lyrical wrestling match with modern concerns: Mark Knopfler of Dire Straits and ex-Rolling Stone Mick Taylor on guitars, the outstanding reggae-rhythm section of Robbie Shakespeare on bass and Sly Dunbar on drums and percussion, and The Hollies' Alan Clark on keyboards. This muscular ensemble knows the expressive value of the soft touch, knows how the spaces between notes can be played more eloquently than a barrage of technically perfect but insensitive sounds. In these spaces, the silence of the CD format speaks volumes.

Take the opening on "Jokerman," for instance. The solid drum roll that thrusts into the left channel and follows through into the phantom center comes out of a total silence that wonderfully intensifies the drum's impact. The quiet tone Dylan sets with his tender reverb-laced vocals on "Sweetheart Like You" is supported by a filigree of instrumentals—a soft guitar accent in the center channel, another in the left, again in the right, the drums and subtle acoustic piano threading throughout. The CD silence that fills this openwork is golden. Mark Knopfler's distinctive guitar is often slipped in lightly, appearing in a subdued run in one channel or played off a paired guitar in the opposite channel. His delicate, shining work is captured perfectly. Knopfler has done doubly well by himself, playing splendidly on this disc and producing it equally as well, in full partnership with Dylan.

Make no mistake, though; Dylan doesn't confine himself to fancy footwork alone. He takes a good, solid shot at full-tilt boogie with both "Union City" and the hard-rocking, controversial "Neighborhood Bully." When all three electric guitars are wailing (Dylan plays guitar, keyboards, and harmonica) and the drums are bashing away, there is some loss of individual instrumental presence but not enough to matter much. In general, the spatial presence of all instruments is excel-

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The CD of Dylan's *Infidels* has excellent spatial presencing of all instruments, with a good feel for aural depth.

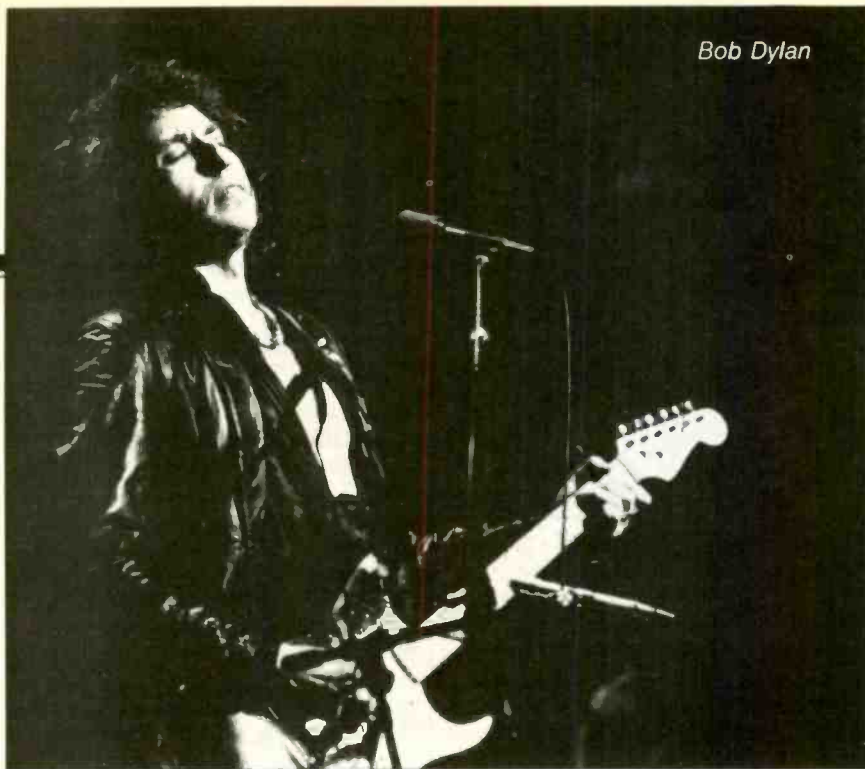
lent, with a well-defined sense of left-right-center placement and a good feel for aural depth. Dylan's voice is placed right up front, mixed in clear as the final bell, so we can catch the portent of his still startling lyrics and their disturbing images ("He can ride down Niagara Falls in the barrels of your skull"; "You can be known as the most beautiful woman/Whoever crawled across cut glass to make a deal"). His unique adenoidal voice is often treated with reverb and once receives the full echo treatment ("Union City") to highlight it even more.

Synthesizers lie low here; no fancy electronics for *Infidels*. The subtle but strong arrangements and the outstanding individual instrumentals behind Dylan make this a sophisticated pop-CD choice. This one is a winner, not for pyrotechnical production, but for its solid, clean presentation of intelligent music that will grab your mind and wrestle it awake while your body sways to the beat. *Paulette Weiss*

**J. S. Bach: Vier Ouverturen, Part 2.** La Petite Bande, Sigiswald Kuijken. **Deutsche Harmonia Mundi 38CT-3**, two-disc set. (Available from Pro Arte Records, 14025 23rd Ave. North, Minneapolis, Minn. 55441.)

This CD is the second part of a two-disc set of J. S. Bach overtures. By far the most familiar is the BWV 1068, whose various sections, including the famous "Air," are favorites of aficionados of J. S. Bach's music.

This is the first CD I have heard from the prestigious Deutsche Harmonia Mundi label, and I'm quite impressed. The digital recording is very open and transparent, yet highly detailed, even though the hall acoustics are quite reverberant. The famous, high Bach trumpets are disposed to the left and right of the orchestra and resound most brazenly. The high strings are quite clean, if a shade bright, and there is a nice balance between the various orchestral elements and the hall acoustics. La Petite Bande and its conductor, Sigiswald Kuijken, are unknown to me, but the playing is of a high order. The performances are nicely structured and, in the faster sections, are played with a verve and spirit that is most ingratiating. *Bert Whyte*



Bob Dylan

Photo: © David Gahr 1983

**Year of the Cat:** Al Stewart  
Mobile Fidelity Sound Lab MFCD 803.

Old friends have a nice habit of popping up on Compact Discs. Listening to Al Stewart's *Year of the Cat* was like getting a "Hello, how are you, just wanted to know how your life was going" telephone call from Freddie Brustein, on whom I had an impossible crush when I was a hopelessly fat 10-year-old grade-schooler. Ah, Freddie. Ah, Al.

Al Stewart's folksy, late-'70s rock style sounds just a bit dated next to the synthesizer-laden output of most modern rockers, but it also sounds comforting, relaxed, intelligent, and, well—pretty. His historical ditties may be a bit lyrically pompous, but his songs of personal pain and discovery hold up despite the fact that hardly anybody uses patchouli scent anymore.

The arrangements and mostly acoustic instrumentation on this 1976 LP, originally released on Arista, are sophisticated and provide delicious textural contrasts. The throbbing, high staccato notes of the mandolin that reside in the left channel of "Broadway Hotel," for instance, are beautifully juxtaposed with the rich, resinous, breathtaking violin line in the right channel. (A violin so rich, by the way, that I would swear it was a viola, despite the liner notes' claim to the contrary.) Just barely holding these two soaring instrumental flights to earth is the steady—almost monotonous—rhythm-section foundation in the phantom center channel.

Orchestrally massed strings are used with finesse, adding body and melodic continuity, not mush. Their entrance in the album's hit title song puts starch into what comes after a pallid, rather limp introduction. Electronic instrumentation, other than the rock-standard electric guitar, is used sparingly but to great effect thanks to producer Alan Parsons, who has a winning way with studio dials. There is a shimmering, electric piano effect on two cuts here, "Midas Shadow" and "One Stage Before," which I have heard elsewhere and which continues to intrigue me above and beyond the sheer loveliness of the instrument's sound quality. Here, the piano's notes are subtly alternated from channel to channel to produce an almost physical pulsing sensation against the eardrums when heard through headphones. Parsons explores some advanced electronic territory only on "One Stage Before," where he tosses in some synthesizer wiggery, including spot-compression of Stewart's voice and a big bass synth that stands in the background with a subdued yet massive presence. Elsewhere, he limits his electronic knob-twirling to adding heavy reverb and double-tracking to Stewart's slightly adenoidal vocals, and to playing with channel location by, for instance, isolating the acoustic piano intro in "Year of the Cat" in the left channel and killing the right channel altogether.

In general, spatial presencing is excellent, with instruments located firmly and clearly in aural space, giving a



As a CD, Al Stewart's *Year of the Cat* is a phone call from the past; there's a little static on the line, but it's well worth getting.

generous sense of depth and fine left-right specificity.

Although there is no detectable tape hiss or extraneous noise, there is a light dulling haze over this recording. Cymbals crash muddily, and tambourines lose the nice metallic chatter that those of us with gypsy hearts are so fond of. There's an almost subconscious sense of suppression that lifts to awareness when an electric guitar, for instance, blazes out like an auto headlight through early morning fog.

As a CD, *Year of the Cat* is a long-distance phone call from the past; there's a little static on the line, but it's well worth getting. *Paulette Weiss*

**The Dude:** Quincy Jones  
A&M CD-3721.

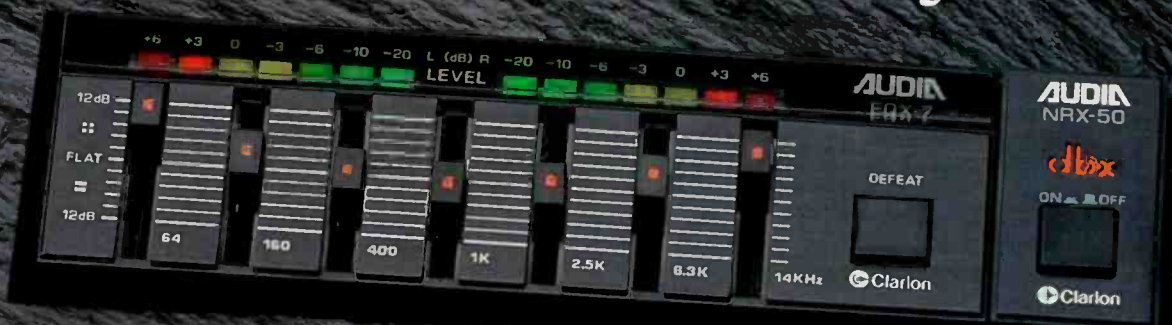
After first hearing this CD, I started a small, safely contained fire in my third floor Manhattan apartment, sent a puff of white smoke out over the Upper West Side, and personally declared Quincy Jones the Pope of pop production. Yes, I know he's been praised and honored, awarded and garlanded by others in higher places (my friend on the tenth floor, for instance, once sent him a fan letter and \$50 to say thanks for the good work). Nevertheless, listening to this digitalized version of his Grammy award-winning album, *The Dude*, was a semi-religious experience, and I am compelled to lift my puny voice in praise, joining all the other hosannas to his name.

Jones is a supreme master of aural texture. From multiple layers of instrumentation he calls forth a hot, brassy horn riff to heat up a smooth, resiny vocal ("Turn on the Action"), lays the

lightest trace of reverb on an acoustic piano to float it, shimmering like a vision, into empty space ("Just Once"), or sets a line of percussion—a light tapping of cymbals—so blessedly far back in the mix that it imperceptibly ticks off the passing of a song, a rare and subtle handling of percussion in the modern pop studio ("One Hundred Ways"). I could give an endless litany of the wondrous textural effects on this CD—crisp handclaps, sharply sweet strings, angelic clouds of vocal backup, bass riffs that start rumblings in the soul—but I won't. Instead, I'll sing the praises of the digital medium that has captured all of this heavenly sound. From highest high to lowest low, this CD performs flawlessly. Jones certainly calls on all of its capabilities in this area, summoning up both celestial legions of high-pitched, piercing strings and one of the rock-bottom lowest bass figures I have ever heard recorded, the latter on "Ai No Corrida."

Jones earns the pop papal crown for

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Quincy Jones earns the pop  
papal crown for his mastery  
of aural space. *The Dude*  
is a multi-dimensional  
cathedral of sound.

his mastery of aural space as well. *The Dude* is a multi-dimensional cathedral of sound limned out both by the fixed presence of instruments in aural space and by their apparent movement from place to place. You can close your eyes and point to the drum kit, the sax, the guitar—whatever—in your listening room, or sweep your finger around the room tracking an effect like the synthesized "whoosh" on "Ai No Corrida" as it travels from right to left channels. Especially appealing are the way Patti Austin's rich foreground vocal on "Somethin' Special" is spirited rearward to meld into the background chorus, and, on the title song, the unexpected and delightful first appearance of Quincy Jones' own basso profundo rap vocal split left and right and placed so far up front that the man might as well be sitting on your lap.

The dynamic range of this A&M product is superb. I was most impressed by the medium's performance in each cut's fade-out segment. Even



as all sound drifted into nonexistence, each instrument in the fading blend maintained its integrity, cut after cut. A fine job. No audible residual tape hiss here either—no extraneous sound whatsoever.

Jones called into service numerous acolytes for this 1981 album. The list of

stars and talent from the world of pop and jazz is awe-inspiring: Michael Jackson, Stevie Wonder, Patti Austin, Herbie Hancock, James Ingram, Toots Thielemans, Cynthia Weil, Barry Mann, Steve Lukather, Paulinho DaCosta, Johnny Mandel—whew! Despite their generous contributions, this smooth pop-soul-funk offering may not suit everyone's taste. It is a super-slick package, and if you're not listening for the inner soul of its production, the surface melodies and lyrics might strike you as a bit facile. Then again, they might not; several selections from the original release—the bouncy Latin-tinged "Ai No Corrida," the rich, heart-stirring James Ingram cuts, "Just Once" and "One Hundred Ways," and Patti Austin's sensual, quietly uptempo "Betcha' Wouldn't Hurt Me"—were substantial pop hits.

Well, the neighbors forced me to put out that papal fire in my living room, but Quincy—I'll kiss your ring any time.

*Paulette Weiss*

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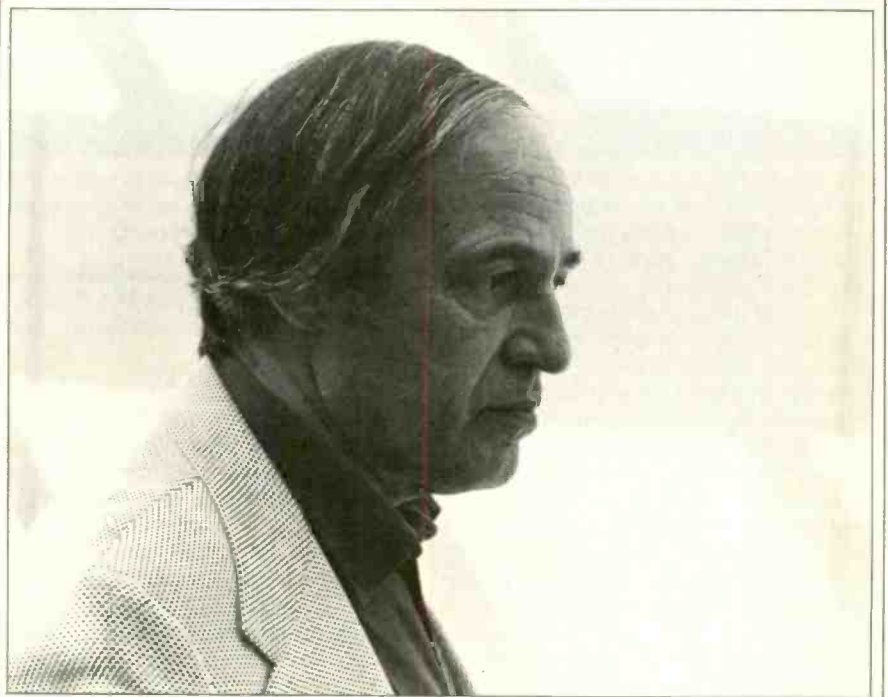
**Boulez: Rituel, Eclats/Multiples.** The BBC Symphony Orchestra, Ens. Intercontemporain, Pierre Boulez.  
CBS M-37850.

This is the sort of professional contemporary music which is both extremely avant-garde and at the same time, in certain aspects, professionally conservative. Where it belongs, for us listeners to recorded music, is a real question. Are we, in living rooms and cars, really expected to hear this material, and are we counted as intended audience? I rather doubt it.

We're dealing here with a major figure in current music and, of course, an ex-conductor of the label's prize orchestra, the New York Philharmonic, whose work for that reason is widely available in the CBS catalog. But there is also the top-flight stratum of celebrated contemporary music, a kind of parallel to the world of great opera singers, famous solo artists and so on. The cash is available to record music of this caliber, and the operation pays off in prestige, you may be sure. Isn't that perhaps enough? No need at all, as I see it, to please you and me, who are merely looking for entertainment, hi-fi sound and the stimulation of something new, comprehensible or no.

So, you try it and what do you get? Perhaps the most difficult music so far composed for good-sized aggregations of instruments. The cover lists "Rituel," a memorial work and kind of funeral piece for large orchestra, as first, but, oddly, it comes on side two. As this suggests, you'd do best to start with "Rituel," which has elements that are helpful and within our grasp. There are unusual sounds, colors; eight separate groups of instruments enter one after the other and give recognizable side-to-side and forward-and-back separation in the stereo recording—good job. And, above all, there is a beat, a funereal beat, to be sure, not steady but enough to keep the mind engaged. The groups come in one by one, then they depart similarly, towards a quiet ending. You will find their different textures definitely interesting, which, in the end, can lead you on to further perceptions.

The other work, "Eclats/Multiples," is a double-length version of a still earlier piece and half of a really tough work



yet to be completed. (Boulez, like others today, writes in this curious fashion, which is much in style among professional composers.) It is one of those enormously complicated, serial-sounding pieces which have absolutely no beat and which come in violent bursts of sound and numerous silences. It is incredibly complicated and offers practically nothing familiar for the average-intelligent listener to latch onto for at least a beginning. First time through, I made nothing at all of it. So, being a conscientious reviewer, I played the whole thing straight through again. (Isn't repetition one of the greatest assets we have in recorded music—how much of the live audience gets to hear the music more than once?)

Yes—I liked it more the second time. Not that I "understand" the music! And the less so after reading the liner notes, which are likely to scare off anybody, though no doubt quite accurate. I think you might like it too. Music is supposed to speak in its own terms, convey its own message. Given time, patience, and optimism, it surely does, even in the case of Boulez.

I still think the man is a cold-fish, precision type—but that's merely for today. For all we know, he may be as popular as Bartók, a few decades hence.

**Tchaikovsky: The 1812 Overture; Capriccio italien; Cossack Dance from Mazeppa.** The Cincinnati Symphony Orchestra, Erich Kunzel.

Telarc 10041, digital, limited edition, \$12.98.

Considering my private oath never to play another "1812," I feel guilty about listening to this one; but since it had become such a well-known demo disc by its belated arrival here, curiosity got the better of me. It is, indeed, as Telarc says, the "Ultimate Audio Challenge," at least for the moment and in terms of the ancient LP! Limited edition, "super-cut" to special parameters, JVC-pressed on double weight, flat, special vinyl without the usual raised edge and dish-like interior, this record is surrounded by dire warnings in heavy black type and *no liability* statements. Play at your own risk. So I did.

Happily, my excellent but slightly middle-aged LP playing system has remarkable built-in safety factors. It self-protects. It emerged unscathed. As the recording reached the well-known and genuine cannon shots, the high-quality pickup (not the latest but one of the recent bests) hopped lightly into the air, touched down several times and landed as easily as a feather a half inch or so on the other side of the



Erich Kunzel

cannon portion. I was delighted at its performance—all was intact and I never did enjoy cannon shots anyhow. Thanks, Telarc; I think I'll stick with my present equipment.

There is music, I am reminded, in the "1812," some of it quite lovely. Especially the variations on the two familiar tunes representing the French and the Russkies. Does anybody bother to play this part? I did. Sorry to say that this is one of the chilliest, most monotonously unemotional playings of that music I can remember, just another job to be done, though it is done with accuracy and dispatch. Same holds true for the two milder works on the other side.

I trust that this bit of healthy perspective will prompt every reader to rush right out and buy the LP, if you

can get hold of one, just to prove that your pickup and arm will play any old cannon with a flawless bang.

**The Art of the Mandolin.** Emanuel Sheynkman; Vincenzo Macaluso, guitar.

**Nonesuch 78019, \$8.98.**

Here is another sprightly item for background music—the sort that pleasantly thrusts itself into the foreground more often than you expect. The mandolin, of whatever shape (my uncle played a pear-shaped model in the early 1900s), used to be pretty sugary, but it has broadened its interest through new music and new playing techniques. A plucked instrument, via a finger-held "pick," it has a unique

Though there is quite lovely music in the "1812," Kunzel's is one of the chilliest, most monotonously unemotional playings I can remember.

wiry sound and, like the balalaika, goes in for rapidly repeated tones, street-piano style.

This recently emigrated Russian plays with fabulous speed and lightness; his guitar helper (definitely a folk-classical man) has an equivalent virtuosity on guitar. No fumbling around for chords here. The two together can produce unusual effects and an extraordinarily fleet and sprightly ensemble. The music is all arranged, of course, and all mod Russian (which means not very modern), from Prokofiev and Shostakovich to assorted semi-familiar names you'll know from very different sorts of music. There's nothing of any great importance to be heard and the arrangements are sometimes a bit obscure, if you know the originals—but who cares. Just a lot of nice tidbits.

Faint percussion sounds (bells, etc.) enliven some items in the upper range (Ksenia Sudarikova plays them)—no big drums or such. The bass range of the LP is virtually empty. It's all highs.

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I found no fault with Luca's violin playing. But Bilson bangs the fortepiano metronomically in the loud and fast parts.

**Mozart: Sonatas for Fortepiano and Violin, Vol. 1 (The Mannheim Sonatas).** Malcolm Bilson, fortepiano; Sergiu Luca, violin.  
**Nonesuch 79070**, two-record set, \$23.96.

This series will eventually cover the same ground as the Sonic Arts set (LS-36) on standard modern instruments recorded in concert, as does one of those big Vox box LP sets. But this version has the increasingly valid distinction of using "original" instruments—not only the fortepiano, a modern copy of a piano of Mozart's day, but also the violin, an unretouched instrument from 1733 that, unlike others, was never rebuilt.

These were the Sonatas Mozart wrote on his "solo" expedition, from Salzburg to Paris, stopping off at the celebrated musical center of Mannheim where he did his best to make a musical impression, with very little success. They are all familiar to Mozart fans and are often played today. Note that these were the first in which the violin moved from a mere optional accompaniment to near-equality with the piano, though the piano still does most of the heavy work. Nonesuch's sophisticated recording, of course, takes this into account in its placing of the two instruments.

The fortepiano, again being brand-new, a copy, sounds pretty much like a modern instrument in the treble, but the lower notes have that pleasantly twangy, harpsichord-like sound that Mozart expected. The overall effect is brighter and less ponderous than the same music played on a modern grand.

An amusing sidelight, ever so British, accounts for the unretouched old violin, which has a noticeably fruity, rounded sound, from lower tension gut strings and a light bow of the Mozart period. The instrument was stashed away for storage by a British violin firm back in the late 18th century. When that company, in the sedate British fashion, finally decided to move to more modern quarters—about 200 years later—the violin was found intact, right where it had been put away. I'd say that company could use a computer to keep track of inventory. (*Editor's Note:* May I say, to the contrary that



Sergiu Luca

had the company had a computer, Mr. Luca, our violinist here, would not have had use of his instrument.—*E.P.*)

I wish I could praise this project to the skies and to our readers. It's okay and very well recorded in digital. But Mr. Bilson again seems to me an accurate, well-trained but chilly player who tends to bang metronomically in the loud and faster parts of the music. After a time, this wears on the ears, though the slower movements are nicer. I found no fault with Luca, the violinist, but it's the fortepiano that calls the tune or, if you will, sets the tone of the ensemble.

**Mozart: Collected Works for Violin and Piano, Vol. 1. Sonatas K. 7, 60, 301 and 303.** Daniel Kobialka, violin; Machiko Kobialka, piano.  
**Sonic Arts LS-36**, digital, \$17.95.

I don't know whether the record biz, among the small companies, is desperate or burgeoning; we printed several reviews of this new "audiophile" classic label, whereupon we were rushed by hand a whole batch of advance white-label pressings, more than we have any business reviewing. I'll try one, though I'd probably be perfectly happy writing about any and all of them if mega-space allowed.

There are special interests or, better, problems involved in Sonic Arts' expensive releases (taking over from Telarc's former astronomical price for digital LPs). First was "live in concert" recording, with all that method's pros and cons. If this Mozart duo was playing live (i.e., in concert before an audience), then there is no direct evidence of it here. The sound is studio-dead and very close, with neither coughs nor clapping audible. The second and more pervasive interest is that this company—or rather Leo de Gar Kulka, impresario and boss—is one of that new phenomenon, the successful pop recording man moving over into what



Daniel Kobialka

one might call vanity-classical, as a kind of business-hobby and builder of prestige. There are many such, and often with highly knowledgeable operations by people who are not unsophisticated in the classical area. Choice of music is one facet, choice of performers a more important aspect; but the payoff in terms of good judgment comes in the actual recording technique used to make the records—the halls, the recording procedures and, especially, the balances and mike placements.

Can you simply switch from high-level, state-of-the-art pop recording, big-studio style, to classical recording? Most definitely, no! It is here that Sonic Arts, for all its fancy processing, determinedly flounders around, making grandiose claims and all sorts of amiable and well intentioned boobos. Live and learn! The company's records are anything but dull and often very interesting; good things are bound to happen sooner or later where



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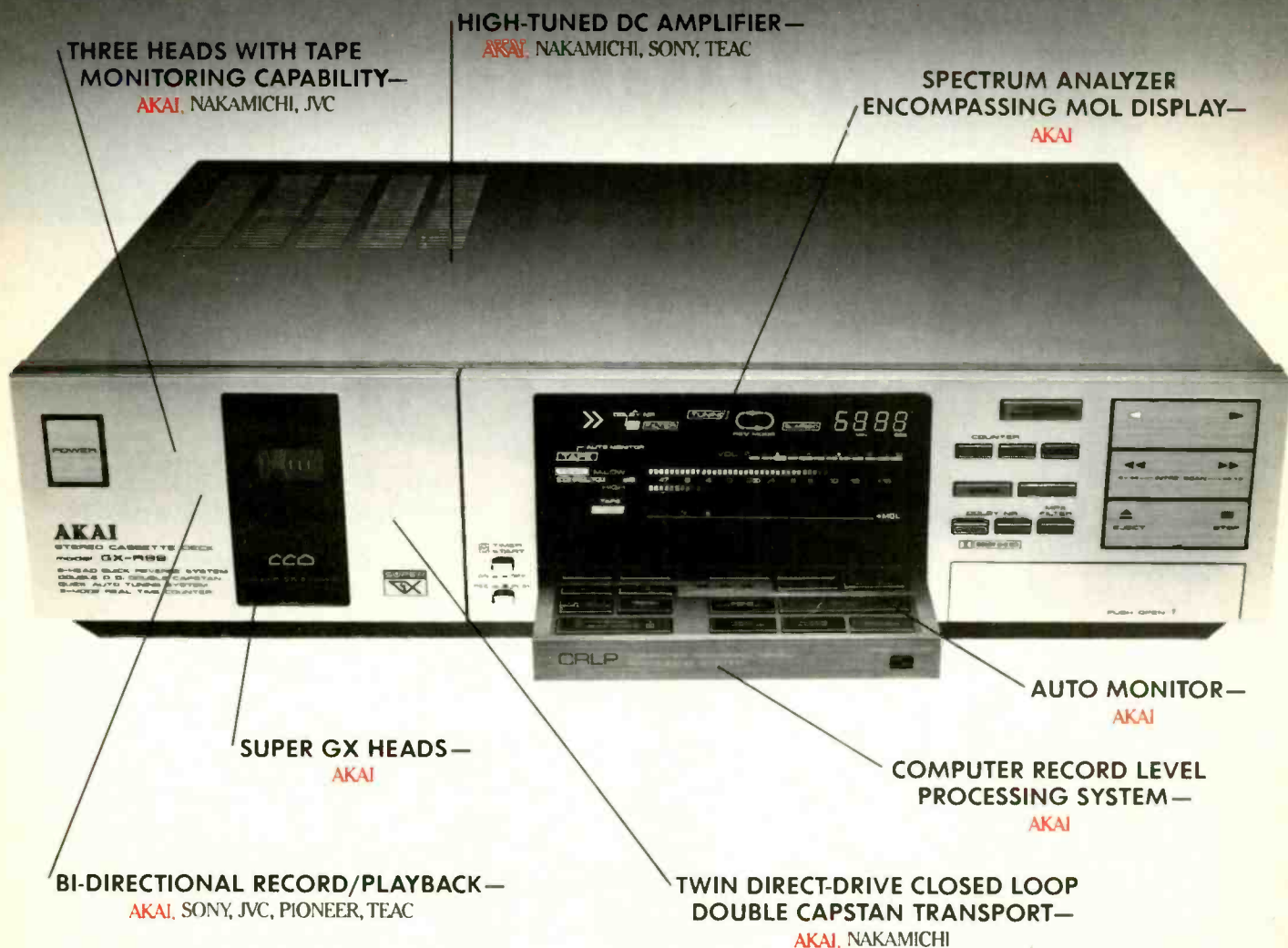
Money can, however, buy more power and flexibility. The P120 at 60 watts per side is also "bridgeable" which means it's a stereo amp til you want more power. Then with the push of a button you can have a 90 watt mono amp to power a single side, adding another P120 for the other.

Naturally, these new Powerplates sound best mated to ADS speakers (300i, 320i). But that's another ad.

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These Mozart sonatas reminded me of a subcompact car on a scenic, bumpy road. Nice view, but the ride is poor.

there is so much zeal (and so much cash) involved.

First—balance, mike placement: Here you have a quite close piano and with it a very close violin, which sounds about eight inches back of your speaker(s). You can practically hear the fingernails. Also, maybe, a mike with some edginess in the highs—common enough in pop music, absolutely fatal for the violin, which at close range is always brilliant. Here, it goes into near-scratchiness every time the player digs in a bit. These two instruments are encased in non-liveness, where even a bit of mellow resonance would help them mix their dissimilar tonal qualities, as in a good concert. From a classical view, this is not a good technique at all. But there is more.

It happens that in Mozart's day the common sonatas for this pair of instruments were *piano* sonatas with semi-optional violin. The breed persisted well into the 19th century, but Mozart was the first to head towards equality. In the two early works recorded here, the violin has only a minor role, and definitely should be subordinate, an accompaniment to the piano. In the two later works it takes on more authority but still is not the lead—the piano keeps that function.

So what do we have? *Too much* violin, too forward, too loud. It is far out of balance in the pair of early works; in the two later pieces (K. 301, 303), things are better but still the fiddle is too close and on the scratchy side.

This is why a classical recording engineer and his producers must really know their music, century by century. Otherwise, basic disaster, digital, CD, or what have you.

The Mozart performers? Same sort of problem. These two are genial, goodhearted players and you'll enjoy them—it's a pleasant musical ride. (The balance, etc. is not their problem, after all.) But the pianist is heartily lacking in good rhythmic sense—all the music is, instead of, say, "one, two, three," just "one, one, one," minus larger shape. Result: The music is bouncy and bangy. Any pop or dance player knows all about that, whether it's a tango or a contemporary rhythm section. As for the violinist, he is better on shaping, if a bit quavery now and then.

Some movements go unexpectedly

well (especially the genuine "one, one" type!), but the whole reminded me of a merry little subcompact (the kind with the sewing-machine motor) bouncing along a scenic but bumpy road. Nice view but the ride is poor.

P.S. The ride is likely to be better in a parallel series from Nonesuch, the *Mozart Sonatas for Fortepiano and Violin*

(note the correct order of precedence), covering the same ground as Sonic Arts but with considerably more sophistication. Volume one of this series is recently out, just ahead of Sonic Arts. Nonesuch also uses digital and charges a mere \$11.98 per LP. Take your choice—the competition is getting hotter.

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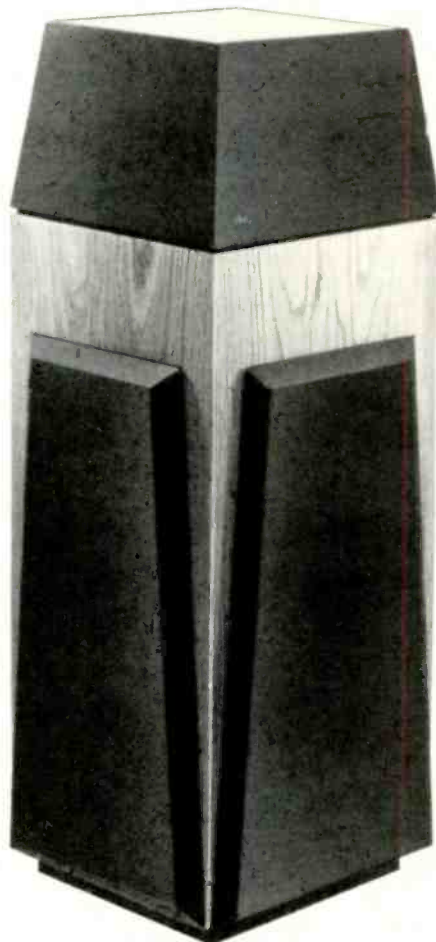
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## SOUNDTRACK OF THE LOST ARK



Illustration: Thomas H. Waters

### Sounds of Star Wars

One of the best-attended lectures at the 1983 fall convention of the Audio Engineering Society was a description of sound techniques at LucasFilm—in other words, the sounds of *Star Wars*.

Audio gave that film, and its successors, much of their impact, as Tom Holman (the founder of Apt and designer of the Holman preamp) demonstrated by showing some clips of the films in their raw state.

Remember the battle on the spaceship at the start of *Star Wars*, where Princess Leia sent R2D2 and C3PO off for help? The original soundtrack echoed with cap-pistol shots (later edited to laser-pistol "ZZzapps" when the laser streaks were animated into the visual side) and hollow footfalls on the plywood

deck of the set. Some dialog was changed too. The original sound is done in mono, and the sound man ("Low man on the totem pole while shooting," Holman says) decides about track assignments and perspective later, when the pressure is off.

"We're used to seeing alternations of perspective, but not hearing them," says Holman. So dialog is usually in the center channel, unless the character speaking is way off to one side. Speakers in theaters frequently don't match each other, so "a character could change from bass to tenor if panned across the sound field."

To make "alien" languages sound real, they're sometimes made from spliced-together bits of exotic Earth languages, such as Kikuyu and

Nepali. This causes much hilarity when the movies play in countries where these languages are spoken.

Similarly, sound effects may be based on familiar sounds, to give them "the needed complexity" and "a root in reality," but the sounds are then shifted in pitch, reverberated and otherwise changed to render them unrecognizable. For example: The Millennium Falcon's sound is based on that of the P-51, a propellor-driven fighter plane, while another ship is based on a blimp. A big door in *The Empire Strikes Back* has no mechanical-sound basis but does have a lion's growl buried subliminally in it.

On a more earthbound note, Holman presented the opening sequence from *Raiders of the Lost Ark* several times, each time accompanying it with a different one of the many music, voice and effects tracks which were layered together for the final release. (To me, the music best conveyed the feeling of the sequence, even more than the dialog did.) "When you put them all together," Holman told us, "the tracks sound fine at levels which would sound too loud when playing any individual track."

### Japanese Jottings

Earlier this year, in Japan, I ran into a number of interesting audio products, none of which I had yet seen in this country (and some of which, I assume, I never will).

Remember the fad for putting bricks on amps? Now, the bricks may be built in. Kyocera has announced a whole line (including amps, tuners, cassette decks and CD players) with massive ceramic or aluminum stabilizing bases. And Luxman and others are showing amplifiers in Japan with what appear to be vibration-damping feet.

Yamaha is offering, for its GT-1000

turntable, a 60-kg (132-pound) isolation-footed stand costing nearly as much as the turntable itself, plus an 18-kg (39.2-pound) copper platter (with lifting tabs) which costs even more. Miyamoto has an oil-damped phono headshell—fine from the vibration standpoint, but does it interfere with proper cartridge/arm coupling?

The big audio novelty, everywhere I went in Japan, was Teac's Ocase tape, which stands for "open-reel cassette." The cassette's shell is an open metal framework, holding two flanged reels, at least one of which is removable. Round cans are provided to hold the reels once they're removed, and the tape is by Maxell. I was tempted to pick up a set, but, at \$18 to \$25 (for cassette plus five reels of tape), I resisted, especially because I remember how hard it is to re-thread that wispy tape in ordinary cassette shells if they're opened.



Toshiba KT-AS10 portable

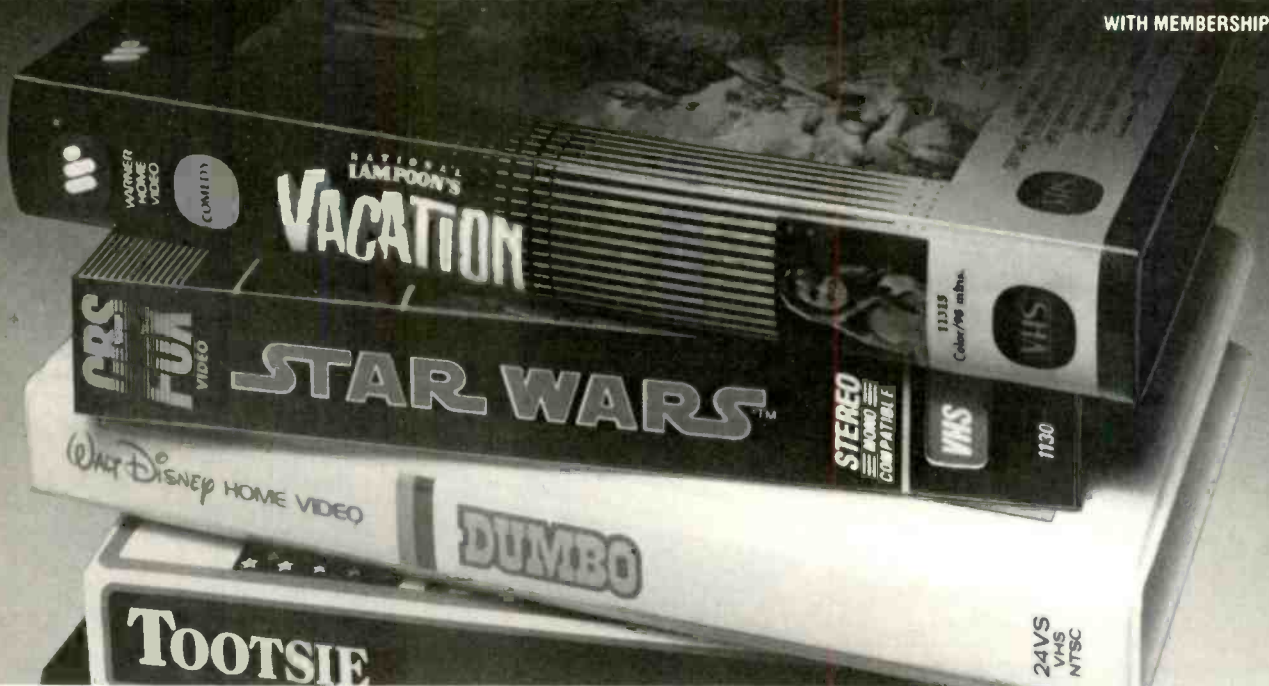
The most heavily advertised item I saw was a Toshiba headphone portable that's thicker but otherwise smaller than a cassette—during play, the back of the cassette sticks out. In Japan, it's known as the "Walky" and comes (like many Japanese electronic products) in a wide choice of colors. Here, one version of it has been announced as the KT-AS10, in black or silver only, for \$149.95. It has auto reverse, Dolby B and a slip-in, AM/FM tuner shaped like a cassette.

Kyocera T-910 AM/FM tuner



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Magnetite is an ancient ore, a venerable tape oxide, but a new factor in cassette duplication.

### Music On Magnetite

Magnetite is nothing new—as lodestone, it's the naturally occurring iron oxide ( $\text{Fe}_3\text{O}_4$ ) from which mankind discovered magnetism thousands of years ago. It's not even all that new as a tape oxide—Agfa, for one, used it as such back in the '60s. And it's still used, according to Agfa, in some premium cassettes. But now it's available in bulk tape for use by professional duplicators. Agfa claims better high-frequency output than standard ferric oxide ( $\text{Fe}_2\text{O}_3$ ) and a lower noise floor than ferric (or chrome, for that matter—which they demonstrated). The first release on Magnetite-12 is 90125, by Yes (Atco 90125-4).

### More on Tape EQ

Back in February, I mentioned that some prerecorded chrome cassettes lacked the chrome recognition notch—deliberately, as I learned in time to note in our June issue. Now comes a note from BASF on just *why* it's done: "Since the majority of cassette players in use frequently don't have switchable EQ settings and are equalized for 120  $\mu\text{S}$  ... the 'normal' EQ setting is more appealing to this mass audience. Playback of ... chrome tape in the 120- $\mu\text{S}$  position retains the low-noise characteristics of ... pure chrome ... while delivering a bonus in high-end frequency response ... Hence, no chrome notch.

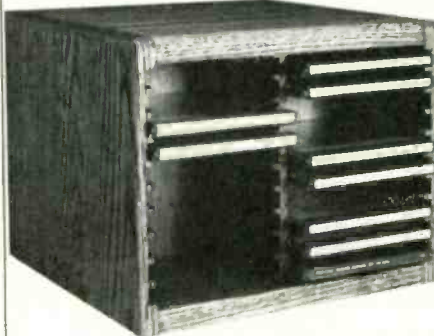
"In fact, the IEC standard ... gives the international standard for prerecorded cassettes as 120  $\mu\text{S}$ , with 70  $\mu\text{S}$  listed as an option ... To my knowledge, those who have used this IEC option—RCA Red Seal, for example—to equalize their prerecorded products at 70  $\mu\text{S}$  have used the chrome notch."

Incidentally, BASF says that the cost of chrome is "pennies per cassette," and that among those using it are A&M, CBS Masterworks, Inner City Jazz, RCA Red Seal, Sine Qua Non and Vanguard (not to mention Musical Heritage Society).

Meanwhile, just to round the issue out a bit more, Agfa states that its Magnetite can also be recorded and played back with 70- $\mu\text{S}$  EQ.

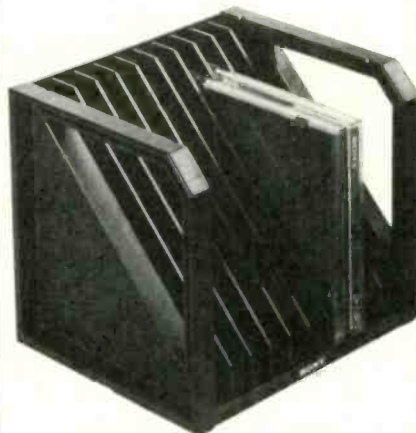
### Racking up CDs

Polygram's Wolfgang Munschinski recently told us about an often-unnoticed property of the "jewel-box" CD package: With its lid removed, it can be used as a drawer in a rack.



Sonrise Mirrormont III

What rack? Well, you'll have to make your own, for now—none have yet reached the market, that I know of, either here or abroad. Mr. Munschinski made his own such rack, with straight sides grooved to hold the "drawers." That's fine for single-CD albums, but there are also multiple-disc ones (most Mahler symphonies and most operas, for example, come in two-disc sets; Deutsche Grammophon's *Turandot* is on three discs).

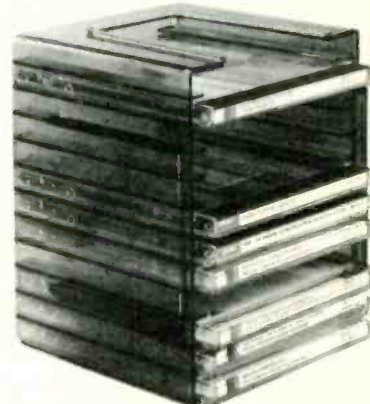


Sony CK-1

So the ideal CD rack would have thin supports that extend from each sidewall inward by at least a fraction of an inch. Those supports would be spaced about  $\frac{1}{2}$  inch apart to clear one-disc albums, and removable for multi-disc sets.

In the meantime, less visionary storage devices for Compact Discs are becoming available. The most cost-effective (i.e., cheap) one I've seen is the Model 9042-1, from United Media Systems/Miterfold International, a wood cabinet with woodgrain vinyl finish that holds 42 discs, in three stacks of 14 each. I don't have the original manufacturer's address, but Laury's Records, a store in Chicago, sells it for \$14.98 plus shipping.

The nicest looking may be the Sonrise Mirrormont III, a swivelling cabinet of solid oak or walnut with rounded corners. It holds 40 discs (two stacks of 10 in front, two more in back), and sells for about \$70.



Sound Accessories Stako-Disc

Custom Woodwork and Design now makes an 81-disc CD drawer (\$75 in oak, \$85 in walnut) to fit its line of cabinets.

In plastic, there's a wide choice, too: Sound Accessories has a handy rack with a cumbersome name (Stako-Disc CD Library System #CD-12). It holds 12 discs horizontally, so you can read their names more readily, on shelves that slope back to hold the discs more securely; it's \$7.95. International Book & Record Distributors imports the Discbox, from England; it holds 10 CDs, and costs \$6.98. Sony, naturally, has one, too: the Model CK-1 holds 10 discs and sells for \$11.95. While the capacity of these plastic racks is limited, you can interlock several of any given model together, both horizontally and vertically, into a neat array. The plastic racks can be either wall- or shelf-mounted, too.

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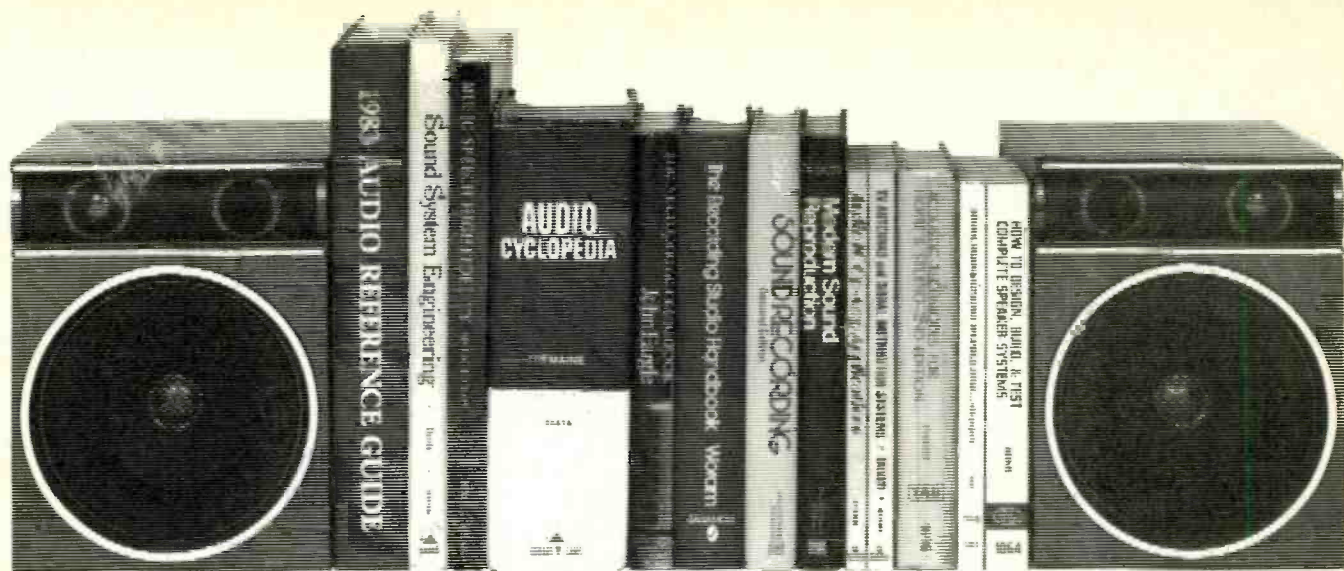
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No component-of-the-month recommendations here, only time-proven products from industry leaders such as Audio Research, Vandersteen, Linn Products, Naim Audio, Spondor, and more. Tired of obnoxious, fast-talking, uninformed salesman? Relax and enjoy the music at THE LISTENING POST. If you want this month's "hot" component, (better hurry), shop our competitors. To audition a lasting, correct-engineered audio SYSTEM, visit THE LISTENING POST (602) 967-1250 Tempe, Arizona. You've heard of us before, try us today.

#### GENE RUBIN AUDIO—LOS ANGELES

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**HI-FI SALES OF MESA** wants to introduce you to true low frequency reproduction, the kind you can't get from most full-range systems. But you can get it from a JBL subwoofer. The JBL B380 and B460 will let you hear the deep bass that's on today's top recordings, and hear it with clarity and accuracy. Hi-Fi Sales, 810 W. Main, Mesa, AZ.

**JERRY'S CONCEPTS** in Home Entertainment Environments now brings you the ultimate in low frequency reproduction—the JBL subwoofer system. Yes, JBL makes the best subwoofers around—the only ones we know of that deliver clean, natural deep bass. Even the best systems can benefit. Jerry's Concepts in Phoenix (602) 263-9410.

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## MIDWEST

**ANY STEREO SYSTEM**, no matter how good, can benefit from a JBL subwoofer. These are the best subwoofers we've heard; they reproduce the lowest octave with clarity and depth. And the midrange of the stereo speakers is cleaner too. Hear how a JBL subwoofer will improve your system, at Meyer Television and Audio in Edwardsville, IL (618) 656-4620.

**AUDIO EMPORIUM**, representing hifi's best values. Free Catalog, 6914 W. Brown Deer Rd., Milwaukee, WI. 53223. 414-354-5082. **AD**

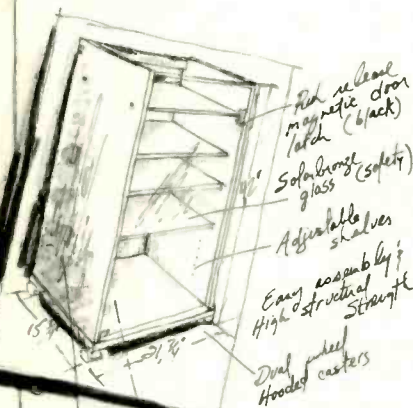
**B&B APPLIANCE** will HELP your stereo system reach new lows—with a JBL subwoofer. The JBL B460 and B380 will let you hear all the low bass that's in today's best recordings—and when you hear it, you won't want to live without it. Hear these remarkable JBL subwoofers at B&B Appliance in Middleburg Heights, OH (216) 842-5600, and in Cleveland (216) 261-5600.

**DIGITAL SIGHTS AND SOUNDS** features new lows in audio—the best subwoofers we've ever heard. And they're from JBL! The JBL subwoofers reach down and bring back the bottom octave that's missing in just about all full-range systems. You owe it to yourself to hear what we're talking about. Digital Sights & Sounds, 783 Bethel Rd., Olentangy Plaza, Columbus, OH.

**GOURLEY PRO AUDIO** now has the world's best subwoofers—from JBL! The JBL B380 and B460 bring you the bottom octave that's missing from most full-range systems. Today's best recordings really benefit from a JBL subwoofer—the difference is dramatic! Hear JBL at Gourley Pro Audio, 400 N. Main, Sioux Falls, SD.

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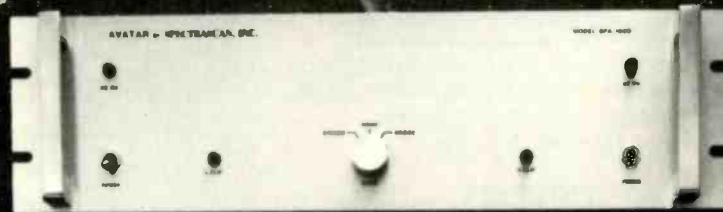
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### MIDWEST

**IN BLOOMINGTON, THE PLACE TO GO** to add new lows to your stereo system is American Audio-Video. We feature the best subwoofers you'll find—and they're from JBL! We think that only JBL can reproduce both the power and the subtlety of the low bass on today's best recordings. Come in and hear what we mean. American Audio-Video, Bloomington, IN. (812) 334-1905.

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**QUITE A CHALLENGE**, but there is a way to add the lowest octave to your stereo system. Hear a JBL subwoofer, and you'll be amazed at the clarity and power it adds to even the best full-range systems. Once you hear it, you won't want to be without it. Come to Stereo Center, Flint, MI (313) 239-9474.

**RED BARON'S INC. IS PROUD** to feature JBL subwoofers, the very best. The JBL B460 and B380 reproduce the lowest octave with clarity and depth, and they reach the volume levels that make such bass stunning in its impact. After you hear what a JBL subwoofer can do for your favorite state-of-the-art recordings, you'll wonder how you lived without it. Red Baron's In Wichita, KS (316) 684-6572.

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### NORTHWEST

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**MARK'S CUSTOM STEREO** now features the world's best subwoofers—JBL! That's right—JBL! The JBL B460 and B380 restore the bottom octave that's missing from most stereo systems—and once you've heard true deep bass, you won't want to live without it. We wouldn't. Hear it all at Mark's Custom Stereo, Ontario, OR (503) 889-8855.

**ROCKY MOUNTAIN HI-FI WANTS** to help you find the missing octave in your stereo system—the lowest octave. Most full-range systems simply can't reach that low. But a JBL subwoofer can. These are the best subwoofers we've ever heard, and adding one to your system will make a dramatic difference. Rocky Mountain Hi-Fi In Great Falls, MT (406) 761-8683.

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#### WEST

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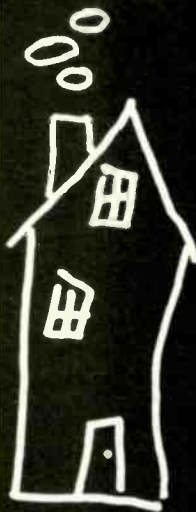
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#### WEST

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**KUSTOM HI-FI IN BURLINGAME** wants to introduce you to the best in low frequency reproduction—a JBL subwoofer. From cannon to contrabassoon, a JBL subwoofer gives you all the power—and the detail—that's present in the lowest octaves. We wouldn't live without it. And we think you'll feel the same way. Kustom Hi-Fi, 220 California Drive in Burlingame, CA.

**LISTEN UP BRINGS NEW LOWS** to the mile-high city—subwoofers from JBL! JBL makes the best low frequency loudspeakers around, and the B380 and B460 subwoofers are what you need to hear the bottom octave that's missing from just about all full-range systems. Hear what we're talking about at 685 S. Pearl St. in Denver.



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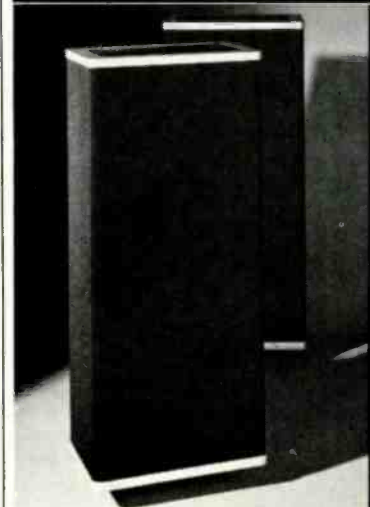
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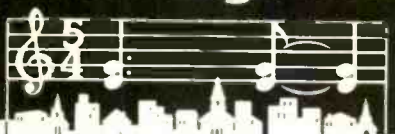
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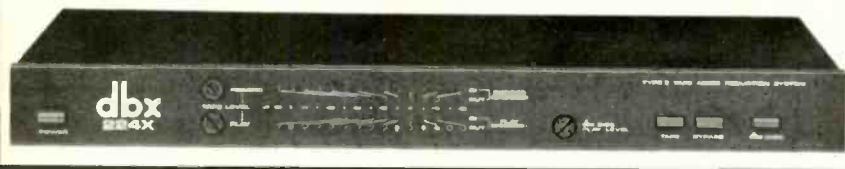
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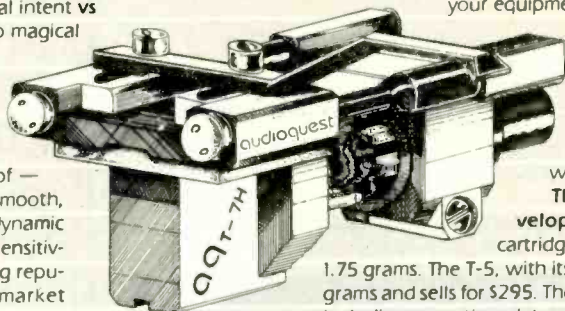
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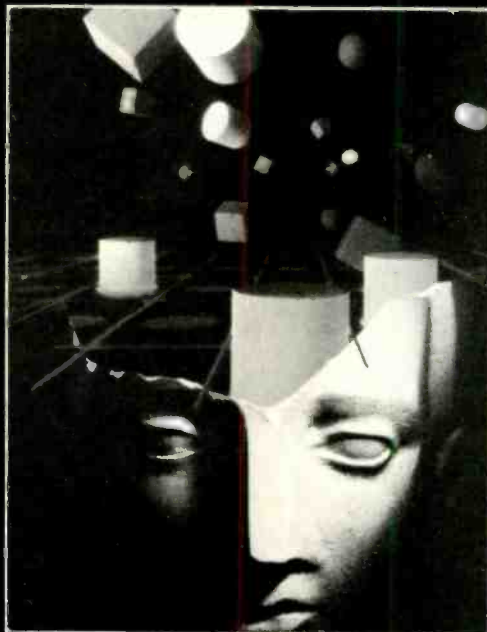
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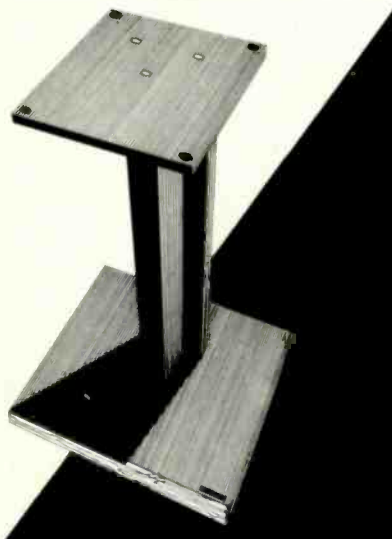
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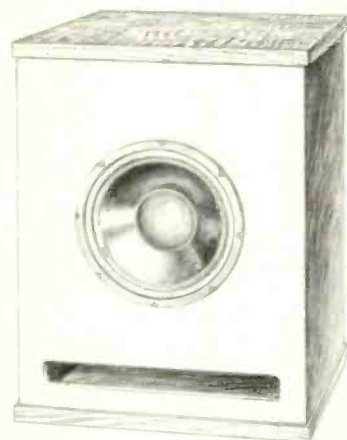
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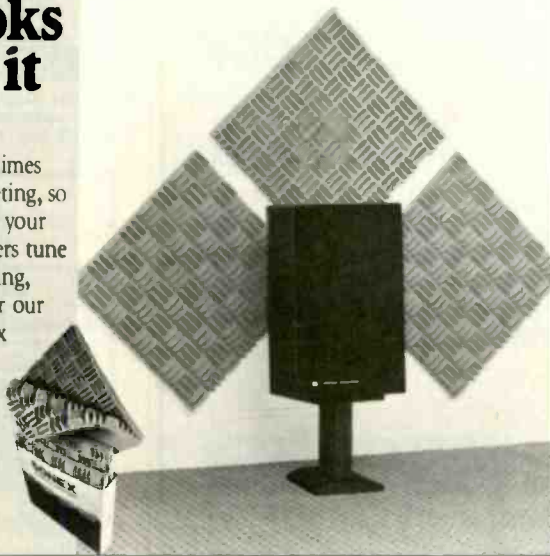
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