

Audio

The
Authoritative
Magazine
About
High Fidelity

JUNE 1981 • \$1.50 • © 06030

**BENCH TEST:
NAKAMICHI 1000 ZXL**

**LINEAR TRACKING
TURNTABLES**

**TELEFUNKEN
DIGITAL MINI DISC**

**BELL LAB'S KELLER
AND THE ROOTS
OF HI-FI**

05052 VA NORFOLK

147 W BAYVIEW BLVD

WILLIAM W KAYSER

72660 KYS 02478090 R4 P 0CT85

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Pioneer's new
speaker has
polymer
graphite cone.



HPM Polymer Graphite.™

Conventional
kazoo has
paper
cone.



**WHAT'S GOOD
FOR A KAZOO
IS BAD FOR
A SPEAKER.**



Introducing the first low distortion speaker. The Pioneer HPM Polymer Graphite.TM With up to three times less distortion than conventional paper speakers.

Most high fidelity speakers today offer you little more than kazoo technology. And the paper cone you find in most conventional speakers is proof of it. Just as the paper cone in a conventional kazoo creates a buzzing noise, the paper cone in most conventional speakers creates distortion.

At Pioneer we've developed our new HPM speakers with Polymer Graphite cones instead of paper. This new material sets new lows in speaker distortion and new highs in speaker technology.

What good are low distortion components when you have high distortion speakers.

Most people believe that to get the most out of a recording all they need is components that give them the least amount of distortion.

But expensive components mean little when attached to conventional speakers. Even components with an amazingly low level of distortion can't be appreciated when you're listening to them on speakers that most likely have ten times the amount.

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Polymer Graphite reproduces sound. Paper and metal create it.

The perfect cone material should be rigid enough to significantly reduce distortion. It should be lightweight. And high in internal loss. So it sustains no vibrations and allows no artificial coloring to your music.

Unfortunately, these three attributes are not commonly found in any one speaker.

Paper cones are not rigid enough to keep from flexing. They tend to break up at high listening levels. As they alter their shape, they alter your music. What's more, over the years, their performance can deteriorate.

Metal cones, on the other hand are rigid enough to lower distortion. And can be light enough for quick response. Unfortunately they tend to ring and add their sound to your music.

Pioneer's new HPM speakers have woofer, tweeter and midrange made of Polymer Graphite.

Because Polymer Graphite is rigid, the wave that comes out of your speaker cone is virtually identical to the signal that went into it.

Because it's so lightweight, it's responsive enough to accurately reproduce transients for an added sense of realism.

And because it's acoustically dead you'll hear nothing more and nothing less than music the way it was intended to be heard.

But that's not all. Pioneer's new HPM Polymer Graphite speakers have a horn loaded, High Polymer supertweeter that expands frequency response an additional octave to 50,000 hertz. A computer designed bass reflex cabinet. And much more.

So if you're in the market for high fidelity speakers, you can buy a paper speaker and get kazoo technology. Or you can buy a Polymer Graphite speaker and get Pioneer technology.

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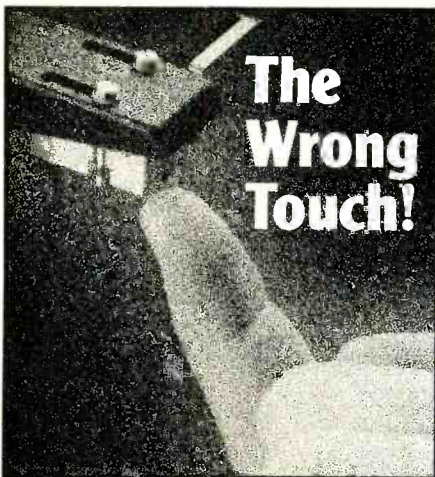
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speaker has paper cone.



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Audio

JUNE 1981

VOL. 65, No. 6



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N.Y. 10036.
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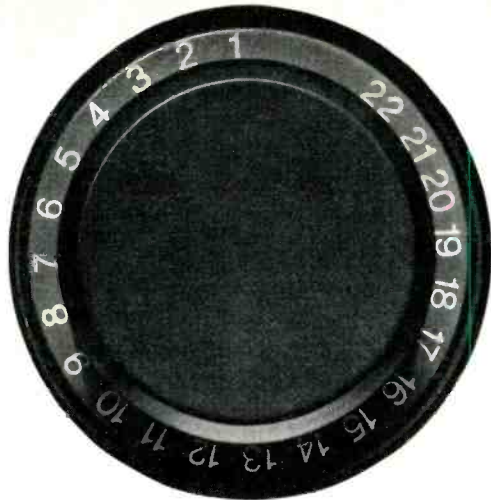


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If If everything were perfect . . . a control unit would consist of a volume control and a program selector switch.

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Editor
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Kay Blumenthal

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Publisher
Jay L. Butler

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Robert J. Kretling, President
George H. Allen, Senior Vice President/Magazines
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Michael Brennan, Vice President and Gen. Manager
Leon Rosenthal, Circulation Marketing Director
William Ganz, Advertising Marketing Director
John J. Miller, Group Business Manager
Karen L. Rosen, Production Director

ADVERTISING SALES

Audio, 1515 Broadway, New York, N.Y. 10036
Jay L. Butler, Publisher
Telephone (212) 975-7247
Stephen W. Wittholt, Eastern Adv. Mgr.
Telephone (212) 975-7654

West Coast Sales Office:

Audio, 3807 Wilshire Blvd., Suite 1201
Los Angeles, Calif. 90010
Jay Martin, Western Adv. Mgr.
Telephone (213) 487-5880.

Midwest Sales Office:

Audio, 303 E. Ohio St., Suite 2001
Chicago, Ill. 60611
Peter C. Cosyns, Midwestern Adv. Mgr.
Telephone (312) 280-0309

Classified Advertising:

Audio, 1515 Broadway, New York, N.Y. 10036
Catherine M. Paduano, Classified Adv. Mgr.
Telephone (212) 975-7530

England: The Paul Singer-Lawrence Media Group,
54 Burton Court, London SW 3 5Y4, England.
Telephone. 01-730-3592

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Sansui. Better turntables for today's better discs.

A RECORD IS ONLY AS GOOD AS THE TURNTABLE IT'S PLAYED ON.

Today, because of sophisticated recording techniques, records are better. There's more and more music in the grooves.

And with digital, direct-to-disc, and half-speed mastering, audiophile discs are nearing perfection.

So your equipment has to be better to meet these tougher, higher standards. That's why Sansui's new line of turntables is designed to play today's audiophile discs—and tomorrow's. We've combined high technology with convenience. Take a look.

The fully automatic, direct-drive XR-Q11 features a microprocessor controlled programmer that lets you choose the playing order of up to seven selections; the quick response quartz-crystal PLL servo system with digital readout greatly improves turntable accuracy and stability, and the solid BNC case helps elimi-

nate feedback. Result? Wow and flutter reduced to 0.015% and a 78dB signal-to-noise ratio.

Our mid-priced FR-D55 shares many of the outstanding features of the XR-Q11, including direct drive, sequence programmer, and the straight-line, DynaOptimum-Balanced (DOB) tonearm with a separate motor to control its fully automatic operation. The arm tracks only the record, not nearby footsteps or speaker-transmitted vibrations.

Like the FR-D55, the modestly priced FR-D35 has a direct-drive motor, platter and strobe indicator, with $\pm 3\%$ pitch control. Impressive 0.025% wow/flutter and 72dB S/N ratio. And all upfront operating controls, so you don't need to raise the dustcover.

That's only half the Sansui turntable story—there are three other models to choose from:

the XR-Q9, FR-D45 and the FR-D25.

Listen to your better records on Sansui's better turntables. At your local Sansui dealer.



FR-D3E

XR-Q11

FR-D55

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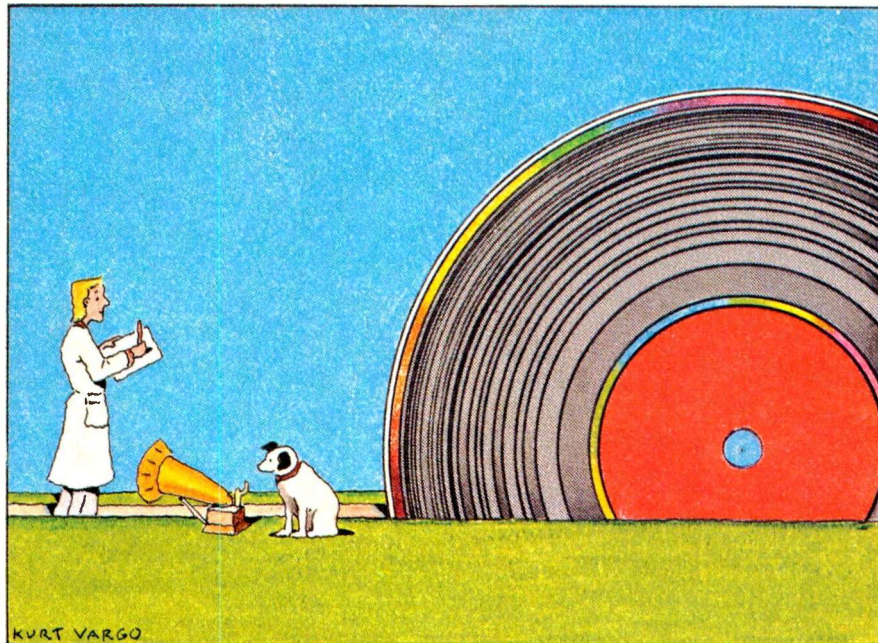
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RCA Records has re-launched its digital LP, this time in full audiophile format. Sumptuous big press event. So now we know where we stand. Audiophile has reached the ultimate, the top, after, of course, starting at the very bottom. The newly packaged RCA line (also cassettes with Dolby) has interesting implications in these heady times when we can wonder whether the sound-only phonograph record can survive independently in the face of the videodisc. No — that crunch is yet to come, as RCA is aware, since its own TV disc is still pretty new in the marketplace. But (and I am now putting words in RCA's mouth) there does seem to be a lot of hay still to be harvested out there in LP land, and the name of the harvest is audiophile.

Short-term capital gains, I'd call it. And better hurry while the pickings are good. They still must be, what with oncelittle Telarc hiring the Philadelphia Orchestra and, recently, the Boston Symphony, plus world-famed soloists. And this right under the noses of RCA, Columbia and Philips! No wonder.

There have been RCA digital LPs of a simpler sort around for quite some time now, as you probably realize. There was an earlier digital launching, too, with the press transported en masse to Philly to sit in on a digital recording session — Bartok. Perhaps these two events were merely complementary, one to begin, the other for the end result, but I think not. What we have is a new policy. The new RCA digitals are packaged to match the fanciest (including Columbia) and even carry a different letter/number designation. The price, \$15.98, has been hiked to fit. That is the name of this game. What you need is an outrageous price, yet they're worth it. And that, needless to say, is a major part of the significance. Earlier RCA digitals didn't cost enough.

This second RCA launching was admirably managed. Entertainment and edibles, of course, including salmon and the Canadian Brass live as well as recorded. But admirable also in the verbiage. RCA modestly describes its new policy as "The Evolution of Excellence" — quite so. This is no revolution, unless within the RCA house. The excellence has been with us elsewhere for a good while. But what is astonishing is the manner of its achievement here. In a few



words, RCA is farming its business out.

Of the three new RCA digitals I have on hand, two were recorded on Soundstream equipment, Dr. Tom Stockham's, the man who made the first classical digital tape for Audio's Bert Whyte at the end of October 1977, and dozens of well-known recordings since. The third disc was done on Sony, also familiar though more recent. The mikes and the entire cutting equipment are out of Neumann of Germany. The plating is by Europa Disk (a U.S. company), also familiar in many an earlier audiophile release. Pressing? You can guess. Not by RCA. By Teldec in Germany on 140 gram pure vinyl.

So it's an evolution, all right, and, as RCA says, state of the art, with much credit going (I say) to these other firms who have between them largely made it possible. An odd world we live in, you'll admit.

The above, keep in mind, is only the basic engineering, the sheer audio portion of the package. RCA had plenty to do elsewhere in the production, ranging from providing the music and the recording halls and the technical direction to, needless to say, the new packaging. All praise! Here, the company is closer in and we feel its collective hand in every detail, including a certain RCA sound, out of as few as four mikes. But the

packaging! I was awed by the "heavy duty" outer skin, so thick I hated to throw it away. Inside the double cardboard is a new "high density polyethylene" slip envelope, somehow both limp and stiff as well as slippery. (On it in white is printed the dog, Nipper, once the trademark of Emile Berliner's early disc operations.) Excellent protection. The liner notes are full and tasteful, the audio specs well set out, and the excellent article on digital, "Quality by the Numbers" by RCA's John Pfeiffer, which was on the original digital releases, is also on the new discs. It is the best and most honest popular description of what "digital" means to the buying public that I have seen.

Excellence, in sum, all the way, though I will say nothing about audio excellence here, since this is not a record review. You can surmise for yourself. Unless somebody made unconscionable goofs, this second RCA digital launching has got to be good in the sound. It ought to be, with all that hardware.

RCA played digital copies of some of the new material at its press event, coming from Sony cassettes as I heard — and here we must recall that one of the fabulous virtues of digital recording is that the information may be copied without significant loss through the generations. This, of course, only at the digital



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When you turn on the stereo, does everyone fight for "the chair?"

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Then look at the illustration on the left. That's the kind of sound you're getting—the kind that comes from cone speakers. Stereo in just one section of the room, pieces of it in the others.

Now look at the illustration on the right. That's the kind of sound you get from us, BES, because of one very critical

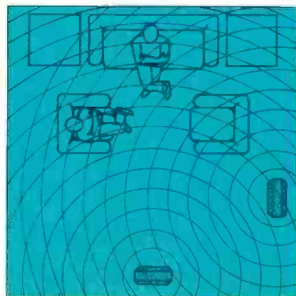
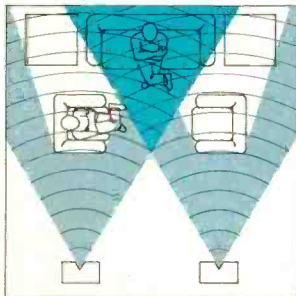
fact: Our speaker has no cone. Why? Because the cone can only project sound in one direction.

The heart of our system is a diaphragm, which vibrates much like a guitar string projecting sound in every direction simultaneously.

What BES has is 360° sound. True omni-directional sound. Sound as close to live sound as you can get.

Look at the BES illustration again. Where the sound from one speaker intersects the sound from the other, you get true stereo. And that's virtually everywhere.

Go listen to us. BES. From any chair in the room.



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RCA has re-launched its digital LP, this time in full audiophile format. This second launch was admirably managed.

end of our present digital/analog composite operation. RCA thus took on a certain risk in playing a segment of one of the actual "digital" discs, which of course is analog. At that point, RCA was heard to remark (in the person of Thomas Z. Shepard) that if a single tick showed up on *this* disc, the entire RCA

staff would be sent in to eradicate it forthwith, on the spot. Or words to that effect. Fortunately, no such operation was attempted. No ticks.

I liked the hole-in-the-cover art, borrowed from a long-ago series of His Master's Voice albums reissued here by RCA. You see through the outer cover to

a part of the big picture on the hard inner liner. I liked the faded red label. Dignified, with another Nipper. I liked the music — but that's another story.

Almost. For a good deal of the significance of RCA's move is in the music chosen for digital release, audiophile-type. It has its "hi-fi demo" moments, of course, and some of the discs are demo-inclined: The Canadian Brass in a lot of well-recorded corn and that much-recorded showpiece of the hi-fi age, "Carmina Burana." But RCA has pointedly included other releases that are definitely music first and in direct musical continuity with the analog past. One does not need all four sides of the vast uncompleted Mahler Tenth, in the Deryck Cooke final version, to produce hi-fi effects! (Better the Beethoven Fifth, which is a fifth as long.) Rather, this album ties in directly with other Mahler symphonies in the RCA catalog also conducted by James Levine, though on analog, not digital.

Similarly, RCA's new digital of the Sibelius Violin Concerto with the new young virtuoso Dylana Jenson (19 years old) is not at all "demo" in the content. Rather, it says to us, RCA's longtime musical policy continues straight ahead, if into audiophile: Keep recording the same old popular show pieces (musical show, not audio) with an ever-new stable of virtuosos. That policy goes back to Caruso and the like and it has never changed, though often supplemented by other types of music.

And so a few conclusions may be drawn. RCA makes it clear (as do many other labels) that the move to digital LP in the fancy audiophile format is basically two things — at a price: Superior engineering and superior packaging. But not, definitely not, a change in musical policy. Even Telarc, the innovative audiophile pioneer of a few years back in the classical area, now is edging sensibly (in both senses) back towards pure music, well recorded and well packaged. The Boston Symphony doing the Beethoven "Emperor" Concerto with Rudolph Serkin! That will be an audiophile first, and it won't be out of Columbia. (That concerto, incidentally, is one of the longest of Beethoven works, almost up to Mahler.)

Thus I can also conclude that the present splurge of top-level audiophile classics does not contradict my earlier

the best value in hi-fi

Three V15 Type IV Technological Breakthroughs

Dynamic Stabilizer Suspended from two viscous-damped bearings, acts like a shock absorber to maintain constant cartridge-to-record distance and uniform tracking force; eliminates record groove skipping caused by warp; cushions the stylus from accidental damage.

Electrostatic Neutralizer 10,000 conductive graphite fibers discharge static electricity from the record during play. Eliminates attraction of dust and tracking force variations caused by static charges.

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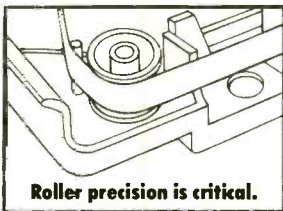


If you think "pads and rollers" are just a California craze, you're not ready for New Memorex.

Pads and rollers are key components of a cassette's tape transport system.

This system guides the tape past your deck's tape head. It must do so with unerring accuracy.

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In fact, our new Memorex cassette will always deliver true sound reproduction, or we'll replace it. Free.

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But when you record on new Memorex, whether it's HIGH BIAS II, normal bias MRX I or

METAL IV, don't forget the importance of those pads and rollers. Enjoy the music as the tape glides unerringly across the head.

And remember: getting it there is half the fun.



**NOW MORE THAN EVER
WE ASK: IS IT LIVE, OR IS IT**

MEMOREX



The move to digital LP is superior engineering and packaging, at a price. But definitely not a change in musical policy.

assertion that in the long run digital recording will simply become the universal method, for whatever purpose (and then everybody can charge the outrageous higher prices — if they dare). It's all a matter of tactics. And a number of labels, including RCA, guessed wrong in that respect. They followed what was merely logical. That, in today's market, you don't do.

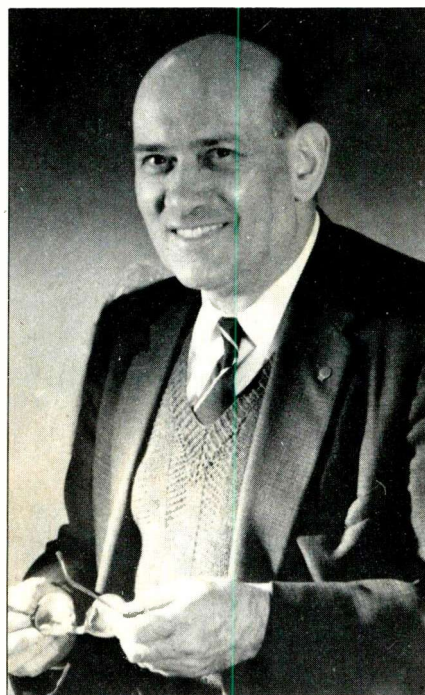
The logic of it says that if digital in the production of LP is simply a technological improvement, not so different from stereo (or, earlier, electrical 78-rpm recording), then a gradual changeover is in order, the old and the new as nearly parallel as is feasible until the shift is complete. Therefore — a modest price premium on digitals to help amortize the change, mildly different packaging (as in quadraphonic and stereo), and for a good while a dual line of goods, not violently different, so that the old "in the can" musical material can be put to work and the old machinery phased out. To this moment a good many labels continue with this policy. Some, notably Crystal, offer their digitals interchangeably with analogs at the same price. Nor is RCA the only big label to cleave to the principle. The major European companies lean heavily to the same in their digital releases.

And yet — it hasn't worked. Not here, anyhow. There are observable reasons. This time around, the playback equipment is already in place. So we need not "go easy" on the buyer who must acquire a painful lot of new equipment. He's ready to put his big money more directly into top-quality recording and superior packaging.

And oh boy, has he! The higher the price, the faster the sales, and a good value, a lot of people obviously think. Which leads to a more potent reasoning: Right now, money still rolls out towards the outrageously expensive package, any sort. Cars, hi-fi, records, skis. High-price audiophile is bound to sell. That is still the assumption. The hay, we trust, is still there for the harvesting.

Well, I can only say in a small voice that I think this is one of the most dangerous assumptions we can make — for the future. And the same, I might add, for extremely expensive gadget-ridden hi-fi equipment of the sort that we now see, no matter how marvelous. It sells today — maybe. But tomorrow? **A**

PAUL G.A.H. VOIGT



At the age of nearly 80, Paul Gustavus Adolphus Helmuth Voigt — although British his family came from Hamburg — died in Canada after a heart attack, following surgery.

In the world of sound recording and reproduction Britain had two preeminent names, Alan Dower Blumlein and Paul Voigt. Blumlein was killed in an air accident in 1942; Voigt survived until 1981, leaving in his trail a stream of brilliant ideas and 32 patents. These latter included his two slack-diaphragm capacitor microphones in the '30s, which were used by the BBC for a short period. In 1926, preceding Blumlein, he developed a commercial recording system using a moving-coil cutting head, in which the movement was damped by crossed diagonal restoring springs.

It is noteworthy that Edison Bell electrical recordings (he began his career with this firm after gaining his B.S. degree at London University) had a frequency characteristic approaching a 3 dB per octave slope across the frequency spectrum, thus anticipating modern practice. The RIAA and British Standard recording curves approximate a 4 dB

per octave slope over the 20 Hz to 20 kHz range.

While with the Edison Bell company, Voigt started work on his loudspeaker, probably the most enduring of all his inventions. Voigt's audio philosophy holds that listeners should not be able to tell whether they are listening to the real thing or not. He regarded the loudspeaker rather like a "hole in the wall," merely separating the listener from the concert hall. So the larger the aperture the better, and his corner horn was created around this concept.

The horn mouth measured about 18 by 24 inches, and the complete system was launched in 1936, although the drive unit was patented as far back as 1928. Using a powerful energized magnet, fitted with a free cone with leather surround, it had an aluminium voice-coil. This method may seem conventional now, but in the '20s it was original.

Later, under the Lowther brand name, Voigt's loudspeaker unit became a permanent-magnet type. Voigt also produced a large tractrix curve-type horn, with a four square foot mouth, which gave almost ideal matching to a high-flux 16-cm drive unit. This system was employed in movie theaters and required only five watts or so to give adequate sound levels. Before the '30s, tube amplifiers of more than a few watts were expensive to build. Voigt also produced an advanced moving-coil cutting head, using a 28-lb. electromagnet, and a complementary long-coil MC type pickup.

The sound fidelity obtainable today from a pair of Voigt Domestic Corner Horns is comparable with the performance of many current speaker systems and is perhaps better than most! This comment is not nostalgia for an old friend, since one of my colleagues has recently acquired a pair and the results are genuinely hi-fi.

In latter years, Voigt lost much of his interest in audio and turned to advanced and highly controversial theories on electromagnetism and gravitation. This work he regarded as ultimately of more significance than his many audio achievements. Only time will prove whether this is so, as today's physicists do not agree with the ideas. Our deepest condolences to his widow, Ida. — Donald Aldous

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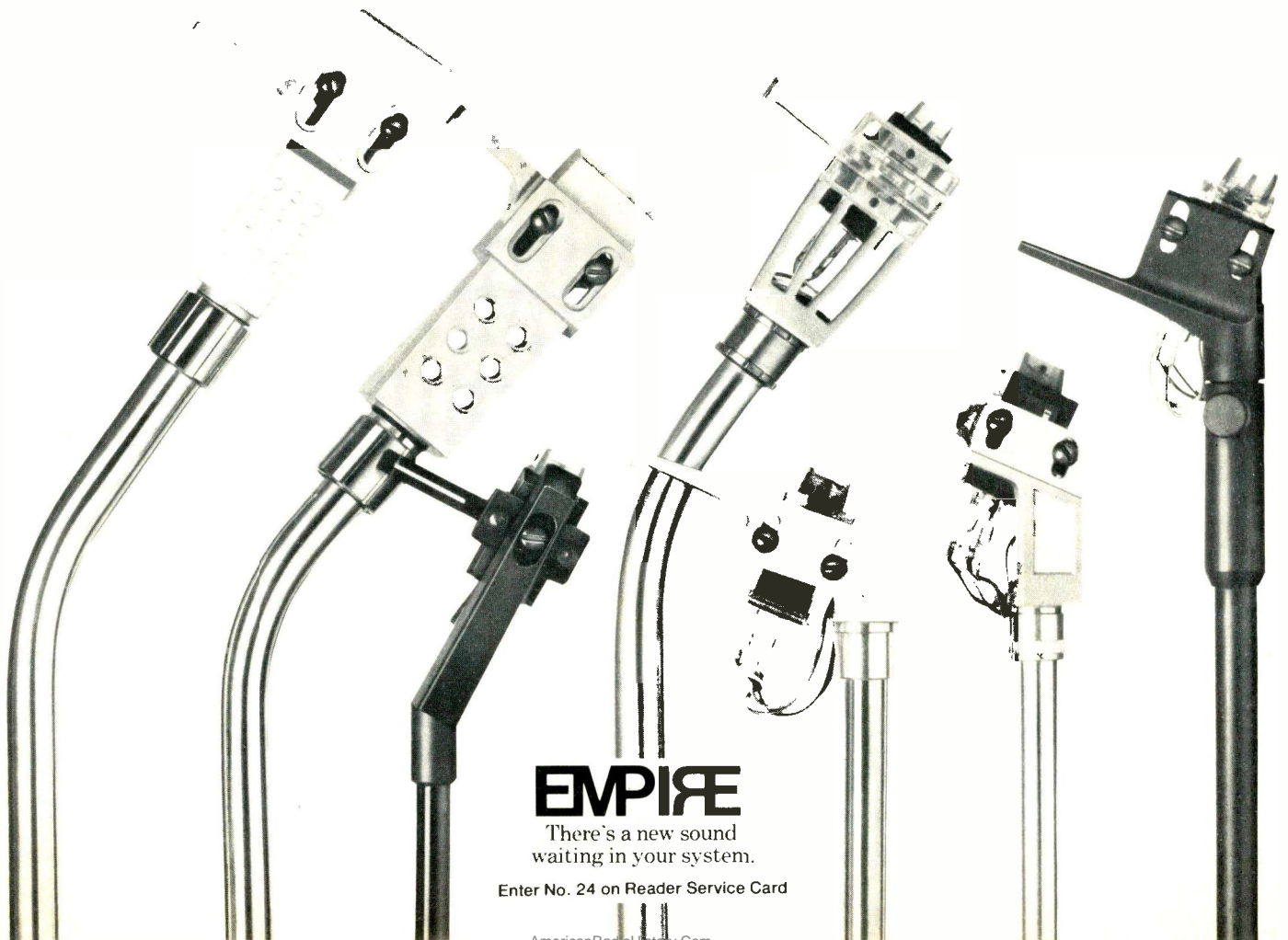


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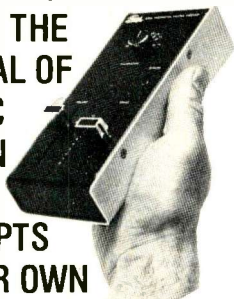
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"It is hard to imagine a greater benefit from a \$249 investment" Julian Hirsh in *Stereo Review*, Dec. 1980.

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**FIDELITY IN
SPATIAL REPRODUCTION**



Mozart: Horn Concertos. Gunter Hogner; Vienna Philharmonic, Bohm. **Deutsche Grammophon 2531 274**, stereo, \$9.98.

Sound: B Recording: A Surfaces: A-

What a gorgeous Mozart recording! There are a dozen-odd currently available versions of these four little concertos and plenty more out of print — after hearing this one I have no desire at all to compare. Why bother? Enjoy, enjoy!

Even the ordering is good. We begin with the least known and earliest, the Concerto in D, K. 412 (the other three are in E flat); the most familiar comes last, the third, K. 447. Thus, at the beginning of side one, you are plunged into the loveliest of unfamiliar Mozart (for many of us) and the most beautiful string sound I have ever heard on any record before. It is the beauty of, well, call it high tech. Limpidly clear, totally minus edginess, yet brilliant. It is the beauty of ideal microphone technique so that these instruments blend perfectly, as they should, yet are warm and alive as a body of musicians should always sound. I was so absolutely startled by the first notes, I could scarcely believe it. And, of course, it is the beauty of Viennese classic playing at its very best, never tired and jaded, never "pushing" for effect, just light, clear, and humorously alive.

And when the horn solo enters, there is more to enjoy. Not a blatant, close-up solo "virtuoso" but a horn that blends with the orchestra as it should in the live performance, yet with every note clear and, as well, every note in the orchestra equally vivid as the horn plays. No, it is not, I gather, an "authentic" valveless horn. The florid Mozart horn parts, composed for that very instrument, are still extremely difficult for the modern player. But Herr Hogner is the smoothest and most musical of modern horn players, with never a miss or a blat (allowable in such a prodigiously demanding instrument!) along with a marvelous sense of rhythm and phrasing and color. A pleasure to hear him, so well recorded. I would readily grant him his anachronistic valves for such perceptive musicianship, though it would be interesting to hear a valveless version. (Now probably somebody is going to tell me it IS a valveless horn. If so, then miracle! But never forget that the original performances in the 18th century were indeed with valveless horn — there was no other.)

Ecos d'España. Guitar Music of Spain. Carlos Bonell.

Nonesuch H-71390, stereo, \$8.98.

Sound: A Recording: A- Surfaces: A-

This sturdy young Spaniard out of

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TDK
The Amazing Music Machine

Carlos Bonell is fond of slow music, but we quickly feel the strength behind this seemingly leisurely approach.

England, just over 30, plays an interesting Spanish guitar, combining a good feel for Spanish atmospherics a la Segovia with a certain sinewy, downright quality that — for me at least — reads England. That's where he was educated, anyhow. In this Enigma recording (British label) his guitar is an instrument you have to hear to believe, big, fat, rich,

larger than life but of a superb clarity in the sound. The guitar was "crafted," it says, by David Rubio, who also makes instruments for Julian Bream.

In contrast to that virtuoso of many recordings, whose finger dexterity tends towards a sort of high-speed nervousness, Carlos Bonell plays an underwhelmed production. He is fond of

slow music, and there is nothing genuinely fast on this entire record. But we quickly feel the strength behind this seemingly leisurely approach when his muscles show suddenly in casual bits of breathtaking expertise.

I liked the program, too, beginning with "modern" — which in guitarese means the same old familiar idiom with a few coy dissonances added here and there, nothing to bother the fans. Still — modern, in place of the too-often stilted "old music." Then there's a splendid big Beethoven-period dirge by Fernando Sor, splendidly performed, a work to interest any listener. Only on side two does he roll back into the gentle Spanish dances, and, to end, four Spanish folk songs — not even these ending with a bang. It's all very casual and the more impressive for it.

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The "power war" is over. High-powered receivers and amplifiers are going the way of the "gas guzzler" in this era of energy consciousness and inflation. Yet technological advancements in source material, such as direct-to-disc and digitally-mastered records, demand far more from your loudspeaker system than ever before.

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Interface

Austrian Court Music 1680-1780. Baroque Performance Institute, Oberlin, 1979.

Gasparo GS 206, stereo, \$7.98.

Sound: B Recording: B- Surfaces: A-

Here is a somewhat novel example of the current exploiting of college and university music as material for LP records. Oberlin, in Ohio, has developed a very considerable school of older music performed as far as possible on original instruments and in a reasonably authentic style; the Baroque Performance Institute is one part of this. The present disc is a scholarly delving into a bit of the enormous amount of music performed at the Imperial Court for the series of music loving emperors and empresses of the Baroque period — virtually none of it published or known in active performance today.

I should hasten to say that this is not the ever-popular Baroque that intrigues many a hi-fi equipment owner, centered upon Vivaldi, Handel, Bach, Telemann and played, usually, on modern instruments including, of course, modern brass. A glorious sound, very late Baroque, and not really typical of the period, which was opera and chamber music orientated, for the most part. The offerings here are small-scale works (from our viewpoint today), excerpts from serious operas, a trio, a sonata; there are two solo voices, soprano and high baritone, and a brace of *viola da gamba*, the



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Bob Carver explains (briefly) how the Magnetic Field Amplifier works. (Others tell how it sounds.)

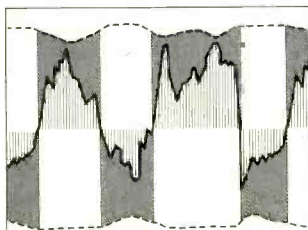
Q. How is it possible for an amplifier as small and as light as the M-400 to deliver so much power and to cost so little?

A. The M-400's size (less than 7 inches) and weight (less than 10 pounds) reflect the advanced technology and the new patented designs used in both its power supply and amplifying stages—and the innovative relationship between them. (Not to mention the incredibly low price that resulted: \$399.)

Q. What is different about the M-400's power supply and amplifying stages?

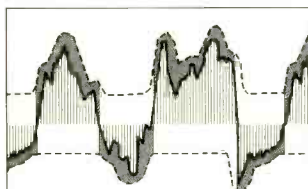
A. In any amplifier, the power supply produces and stores energy for use by the amplifying circuits.

Conventional amplifier power supplies are very inefficient because they produce a constant high voltage level at all times—irrespective of the demands of the ever-changing audio signal—and even when there's no audio in the circuit at all!



Conventional power amplifier

Solid line: audio output signal
Broken line: power supply voltage
Shaded area: wasted power
Vertical lines: power to speakers



Magnetic field amplifier

This inefficient approach demands large and expensive power transformers and electrolytic capacitors. Large heat sinks are also needed to get rid of the heat associated with the constant high voltage of conventional power supplies.

In sharp contrast, the M-400's "smart" power supply produces only the power that the amplifier section needs from moment to moment to handle the signal accurately. In effect, the M-400's power supply is *signal-responsive*. As a result, overall efficiency is extraordinarily high.

Q. Do I really need 200 watts per channel?

A. Yes! If you want to hear music reproduced with full realistic impact and dynamic range, the musical peaks must be handled without compression, clipping or overload.

You'll be amazed at the improvement in openness and clarity when your system is able to deliver the power that music really requires.

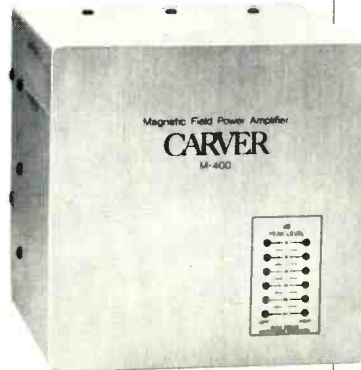
When full digital audio arrives, dynamic-range capability will be even more significant. And the M-400's power will be even more necessary—with its ability to deliver 500 watts in mono, 900 watts for brief time periods, and more than 1200 watts on peaks!

Q. Now I understand why the M-400's power capability will improve my system, but can my speakers take it?

A. Speakers with a power rating of 50 watts or so will have no problem with the M-400. That's because speakers are not generally blown out by high, clean power, but rather by low-powered amplifiers pushed beyond their overload points. These low-powered amplifiers

"clip", generating speaker-damaging transients.

In addition to providing better sound and sufficient power, the M-400 has special protective circuits that guard both itself *and* your loudspeakers from almost any conceivable damaging circumstance. These include long and short-term overload, sudden overdrive signals (such as from dropped styli), shorted speaker leads, etc.



M-400 Magnetic Field Amplifier 201 watts minimum continuous power per channel (500 watts mono) into 8 ohms, 20 Hz to 20 kHz, with no more than 0.05% total harmonic distortion.

All this protection operates via the signal-controlled power supply circuits, not the amplifier stages, so there's absolutely no chance of the typical distortions caused by conventional protection circuits.

Q. Aside from the technical innovations in its design, how does the M-400 sound when it comes to music?

A. My design goal was to make it sound musically accurate, and I'm proud to

say that it does. More convincing perhaps, others confirm this. Leonard Feldman in *Audio* reported: "Music reproduction was superb and completely free of any false bass coloration or muddiness. The amplifier handled the toughest transients we were able to feed to it with ease... there was none of the brittle quality that one often detects from amplifiers that are beginning to strain."

Julian Hirsch reported in *Stereo Review* that "... Its distortion and noise levels are entirely negligible... hardly conceivable that a small, inexpensive, lightweight cube such as this could deliver as much clean power as any but a few of the largest conventional amplifiers on the market—but it does."

Q. Is the M-400 limited to systems with separate amplifiers?

A. No. The M-400 can be used in many different types of systems, including those with receivers and integrated amplifiers. With our new Z-coupler device, you can upgrade your existing low-power system into a superb 200 watts-per-channel system. What's more, the M-400 is easily connected without accessories to put out 500 watts mono!

Q. How can I get more information?

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old "leg viol," cousin of the cello, the sound of which, as well as the playing style, takes a lot of getting accustomed to — though it has fascinated musicians for centuries. It snorts and swoops most peculiarly, it has a cold in the head, and three or four of them multiply the effect.

All this given, these are pleasant performances definitely not shaped for records but rather for local concert. The leader, August Wenziger, imposes what to my ear is a somewhat old-fashioned style — that is, in terms of recent years — of gusty swoops and sighs, a product of the 1930s more clearly than of the Baroque years themselves, with much sudden swelling-up and dying-away.

The *viola da gamba* does not have to be played in this fashion, nor does the singing voice necessarily sing this way. Not good for record listening where an even keel comes over well; gustiness makes us reach for the volume control.

These things considered, the recording is cleanly done and never out of control. But there is a hard room sound, of plaster walls perhaps, most notably when the solo voices perform, which is from my point of view a bit amateurish. I'd guess that they were made, if not with an audience, then in the empty hall where the audience had been, at the Oberlin concerts. In spite of all this — lovely music if your ear is attuned.

Handel: Samson, Baker, Watts, Tear, Shirley-Quirk, Luxon; London Voices, English Chamber Orchestra, Leppard.

RCA ARL4 3635, four discs, stereo, \$39.96.

Sound: A- Recording: A- Surfaces: A

What a splendid musical edifice this great album raises up for us! Though not to any credit of RCA's, except some of the finishing. The RCA label is now reissuing notable European recordings through the French Erato company — oddly, that is the source of this totally British performance.

Those who were weaned on "Messiah" perhaps do not realize how much more dramatic are Handel's other big oratorios, notably those out of the Old Testament, crowned by "Israel in Egypt" with its double chorus throughout. "Solomon" is all oriental splendor, with the Queen of Sheba in person, all opulence unparalleled. "Samson" is tragedy from start to end in the noble tradition, yet it, too, is full of color and drama, all accomplished within the strict shapes of the musical traditions of Handel's day.

Here we have a great, a dedicated performance, in spite of the usual thing — big, modern voices almost preposterously "wrong" for the music, both in the arias and the large quantity of sung recitative. Big artists, true musicians, can overcome! With one exception, these do, and it is a truly stellar cast both male and female, not to mention the superbly expressive chorus, the London Voices, that is in constant assistance.

The exception, curiously, is Samson himself, Robert Tear. In this music he is not only out of style, wobbly and inaccurate, but his pitch, his *hearing* of the harmonies, is woefully lacking; he is constantly off, out of tune, in the wrong key, so to speak, most noticeably in the recitatives which he all but simply speaks, so hideously sour are his notes. Strange! In other music, Robert Tear has a fine reputation; he just doesn't get the musical sense of Handel's idiom, which to millions of us is simple and direct, far easier than old Bach's.

Fortunately, Samson is martyred before the last side and, before that, he is often off-stage doing great acts and the like, described (very musically!) by those on stage.

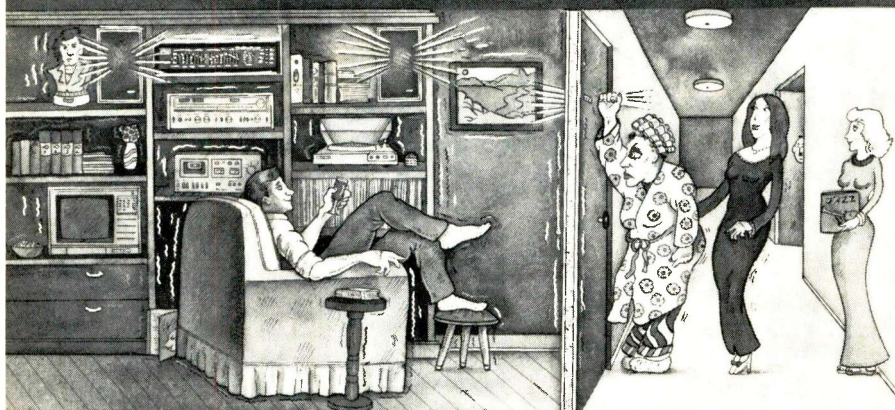
Dvorak: Symphony No. 7 in D Minor, Czech Philharmonic Orch., Kosler.

Quintessence PMC-7126, stereo, \$5.98.

Sound: B Recording: B-? Surfaces: A-

Like the Russian Melodiya label, Czechoslovakia's Supraphon has often been licensed out to American companies over the years. It has a distinguished history. I played Supraphon

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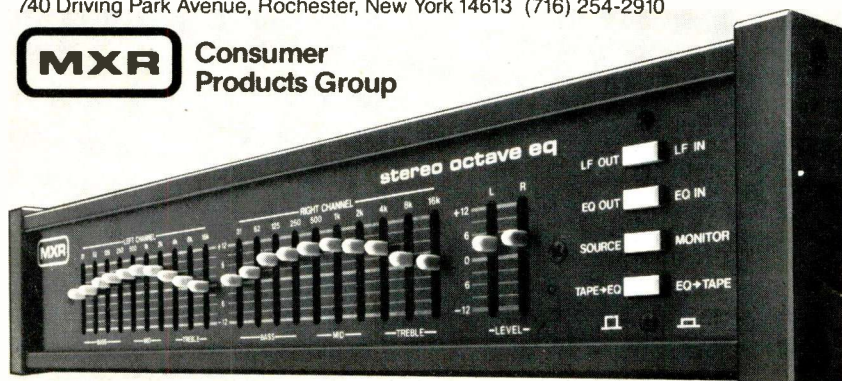
Annoying problems like hiss, turntable rumble and other kinds of distortion are easily overcome with the Stereo Octave Eq. It can accommodate the extended dynamic range of the new high performance discs and be an invaluable tool when recording car stereo cassettes.

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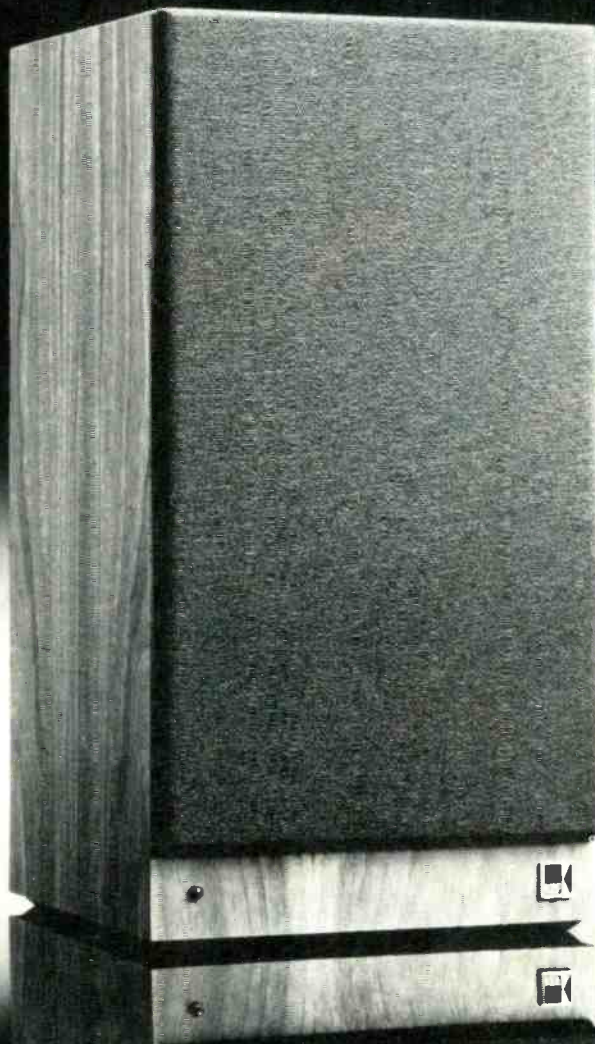
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shellac 78s many years before the LP appeared. Those who are familiar with the Melodiya sound, whether on Angel, Columbia or recently on Quintessence itself, will perhaps suspect that this 1964 recording is Russian influenced, a not unlikely thought. The sound is definitely close-up, but the ambience is rather on the dead side and too close for my taste since, in the more demanding passages, the strings tend to jab — so many discrete individuals — rather than blend together as intended.

But do not forget that the Czech lands were for centuries at the very cultural heart of Western music, and the people for whom Dvorak wrote his symphonies still live within that culture. Fortunately, the past, at least most of it, is apolitical in music. In five minutes you can sense love, respect and understanding in this really fine performance of perhaps the moodiest, most darkly Romantic of all the Dvorak symphonies, dating from 1885, a long, long near-century ago. Czech life, so different then, is not easy for any outlander to recapture.

Offenbach: Suites pour deux violoncelles. Etienne Peclard, Roland Pidoux.
Harmonia Mundi HM 1043, stereo, \$9.95 (155 North San Vicente Blvd., Beverly Hills, Cal. 90211).

Sound: A Recording: A Surfaces: A

What — that brilliant, slightly hysterical satirist of French operetta, Jacques Offenbach, writing learnedly for two cellos? Yes — and most entertainingly, too. An unexpectedly lovely and melodious record, beautifully played and recorded with a sound as full as a whole string orchestra.

Somehow, we expect works for solo strings, minus accompaniment, to sound heavy and labored, like the incomparable (but difficult) Bach sonatas for solo violin and solo cello. But there are two here! That makes the difference, and sheer technical expertise (Offenbach was a virtuoso cellist in his earlier years — when these works were probably composed) plus the well-known Offenbach gift for melody make this an utterly different sort of music. Learned in technique, yes! But in sound, freely, lushly Romantic, and so played, to perfection. An absolutely first-rate cello record.

The first of the two Suites, on side 1, keeps reminding me of Dvorak at his most melodious (he wrote similar works for small string groups), though Dvorak composed many years later. The second — could it actually be the first? — seems earlier in orientation, more of the Chopin era and even Weber (another great tune writer). In two minutes, unless you are a cellist, you'll forget all about the cellos and just listen to the music.

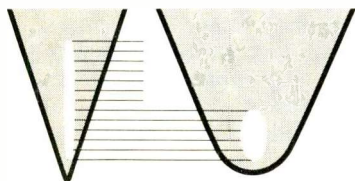
The Adcom Crosscoil XC. The finest high output moving coil cartridge yet devised.

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The Adcom Crosscoil XC/van den Hul.

Relative groove contact area (in white) van den Hul (L) vs elliptical stylus (R)



Staying on track

Anyone with even a casual knowledge of phono cartridge design recognizes that the interface between the stylus tip and the record groove is of paramount importance. For if the stylus tip is unable to accurately trace the microscopic undulations of the record groove, the result must inevitably be something less than faithful reproduction.

Obviously, the shape or contour of the stylus tip is the critical performance factor. Just how critical, may be inferred from the proliferation of stylus designs in recent years.

Ideally, the perfect stylus would have the same shape as the stylus used to cut the record master. Unfortunately, this rather obvious solution has proved to be impractical, for such a stylus tends to "recut" the groove with each play and hasten record wear.

Clearly, what is required is a modified tip shape which closely approaches that of the cutter stylus, yet avoids its potentially destructive drawbacks.

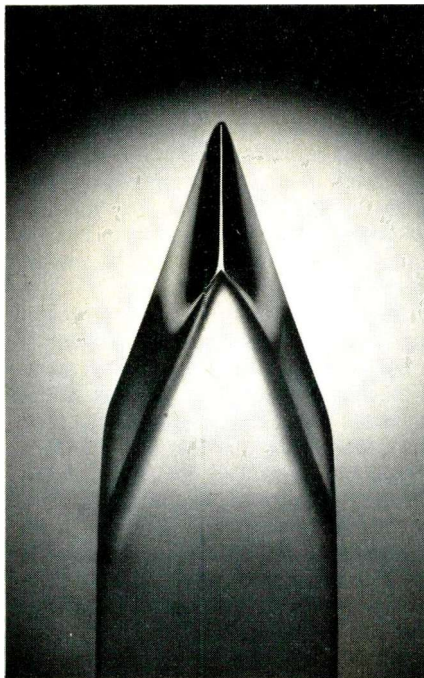
Enter the van den Hul Stylus.

Employing advanced computer optimization techniques, A.J. van den Hul, a Dutch scientist, has developed a new stylus shape that achieves this most elusive goal.

The shape of the new van den Hul stylus tip is the closest, practical approximation of the cutter yet devised. Its contact radius is only 3.5 microns (front to back), while vertical groove contact is extended to 85 microns.

As a result, the new stylus can trace frequencies as high as 85 kHz. So, reproducing 20Hz to 20 kHz signals is no problem at all.

But extended frequency response is only the beginning.



Exhaustive testing has revealed that the new van den Hul stylus materially reduces record and tip wear. And thanks to the extended vertical contact radius, records actually play more quietly with less groove deformation.

Tip mass is extremely low, achieved via a programmed grinding pattern that removes excess diamond from front and rear surfaces. An added benefit is the reduction of tracing distortion at all levels of groove modulation. Finally, a square diamond shank insures precise alignment of the tip in respect to the cantilever.

But in order to fully realize all of the performance benefits conferred by this truly innovative stylus, it must be coupled to a demonstrably superior cartridge capable of translating extraordinarily complex mechanical movement into a precise electrical analog.

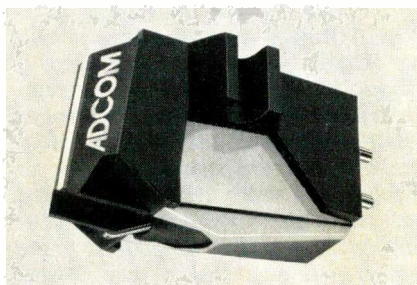
Happily, the Adcom Crosscoil XC is just such a cartridge. Experts have been unstinting in their praise, citing the Crosscoil for its extremely flat and extended frequency response, low distortion, superb dynamic range and above all its unfailing musicality.

In combination, cartridge and stylus seem to transcend their individual capabilities. A synergism that fully justifies the expression, "the ultimate cartridge."

Surely, one day someone will create a cartridge to equal it, but if you would like to experience the future now, listen to the Adcom Crosscoil XC/van den Hul. It is truly the shape of things to come.

For additional information and the name of your nearest Adcom dealer write: Adcom, 9 Jules Lane, New Brunswick, New Jersey 08901 U.S.A.

THE SHAPE OF THINGS TO COME.



THE ADCOM CROSSCOIL XC/VAN DEN HUL

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TAPE GUIDE

HERMAN BURSTEIN

Quality Control Patrol

Q. I have been having a problem with two well-known brands of cassette tape which have been jamming in my deck, yet two other well-known brands have given me no such problem. Is there such a thing as quality control any more? — Albert Brown, Brooklyn, N.Y.

A. Over a long period of years I have been hearing from time to time about combinations of components that are highly regarded individually yet don't work well together. For example, one may hear about a certain top-flight power amplifier that just doesn't work well with a certain much-acclaimed speaker (oscillation, blown fuses, etc.). Or one may hear about a tape that squeals with a certain tape deck, although it is very quiet with other decks. Perhaps you have one of these luckless combinations.

But there are other possibilities. Perhaps your cassette deck is at fault. You can check by playing the offending cassettes on other decks; hopefully your audio dealer will be cooperative in this respect. If the same cassettes still jam on other decks of your model, but don't jam on other brands and models, it would appear that it is your model line which is at fault. If they jam in all cases, it is clearly the cassettes that are at fault. If the cassettes jam only on your deck, then this is where the fault lies. And the deck should be brought in for repair or exchange — preferably exchange.

Another possibility is that you were unlucky enough to get several cassettes out of a bad batch, owing to a lapse in quality control. But since this happened with two different brands of tape, the possibility, although it still exists, becomes quite remote.

Trade-Offs

Q. I am in the market for a cassette deck. What should I take into consideration pertaining to bias and distortion? — Amos Perrine, Huntington, W. Va.

A. Of course, you want a deck with as low distortion as possible in recording and playback. In recording, distortion ties in with bias. Sometimes, in order to get extended treble response, a manufacturer may underbias excessively, resulting in too much distortion. A good deck seeks an optimum combination of low distortion and extended treble through careful choice of bias, treble

boost in recording, and recording level. Signal-to-noise ratio is also involved; thus a reduction in recording level in order to reduce distortion will also decrease signal-to-noise ratio. In view of the variety of cassette tape coating formulations, it is desirable to have considerable flexibility in choice of bias as well as record and playback equalization. Playback equalization should offer a choice between 120- μ s equalization for ferric tapes and 70- μ s equalization for chrome, ferrichrome, cobalt-modified, and metal tapes.

Alignment Line-Up

Q. Where are alignment tapes available? — Jerry Pulice, Staten Island, N.Y.

A. Test tapes of various kinds and at various prices are available from: Ampex, 401 Broadway, Redwood City, Cal. 94063; Taber Manufacturing and Engineering, 2081 Edison Ave., San Leandro, Cal. 94577; Magnetic Reference Laboratory, 999 Commercial St., Palo Alto, Cal. 94303; Nortronics, 8101 10th Avenue North, Minneapolis, Minn. 55427; Audiotex, 400 South Wyman St., Rockford, Ill. 61101; TDK Electronics Corp., 755 Eastgate Blvd., Garden City, N.Y. 11530, and Magnetic Information Systems, 415 Howe Ave., Shelton, Conn. 06484. This is not necessarily a complete list.

Un-Dolbyized

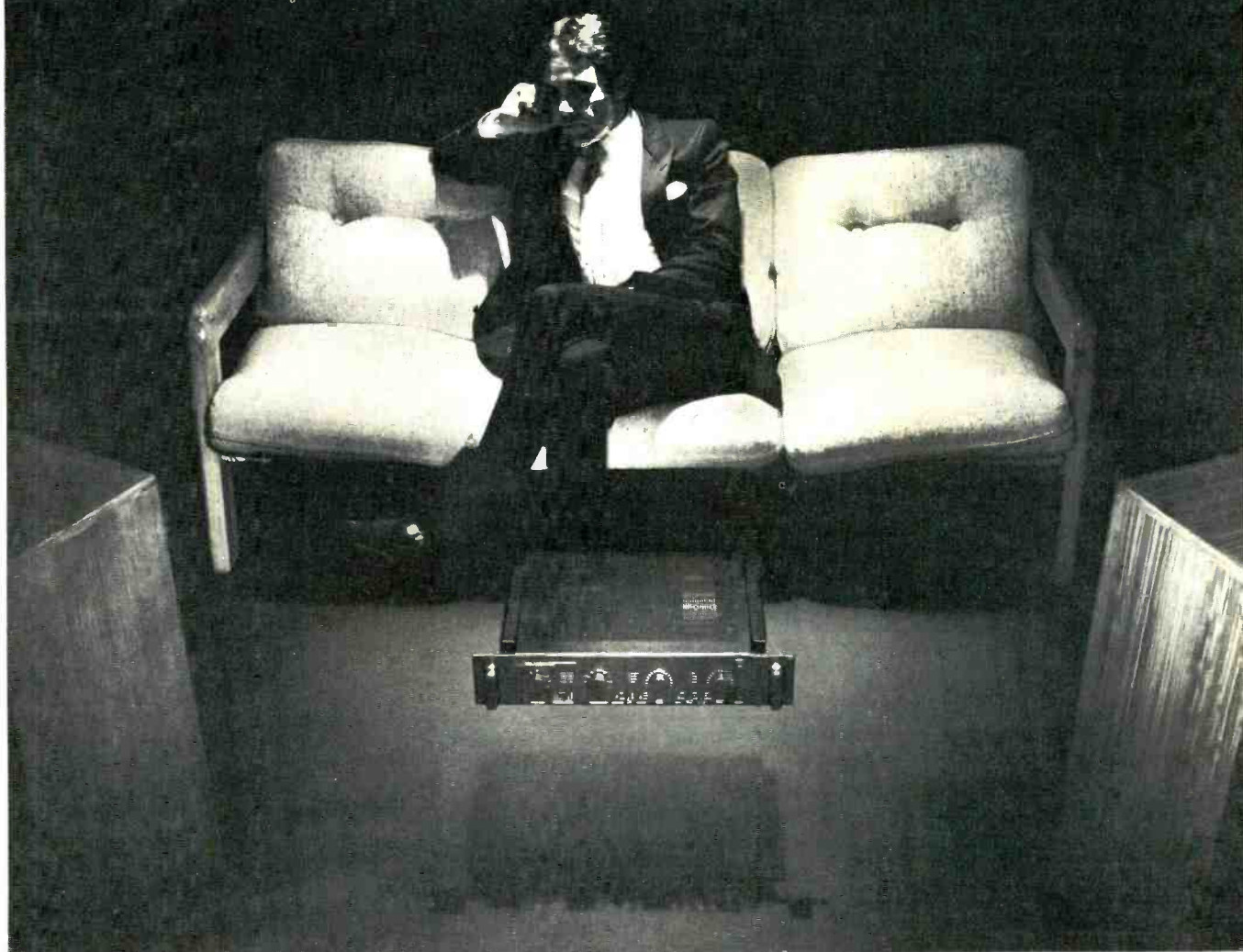
Q. If I make a cassette recording with Dolby NR on, is it harmful to play the tape back with Dolby NR off? Conversely, if I record with Dolby NR off, is it harmful to play the tape with Dolby NR on? — Richard Paul, Philadelphia, Pa.

A. I am not sure what you mean by harmful. If you refer to physical or electronic damage to your equipment, there is absolutely no harm in playing without Dolby NR a Dolby-encoded tape, or in playing with Dolby NR a tape that has not been Dolby encoded.

If you refer to frequency response, yes there is often harm. If a tape has been Dolby encoded and is played without Dolby encoding, the result is an increase in brightness, in treble response.

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.

Is it Symphony Hall ...
or your living room?



You've spent a fair amount of your hard-earned money on audio equipment. And yet, no matter where you put your speakers or how much you "process" the signal with equalizers, expanders and enhancers, the stereo in your living room continues to sound like "a stereo in your living room".

If your search for sonic realism has left you somewhat disillusioned, you might take solace in the knowledge that your brain is functioning correctly. You see, singing in the shower sounds distinctly unlike singing outdoors because the ways in which sound reflects from nearby surfaces and the varying amounts of time these reflections take to reach your ears give your brain vital clues about your acoustic environment. It is precisely this psychoacoustic principle that makes it difficult for conventional stereo to create believable sonic illusions in your living room.

And it is precisely this principle which makes the ADS 10 Acoustic Dimension Synthesizer unique. Using sophisticated digital delay technology, the ADS 10 recreates (through a pair of rear-channel speakers) the ambient sound field which surrounds the listener in any real space. No other product can so convincingly transport you from your home to the musical environment of your choice - any place from an intimate club to an awe-inspiring cathedral. And it can do so with any conventional stereo program source, not to mention older monaural recordings.

If you would like more information on what experts consider the most advanced, flexible and musical digital delay system ever made, write to ADS, Dept. AU27, or call toll free 1-800-824-7888 (California 1-800-852-7777) and ask for Operator 483. Or better yet, take your favorite records to your ADS dealer and let him demonstrate how the ADS 10 can recreate the live musical experience in your home.



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Distortion has been virtually eliminated

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Alternatively, if a tape has not been Dolby encoded but is played with Dolby decoding, the sound is dulled, a decrease in treble. On the other hand, your ear might find one effect or the other to be pleasing. For example, if your speakers are overly bright, you might find a slightly dulled sound beneficial when playing tapes that are not Dolby encoded.

Real Old Reels

Q. I have several tapes made with an old open-reel deck. Will these play back properly on a new deck? — John Etnier, South Harpswell, Maine

A. Any tape that has been properly recorded, that is with the NAB recorded induction characteristic, will play back flat on a deck that supplies the NAB playback characteristic for the speed in question.

Print-Through and Through

Q. Many of my cassette recordings have a delayed echo on side 1 — that is, a repeat of what is said, several words behind, at a very low volume but audible and annoying. When I flip to side 2, rather than an echo I hear an anticipation of what will be said — starting several words ahead. I use good tape. The problem seems worse on older tapes but is discernible on new ones as well. Can you advise what the problem may be and how to solve it? — Wendy Rickert, Boulder Creek, Cal.

A. Your problem is called print-through, wherein the signal on one layer of tape is magnetically transferred to adjacent layers. Whether you get pre-echo or post-echo depends on whether the tape is rewound before storage or left in the played condition.

Print-through tends to increase with time, approaching a limit. Print-through tends also to increase with magnitude of the signal level recorded on the tape and with decreasing thickness of the tape. Therefore, measures to minimize print-through are to avoid high recording levels and to avoid the very thin tapes, such as C-120. (There are additional reasons for avoiding the ultra-thin tapes, involving distortion, squeal, etc.) For a given type of tape and for a given recording level, some brands of tape may be less susceptible to print-through than others. Trial and error are necessary to find out which tapes are best.

To some extent, existing print-through can be reduced by shuttling the tape back and forth prior to playing. A slow shuttling at operating speed is recommended.

Because of print-through, accumulating physical stress and other reasons, it is a good idea to play a tape periodically, say every few months, rather than let it stay in storage indefinitely. **A**

Who says a "moving coil" is the best?

Compare the new choice: Moving Flux MF™

Until now, buying a phono cartridge has been a difficult decision. You could choose the superb sound — and high price tag — of a moving coil cartridge. Or you could elect the economy and adequate hi-fi performance of a moving magnet cartridge or other magnetic cartridge type. Astatic has made the decision easier.

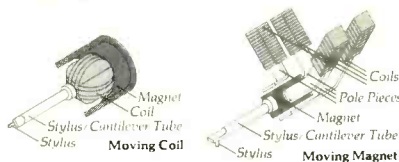
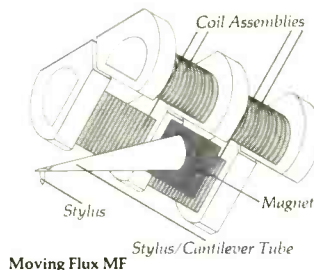
The Moving Flux MF™ cartridge.

It's a state of the art breakthrough — a newly patented* principal in phono cartridge design. The moving flux transducer combines the superb performance of moving coil designs with the economy of moving magnet cartridges. *It's a whole new choice that eliminates compromise.*

Like a moving coil...

Astatic moving flux cartridges convert stylus mechanical motion directly into electrical energy. Musical detail is more clearly reproduced than with moving magnet designs. That's because moving magnet cartridges and all other magnetic types have a built-in source of phase distortion — the iron pole pieces that transfer magnetic energy from the stylus to the output coils as output voltage. This phase distortion results from *magnetostriction* (magnetic time delay).

Dr. Heinrich George Barkhausen discovered magnetostriction over 80 years



ago. He found that iron, because of variations in size, shape, and alignment of its molecules, becomes magnetized in discrete steps rather than in a smooth linear manner.

In the pole pieces of any magnetic cartridge this nonlinearity translates into musical sound that is reproduced with distortion and less than full fidelity.

Moving flux cartridges, like the moving coil, *eliminate* magnetostriction by eliminating pole pieces. The results are audible. Sound comes through clear and undistorted, transparent and "clean" — characteristic of outstanding moving coil sound. Stereo imaging is solid and sure.

Like a moving magnet...

Astatic moving flux cartridges offer three features that make them economical. First, their high output means you don't need an expensive transformer or pre-amp to enjoy the superb sound. Their low inductance and load impedance permits proper matching to any magnetic input terminal. Second, you can replace the stylus yourself — no expensive factory rebuilding when it becomes worn.

Finally, Astatic's line of four Moving Flux cartridges are all priced competitively with moving magnet cartridges — well below the high range of moving coil units.

Who is Astatic?

The largest manufacturer of tonearms, cartridges, and styli in the USA. Astatic has been innovating and contributing to the art of cartridge design since 1930. These years of research and development have paid off in a new, no-compromise choice for the cartridge buyer.

At last, a cartridge that combines the best features of moving coil and moving magnet — without the drawbacks of either. Come hear and compare for yourself at selected hi-fi dealers throughout the country.

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magnetic cartridges.



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* U.S. Patents 4,072,823 and 4,123,067

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Station Break-In

Q. I am having a problem with r.f. interference involving connecting cords between my receiver and turntable. The receiver is one block away from the broadcast transmitter of the station causing the problem.

When in the phono mode, with cables connected, this FM station is clearly audible. When the cables are disconnected, no sound from the station is heard.

—Dan Scanlon, Detroit, Mich.

A. This kind of interference is not always readily removed. The quickest approach is to obtain the antenna from any discarded portable radio. Remove the ferrite rod, wrap all excess phono interconnecting cables around this rod, and secure the cables by tape or whatever means are at hand so that the coil will not slip off. This arrangement tends to work best at lower radio frequencies than those used to broadcast FM. It is still worth a try, however, because it is simple and does not require working on the innards of the receiver.

Another similar approach, while crude in appearance, has worked for me in similar cases, again without having to open up the equipment. Coil up all excess phono lead into as small a bundle as possible and wrap the entire bundle in aluminum foil. Ground this foil to the chassis of the receiver at one of the inputs to the phonograph.

If neither approach is successful, you will then have to work inside the receiver. First obtain ferrite beads, either from a portable AM/FM radio or a good electronics parts supplier. Slip the beads over the leads connecting the phono connector to the rest of the set. (This will be impossible in those instances where the connector is soldered directly to a p.c. board). The increased inductance provided by the ferrite beads may alone be sufficient to remove the interference.

The next possibility is to make up a "pi" filter using an Ohmmite Z144 r.f. choke and two 40-pF mica capacitors. One filter will be needed for each channel, with the choke wired in series with the phono connector and the rest of the circuitry. The capacitors are run to ground with short leads from each side of the choke. For stereo, two chokes and four capacitors are required. If connectors are soldered directly to p.c. boards, you must first cut the foils to insert the

choke. (But if you are not expert in working with p.c. boards, do not attempt this.) You may have to use somewhat higher value capacitors than those I have suggested, but I have chosen these values because they will have minimal effect on the audio performance of the system. Note that any increase in capacitance should be considered in terms of the overall capacitance your pickup must see.

It is often necessary for an equipment manufacturer to ground the phono connectors at some point in the circuit other than at the point on the chassis to which the connector is attached. While this arrangement may result in the elimination of ground loops and, hence, the reduction of a.c. hum, such a practice will result in an increase in possible r.f. interference.

To obtain good r.f. grounding and still maintain good audio performance, bypass the ground terminal of each phono connector to the chassis with a 100-pF ceramic or mica capacitor, one for each connector. Use the shortest possible leads when installing these capacitors. Lead lengths which are too long will possess inductance and reduce the efficiency of the capacitor as a bypassing agent.

It may be that this ground arrangement, in and of itself, may remove the interference without resorting to "pi" filters and the like.

Mike L. Ement's Duration

Q. Is the life expectancy of electret condenser mike elements unlimited, or do they deteriorate with age? — Tom Sherwood, Dayton, Ohio

A. Electret elements will deteriorate with time. Their output will gradually decrease. However, many years must pass before this becomes apparent. I have owned these microphones for more than 10 years and have not noticed any deterioration.

Cartridge Types

Q. What is the difference between a strain-gauge cartridge and a moving-coil cartridge? — David Schermerhorn, Allentown, Pa.

A. A moving-coil cartridge is one in which the stylus moves a coil to which it is attached. This coil is in the presence

of the field of a permanent magnet. The motion of the coil with respect to the magnetic field causes a voltage to develop, and this voltage is then amplified and equalized so that we hear a properly reproduced signal.

A strain-gauge cartridge is quite different. Here the stylus is attached to a semiconductor material which has the property of changing d.c. resistance in proportion to the amount of deflection, or bending, of the element. The resistance change will be proportional to the instantaneous position of the element, as moved by the stylus.

Connecting a strain-gauge cartridge directly to the input of a preamplifier does not produce any signal. The change of d.c. resistance, in and of itself, does not result in a voltage across the terminals of the cartridge so the preamplifier has nothing to amplify. To make such a cartridge produce meaningful output, it is necessary to apply a small d.c. voltage across this variable resistance element. The amount of voltage developed across the resistance will vary according to the instantaneous value of resistance. We now have a voltage which varies in accordance with the modulation impressed on the grooves, which is exactly what is required as the end product of any phono cartridge.

Again, as with a moving-coil cartridge, the voltage is small and must be amplified. Such a cartridge, however, requires less equalization to correct for the pre-emphasis placed on the discs being played.

This discussion of the operation of a strain-gauge cartridge is, of necessity, oversimplified; it does not account for necessary compensation for linearity of output voltage to instantaneous stylus position. It also does not account for the inability to change phase by merely reversing connections to terminal plugs, etc. We hope, however, that it gives you a basic feel for the nature of such a cartridge. When all of its particular eccentricities are taken into account, a strain-gauge cartridge is capable of incredibly wide-range, transparent reproduction. Δ

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.

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THE BOOKSHELF



No One Here Gets Out Alive by Danny Sugerman and Jerry Hopkins. Warner Books 97-133, \$7.95.

Having read this book after being besieged by its negative reviews, we expected the worst: Cheap sensationalism from cover to cover, at least a sexual episode per page, and nonstop glorification of drugs. In actuality there is relatively little of this compared to the abundance of other sorts of moral abandon in the life of Jim Morrison, the subject of this book. Though not intimate acquaintances of Mr. Lizard King, we would guess that it's a reasonably accurate portrayal of the lead singer of The Doors.

The rock biography, as a form, is fairly similar to its Hollywood counterpart,

since as a rule both reading audiences want to peek through every keyhole, know about every wrinkle in the subject's personality, and drag every skeleton out of the closet. With Morrison, this is a difficult task as there is an ongoing battle between the Morrison Estate (controlled by his parents, who were totally ashamed of their son's behavior) and those who wish to preserve the Morrison legacy (such as the authors). There are legal reasons why Morrison's poetry must stay in the vaults, and with the Morrison family adamant about not doing interviews, one can imagine that the information divulged about Jimbo's childhood must have been near impossible to uncover. Still, one can easily get a feel for the atmosphere which helped nurture the seething rock/blues poet who earned his living as a singer but became a greater figure after his death, despite the success he had in the singles market while still kicking.

The Morrison Mythology is well-preserved in *No One Here Gets Out Alive*. Although the veneer of mock callousness is only occasionally pierced, one can only read between the lines and sometimes get glimpses at the man behind the mask — but at best these are only guesses. And as for whether Jim Morrison is (as legend has it) still alive and living a secretive existence, the authors cast serious doubts on such stories, yet in the final analysis they don't dismiss the possibility completely.

For those interested in the subject, there is more than enough meat in *No One Here Gets Out Alive* to liven the taste buds. But the nature of the food-stuff is to keep one always . . . hungry for more.

Jon & Sally Tiven

IEEE Standard Dictionary of Electrical & Electronic Terms, 2nd Edition, Std. 100-1977. IEEE and Wiley Interscience, 882 pp., \$37.50 (\$33.75 to IEEE members).

This dictionary covers a wide range of topics with such categories as automatic train control, medical electronics, and rotating machinery among those included. It should be understood that this is a "Standard" dictionary, since the terms and definitions contained are those that have been used by IEEE in a specific standard. Thereby, the definition is standardized for all who wish or need to follow IEEE practice. The bulk of the new definitions are from standards published between 1968 and 1977. Most definitions from the first (1972) edition have been reaffirmed and included because of their continuing usefulness.

The terms are not necessarily in agreement with popular usage, and there are many recently coined words that do not appear, hologram, field-effect transistor, etc. It is a little frustrating not to find such items of interest, but they'll have to wait standardization — and the next edition. There are 20,254 entries, and, if you want the standard definition, this is it. Howard A. Roberson

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Eyebrow,
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Dolby C and Nakamichi The Perfect Combination

Nakamichi Spoken Here.

No question about it. Dolby C is a remarkable noise-reduction system. With 10-dB greater quieting than Dolby B, tape noise is inaudible. And, unlike straight companders, Dolby C doesn't "pump" or "breathe." But you don't get something for nothing! Dolby C demands exceptional performance from the cassette recorder. Even Dolby Laboratories states that "taking full advantage of the noise reduction effect of the Dolby C system requires high mechanical and electrical performance from the recorder incorporating it, including very low noise in the circuitry which surrounds the noise reduction processor."

To achieve its superior quieting, Dolby C uses more compression during recording and more expansion in playback. If recorder response and tracking are excellent, the compensation is perfect. But every frequency-response error in the recorder is magnified more by Dolby C than by Dolby B. The result? Audible coloration! Mistracking error alters tonal balance and upsets the delicate relationship between fundamental and harmonics. The result? A change in timbre!

While many cassette decks will feature Dolby C, Nakamichi recorders are renowned for the superior headroom and inherently smooth, wideband, 20-20,000 Hz response needed to recreate the total sound experience—a response free from low-frequency contour effect, mid-frequency sag and high-frequency rolloff—the response demanded by Dolby C to achieve its full potential without audible coloration.

New for Nakamichi? Hardly! We have always demanded such perfection from our recorders—perfection that defies obsolescence. So, with utmost confidence, we offer the NR-100 Dolby-C system designed for our most recently introduced models and the NR-200 Dolby B/C processor for use with other Nakamichi decks. For our new customers, we have a completely revised line of recorders with built-in Dolby B/C and advanced electronic metering. See them now at your Nakamichi dealer.



To learn more about Nakamichi's unique technology, write directly to:
Nakamichi U.S.A. Corporation, 1101 Colorado Avenue, Santa Monica, CA 90401.

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Audio Research Preamplifier

The SP-6B preamplifier from Audio Research utilizes hybrid technology; its solid-state power supplies are coupled with vacuum tubes in the amplification stages. Features include a rear-panel gain "range" switch to better match components and a two-minute warm-up timer that automatically mutes output

during circuit stabilization. Frequency response for the magnetic phono section is said to be from 30 Hz to 40 kHz, ± 0.25 dB, and for the high-level section from 5 Hz to 30 kHz, ± 0.25 dB. Specified harmonic distortion is less than 0.01 percent at 2 V rms, 20 Hz to 20 kHz, and IM distortion is less than 0.002 percent for the same output. Price: \$1,495.00.

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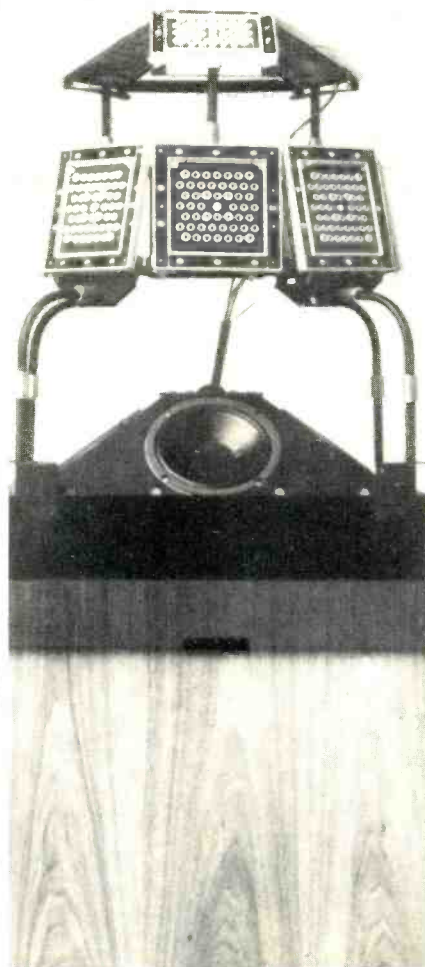


Audio Research Power Amplifier

Audio Research's Model D-120 is a solid-state linear power amplifier incorporating their proprietary "Analog Module" design circuitry. Newly available output devices, 10 times more linear than the standard bipolar transistor, are exactly matched for maximum linearity and coupled to an 80-joule power storage supply which allows the amplifier to remain stable under any normal operating load. High linearity allows for re-

duced levels of corrective feedback, and bias currents can operate at a higher level, bringing the amplifier closer to Class-A operation. Power output is 120 watts per channel, both channels driven into 8 ohms, with less than 0.25 percent THD from 10 Hz to 20 kHz; bridged mono output is 400 watts. IM distortion is less than 0.035 percent at rated output, slew rate is 80 V/ μ S, rise time is 2 μ S, and the damping factor is 300 (10 Hz to 20 kHz). Price: \$1,795.00.

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Cosmos Industries Loudspeaker

The Cosmostatic omnidirectional electrostatic system has a self-contained 1,200-watt amplifier on the rear of each speaker to drive eleven 6 x 6-inch electrostatic panels above 1 kHz. Below 1 kHz, the main amp drives four 6-inch woofers back-loaded into a cabinet that has two chambers of unequal volume. The chambers are vented to each other, and each terminates into a 10-inch passive radiator. A 1.6-inch dome is used to provide a smooth transfer from the woofers to the ES system at 1 kHz. This array combines to produce a specified flat response from 50 Hz to 20 kHz. Price: \$3,600.00 per pair.

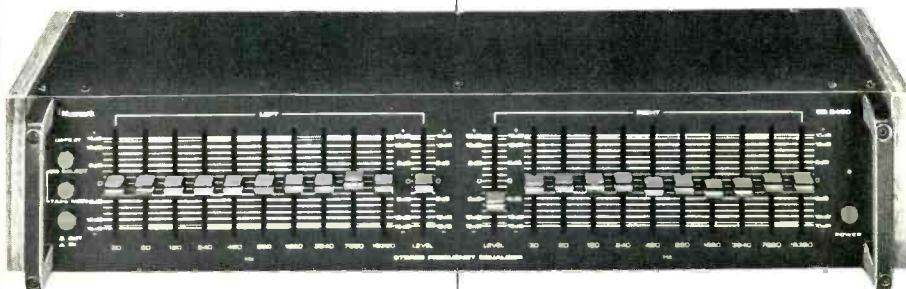
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Jensen Loudspeaker

The System 500 is a three-way acoustic suspension design with separate midrange and tweeter controls. The 1-inch soft dome tweeter works in conjunction with a 2-inch rear-firing direct radiator to produce a more uniform pattern of high-frequency energy. A 5-inch cone midrange and 12-inch acoustic suspension woofer form the remainder of the vertically aligned speaker complement. Crossover points are at 760 Hz and 4.2 kHz, frequency response is said to be from 38 Hz to 20 kHz, ± 3 dB, claimed SPL is 90 dB (1 watt/1 meter), and recommended minimum amplifier power is 10 watts. Price: \$290.00.

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Numark Equalizer

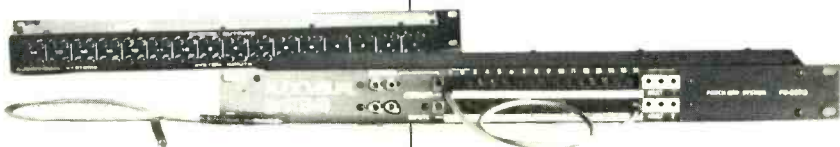
The Numark EQ2400 graphic equalizer is intended for the home recordist and to improve the sound of stereo components. Each of the 20 linear sliding controls, calibrated with ± 15 dB boost or cut, is said to have true octave spacing. Frequency response is claimed to be 10 Hz to 100 kHz, ± 1 dB, with THD less than 0.01 percent and IM distortion less than 0.02 percent. Price: \$199.00.

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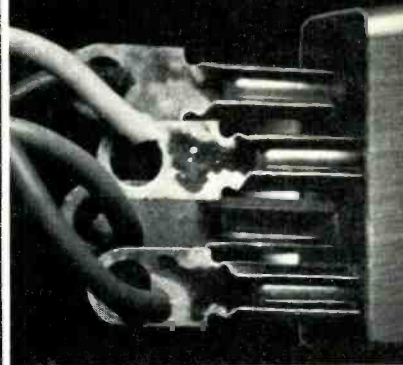
Audiovisual Systems Programmable Patch Bay

The PB-289G patch bay can serve as the "nerve center" for stereo audio and/or video components, allowing them to function separately or together and permitting A/B comparisons for component evaluation. For normal operation, no patch cords are needed; an internal switch array allows the user to establish a basic signal path. Insertion of one or two patch cords then allows components to be added or rearranged as desired. Access to all possible 16 phono jack inputs and 16 phono jack outputs is made via the front panel of this rack-mountable unit, and designation strips are provided to clearly label all points of connection. Price: \$650.00.

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Noise and Distortion. Start Here



Poor connections cause problems at phono cartridge pins, tone arm connectors, speaker terminals and wherever there are jacks & plugs.

Air contains corrosive elements such as sulfur dioxide, chlorine gasses and salts that coat metal connections with non-conducting films causing noise & distortion.

The Cramolin Audio Kit will improve sound definition even in the finest electronic equipment.

An application of Cramolin CR-10 dissolves metallic oxide films that increase connection resistance.

Then CR-20 forms a long lasting molecular layer protecting metal from atmospheric contaminants.

Cramolin[®] Audio Kit

Used for years by the US Military and professionals who demand the best. Safe to use and acid free; it is effective on all metals, including gold.

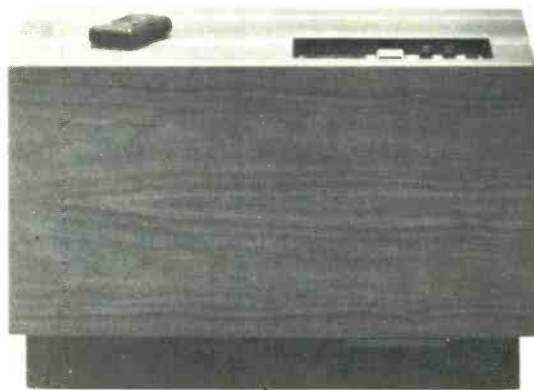
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WHAT'S NEW IN VIDEO



Kloss Video Projection System

The Novabeam is a two-piece high-luminescence projection video system with a 6½-foot diagonal screen. Its receiver-projector console offers remote control and may also serve as a coffee table. Price: \$3,150.00.

Enter No. 110 on Reader Service Card



Lectrotech Video Stabilizer

Model VS-2020 video stabilizer is used in conjunction with either a Beta or VHS videocassette recorder to eliminate vertical sync-related problems such as roll, jitter, and blackout. The unit is packaged in a 1½ x 3 x 6 inch aluminum case. Price: \$129.50.

Enter No. 111 on Reader Service Card



**Radio Shack
TV Tuner**

The Realistic TV-20 VHF high-fidelity television tuner is designed to provide a wide-range, low distortion source of TV sound for playback through an audio system and for tape recording. The unit features output level control to match its output with other signal sources, a fine tuning knob to permit precise channel tuning, an IC i.f. stage, two types of antenna input jacks to match 300- or 75-ohm lead-ins, and an LED power indicator. Specified S/N is 60 dB, with distortion of less than 0.5 percent. Price: \$79.95.

Enter No. 112 on Reader Service Card



**Apres Audio
Components Cart**

Le Cart is a mobile storage vehicle on casters that holds a television, video and/or audio components, tapes, and accessories. Available in either natural or walnut oak, each cart features solid oak

railing, brass accents, and three brown formica shelves. Overall dimensions are 31 inches wide, 20 inches deep, and 34 inches high (including casters). Price: \$200.00.

Enter No. 114 on Reader Service Card

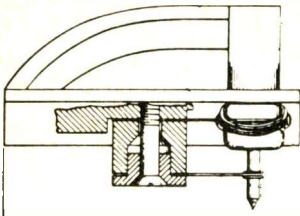


Akai Film Adaptor

The VLC-V9 Tele-Cine Adaptor transfers film and slides to video to allow users to create their own video movies. Material shown by a film or slide projector is directed through a vertical fresnel lens and reflected by a mirror into a video camera. The information is transferred immediately to a videocassette and is then ready for viewing. By using the transfer device, movies can be edited and segments placed in any desired order. Price: \$89.95.

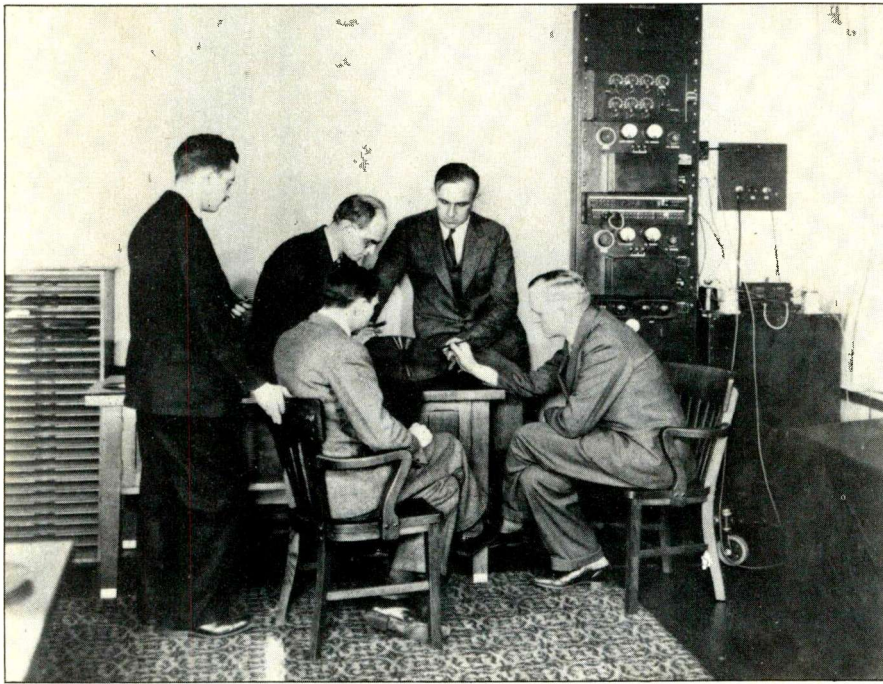
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THE ROOTS OF HIGH FIDELITY SOUND

BERT WHYTE



The Bell Labs group that developed high-fidelity recorded sound are shown circa 1930. From the left, they are: P. B. Flanders, J. P. Maxfield, D. G. Blattner (seated), A. C. Keller, and H. C. Harrison (seated).

The year is 1933, and President Franklin D. Roosevelt is trying to cope with the Great Depression. Those who are lucky enough to hold house and hearth together oftentimes attempt to relieve the tensions of the day by playing phonograph records. Their 12-inch records revolve at 78 rpm and are made of a shellac-based compound with an abrasive asphaltic filler that will grind the steel playback needle to the contour of the record grooves. This naturally produces noise. The phonograph pickup is a mechanical/acoustical transducer, and the steel needle linked to the

transducer tracks the record with about 5 to 7 ounces of force. At best, the frequency response of the record and playback system extends from about 150 to 3,000 cycles. The sound is noisy, nasal, and constricted.

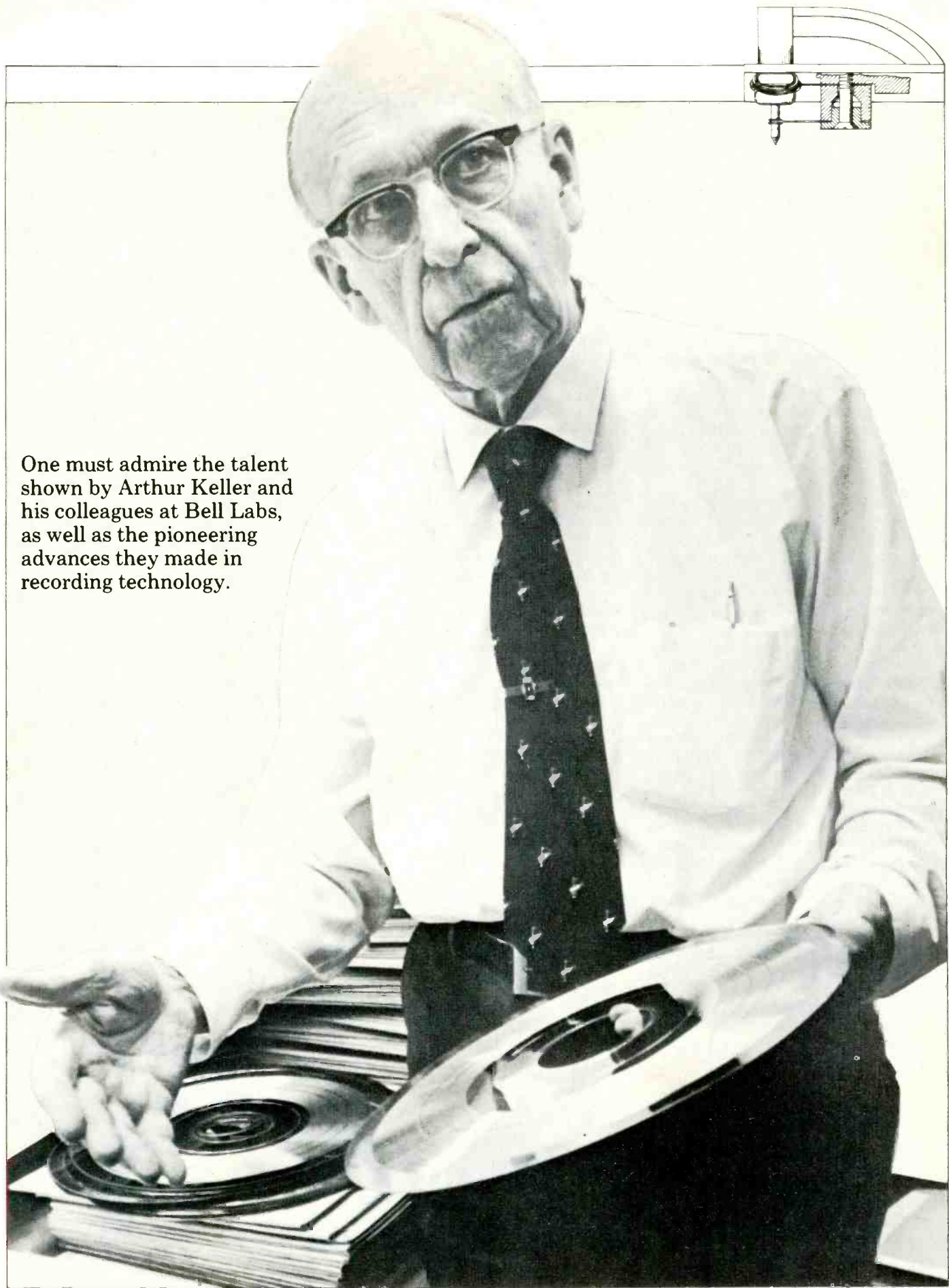
At the same time in a laboratory in Murray Hill, New Jersey, other people are playing phonograph records. Their 12-inch discs revolve at 33 1/3 rpm. The records are made of a plastic and have quiet playback surfaces, which are tracked by a magnetic moving-coil phono cartridge at a force of 2 grams. A vacuum-tube amplifier magnifies the tiny

electrical signal coming from the pickup manifold and feeds it into a loudspeaker with a multi-cellular horn tweeter and 15-inch woofer. The full-bodied sound extends from 40 to 12,000 cycles, and the music of the Philadelphia Orchestra conducted by Leopold Stokowski sounds just great. In another part of the laboratory, another record is being played and its output is fed to two amplifiers and two of the big loudspeakers, because the playback is in stereophonic sound.

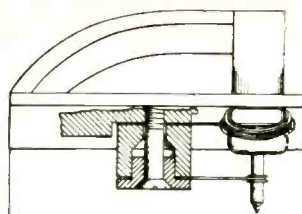
How can this be? Have we stumbled across a secret laboratory run by creatures from outer space? Not at all. The laboratory is operated by mortal men under the benevolent embrace of the Bell Telephone Company.

The hi-fi or audio industry as we know it today is generally considered to have come into being about 1948. At that time, much of the so-called hi-fi equipment was derived from broadcast and motion picture technology and was sold mainly in radio and electronics parts stores. However, a limited number of such items as phono cartridges, amplifiers, and loudspeakers were specifically developed for the hi-fi nuts and their fledgling market. It must be remembered that 1948 was still the era of monophonic sound, 78-rpm shellac records, and 5- to 10-watt amplifiers. It was pretty primitive stuff, especially considering the equipment Bell Labs had developed 15 years earlier. The story of the Bell Telephone Laboratories research that led to the first high-fidelity sound and the people who developed it is truly fascinating.

Bell Labs was in a uniquely favorable position to undertake basic research in speech, hearing, music, and acoustics. The underlying thrust for all this activity was the improvement of the quality of telephone sound and its transmission.



One must admire the talent shown by Arthur Keller and his colleagues at Bell Labs, as well as the pioneering advances they made in recording technology.



Considerable progress had been made in these areas during the 1920s. Bell Labs had always been interested in disc recording and reproduction, especially of speech, and felt this was a valuable adjunct in their ongoing development of telephone sound quality. The recording of music presented similar problems to the recording of speech, especially with respect to frequency response, dynamic range, and distortion content. As far back as 1916, the Western Electric Engineering Laboratory (the precursor of Bell Labs) had indicated that research directed to the improvement of disc recording and reproduction of music would be worthwhile.

It must be remembered that during the '20s, '30s and '40s the Bell System was a vastly successful commercial enterprise. Bell Labs had enormous technical and financial resources and attracted many brilliant scientists to its roster. Distinguished Bell Labs personnel included such men as Dr. Harvey Fletcher (the same man who worked out the Fletcher-Munson loudness compensation curves); Joseph P. Maxfield and Henry Harrison, co-developers of electrical recording, and Arthur C. Keller, a truly prolific inventor and altogether remarkable man who invented the moving-coil phonograph cartridge, the first stereophonic system, gold sputtering for plating record masters, and, with colleague Ira Rafuse, the single-groove 45/45 stereo record. He also was the engineer in charge of recording Stokowski and the Philadelphia Orchestra during their famous 1931-32 collaboration with Bell Labs.

It is safe to say that the intensive efforts and unstinting financial support Bell Labs lavished on its research to improve disc recording and reproduction were then without parallel and are unlikely to be equalled, let alone surpassed, in the foreseeable future by any single organization. The first major advance in record-

ing technology resulting from this research at Bell Labs was the introduction of electrical recording in 1925. Up to this time all recording was accomplished by acoustical methods. Readers will be familiar with photographic scenes from those days, showing musicians clustered closely together right in front of the large megaphone or recording horn. This method depended on the power of the sound waves alone to activate a diaphragm (usually made of mica) which in turn would drive a cutting stylus to inscribe grooves on a rotating thick wax recording blank. So little power was generated by the sound waves that many of the harmonics, even those within the frequency range of the system, were not recorded at all. Similarly, there was no dynamic range, since everything had to be recorded at maximum loudness simply to activate the cutting stylus.

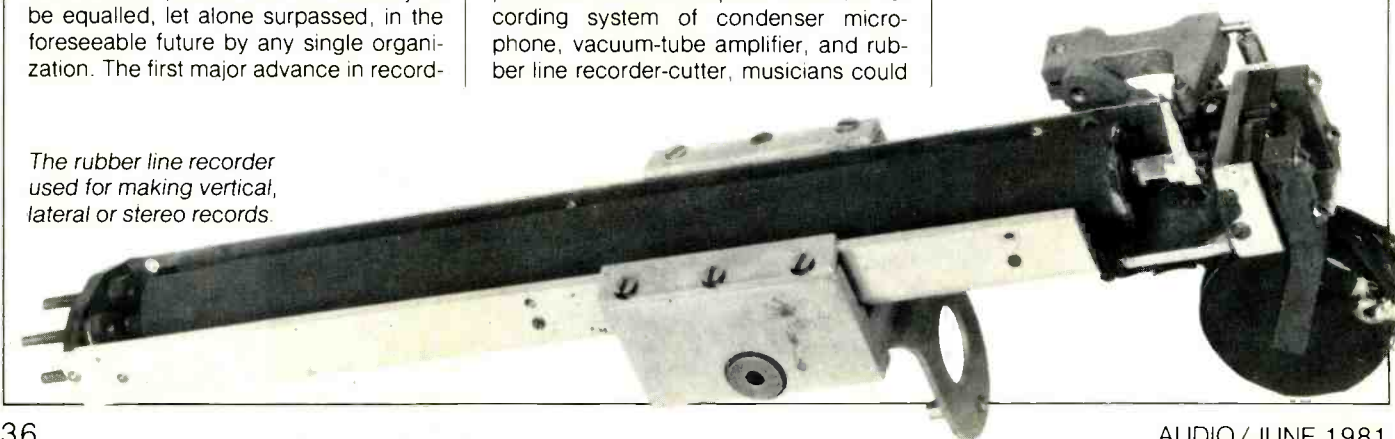
Bell Labs gave the task of developing electrical recording to Joseph P. Maxfield and Henry Harrison. Their colleague E.C. Wenthe had developed the first condenser microphone which had sufficient sensitivity and frequency response to transform the incident sound wave energy to electrical signals. Maxfield used a vacuum-tube amplifier to boost the microphone output to levels high enough to engrave a wax disc. Henry Harrison's contribution was an electromagnetic recording cutter which combined an armature, cutting stylus, connecting shafts, and a rubber transmission line as elements of an electromechanical network. He had based his "rubber line" recorder on the then well-known electrical transmission theory and the mechanical analogs of resistance, capacitance, inductance, etc. pertinent to the theory. With the Harrison recording cutter, a frequency response of 50 to 6,500 cycles was possible. With a complete electrical recording system of condenser microphone, vacuum-tube amplifier, and rubber line recorder-cutter, musicians could

be recorded in their usual on-stage performing locations. This made possible for the first time the pickup of reverberant energy as well as providing some dynamic range.

An interesting offshoot of Maxfield's work on electrical recording was his mathematical analysis of the best record speed for maximum playing time on a record of given diameter at a specific cutting pitch and groove velocity. This was done in connection with Vitaphone sound motion pictures, a process introduced in 1926 which used a disc recording synchronized with the film. Maxfield determined that a 16-inch disc revolving at 33 1/3 rpm would give sufficient playing time for a standard 1,000-foot reel of movie film. According to Maxfield's analysis, 33 1/3 rpm is not the ideal speed for 12-inch disc recordings, and its use in recordings of that diameter, then and now, is just a carry-over from the Vitaphone process. Apparently, 45 rpm is a more suitable speed for records of 12-inch diameter. There are presently a number of audiophile 12-inch 45-rpm recordings, and their makers claim that the higher speed (as compared to the normal 33 1/3 rpm) affords higher frequency range and improved transient response. This is, however, accompanied by a reduction in playing time. Recently, the Nimbus Record Company in England claimed it has a process which will allow 45-rpm records of 22 to 24 minutes duration on "average program material," while maintaining normal recording levels and bass response.

By 1930, Henry Harrison's rubber line recorder-cutter had been modified to allow a frequency range of 30 to 12,000 cycles. It could make lateral or vertical "hill and dale" cut records, and later on

The rubber line recorder used for making vertical, lateral or stereo records.



Dolby® C-type Noise Reduction

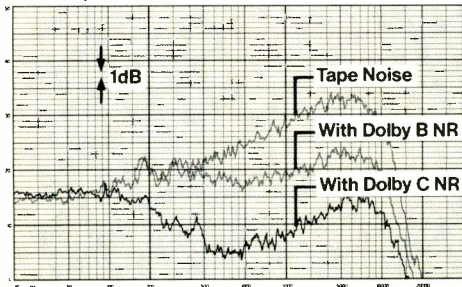


Figure 1: Noise from biased cassette tape (70 μ s equalization), measured with a constant-bandwidth wave analyzer, and weighted (CCIR/ARM) to reflect the ear's sensitivity to noise and to noise reduction effects.

What Dolby C-type NR is

Dolby C is a new noise reduction system developed by Dolby Laboratories for consumer tape recording. It provides 20 dB of noise reduction above about 1 kHz, compared to the standard Dolby B-type system's 10 dB of noise reduction above about 4 kHz. Like the original system, the new Dolby C-type system operates without side effects on virtually all kinds of program material. It does not replace the standard Dolby B system, but will supplement it in a number of new high-performance cassette decks appearing in 1981.

How Dolby C-works: dual-level processing

In some respects, Dolby C-type noise reduction operates like Dolby B. When a recording is made, the middle and higher frequencies of low-level signals are selectively boosted, while loud signals are essentially untouched. On playback, the previously-boosted signals are attenuated

to where they were in the original program material, thus restoring proper musical balance while simultaneously effecting noise reduction. With Dolby C, signals are boosted and attenuated more than with Dolby B. In addition, Dolby C operates down to a lower frequency to maintain subjectively uniform noise reduction across the audible range.

Dolby C-type noise reduction is based upon a new and unique dual-level processing scheme. Two sliding-band processors operate in tandem at different levels to solve the problem of achieving 20 dB of compression and expansion without introducing undesirable side effects. Dolby C also incorporates several other new developments which reduce the effects of high-frequency tape saturation and minimize encode-decode errors, so that the new system puts no special demands on the user and requires no special recorder adjustments.

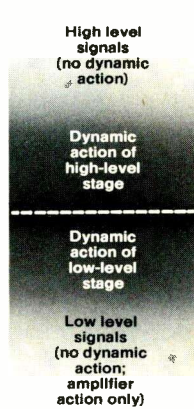


Figure 2: Dolby C-type noise reduction features dual-level processing, whereby two sliding-band processors operate in tandem at different levels. Like Dolby B, companding action is restricted to part of the dynamic range, above which there is essentially no action, and below which the system acts as a fixed-gain amplifier. Minimizing the system's dynamic action minimizes the possibility of side-effects on the signal being recorded.

Dolby C-type noise reduction has been designed so that recorders incorporating it can also provide the Dolby B characteristic at the push of a switch. This means that existing cassette recordings encoded with Dolby B-type noise reduction will be properly reproduced on the new models featuring Dolby C. In addition, most listeners are likely to find that Dolby C recordings are enjoyable on machines equipped only with Dolby B, or on portable and automobile players without any noise reduction circuitry.

Availability

The following manufacturers have announced plans to develop products incorporating Dolby C-type noise reduction:

Advent	Nakamichi
Aiwa	NNEC
Akai	Olympus
Alpine Electronics	Pioneer
BASF	Sansui
Chunilsa	Sanyo
Crown (Japan)	H. H. Scott
Denon (Nippon Columbia)	Shinwa
Dual	Silver (Shin-Shirasuna)
Hitachi	Sony
JVC (Victor)	TEAC
Lux	Vector Research
Marantz	Yamaha (Nippon Gakki)
Mitsubishi	
NAD	

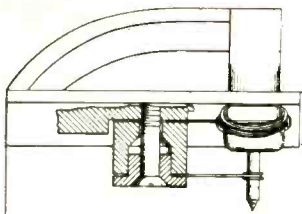
What Dolby C means to cassette recording

Combined with good tape formulations and a well-engineered cassette deck, Dolby C reduces tape noise to a level below the noise of virtually any program source available now or likely to be available in the foreseeable future. In fact, even at high listening levels, tape noise is lower than the ambient noise in many listening rooms. Thus for all intents and purposes, with Dolby C-type noise reduction, tape noise in cassette recording will no longer be of any practical consequence.



Dolby Laboratories Licensing Corp.,
731 Sansome St., San Francisco, CA 94111,
Telephone (415) 392-0300. Telex 34409.

"Dolby" and the double-D symbol are the registered trademarks of Dolby Laboratories for its A-type, B-type, and C-type noise reduction systems. S81/3122/3136



single groove stereo records of both the vertical-lateral combination and 45/45 variety were possible. Around 1928, Arthur Keller was experimenting with a two-band disc-recording system he had invented, and this ultimately led to two-band concentric groove stereo records. In his experiments, Keller showed that maximum distortion in a record was caused by intermodulation between high and low frequencies, rather than by harmonic distortion of single tones. Using a crossover frequency of 1,000 cycles, Keller split the frequency band so that the relatively high-energy low frequencies were recorded on the inner portion of the disc, while the low-energy high frequencies were recorded on the outer portion of the disc. The two concentric bands of the vertically cut disc were played by twin pickup cartridges which, when combined electrically, gave considerably less distortion and a distinct improvement in quality as compared to conventionally cut discs. With the two concentric-band concept, stereo experimentation was obvious and inevitable.

The Roxy in New York was a very large theater and a major showcase for top films. It also had a stage show and boasted "a symphony orchestra of 80 men" under the direction of Erno Rapee. This orchestra regularly scheduled such musical chestnuts as Ravel's "Bolero," Rimsky-Korsakov's "Capriccio Espagnol," Tchaikovsky's "March Slav," and other works of similar distinction. Bell Labs arranged to have two of their famous 640-AA calibration condenser microphones permanently hung over the orchestra pit, and two equalized telephone lines run to the Bell laboratories in Murray Hill, New Jersey. When the Roxy symphony was performing, all Keller had to do was flip a switch and . . . voila! Instant Stereo! He made quite a few concentric-band stereo recordings but recognized, of course, that this format reduced the amount of recording time. (Many readers will no doubt recall the two-band binaural recordings issued by Emory Cook in the early 1950s. They were played back with a Livingston arm equipped with twin cartridges spaced so that they could play the concentric bands simultaneously. Synchronizing the cartridges was irksome, and there was the problem of different groove velocities in the outer and inner bands.) The Roxy Theater has long since been a



The gold-sputtering machine invented by Arthur Keller.

victim of the wrecker's ball, but I understand some of the recordings still exist, and perhaps some day Bell Labs will make it possible to hear them.

After the experiments with two-band concentric recording of both the split-frequency monophonic and the stereo variety, Arthur Keller invented a multiplex single-stylus recording system which permitted two or more channels of sound in a single groove. However, with the recorder-cutter of the time, there was not sufficient bandwidth to provide two channels of wide frequency range sound. Keller therefore decided to use a two-band system which used a vertical cut for one channel and a lateral cut for the other channel. One of the recorder-

cutters was modified for this purpose to minimize cross-modulation between channels, and quite a number of stereo recordings were made during the early 1930s. (It is interesting to note that years later, in 1956, I met Arthur Haddy of Decca in New York and he demonstrated some similar vertical-lateral stereo recordings for me.) While these vertical-lateral stereo recordings had adequate separation between channels, Keller felt that distortion differences in the two channels were objectionable. To overcome this and other problems, Keller and his colleague Ira Rafuse invented the 45/45 stereo recording system which is in current use. This plain statement of fact requires some explanation.

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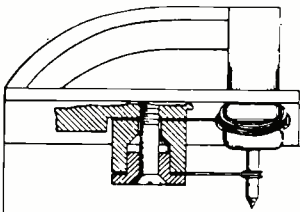
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First of all, I am happy to note that Arthur Keller is still very much alive, quite hale and hearty in his 81st year. I have had the pleasure of meeting with him and discussing many aspects of his research at Bell Labs. In respect to the invention of the 45/45 stereo system, Keller notes that he and Rafuse had completed their work on this project in 1932 and had submitted patent applications through Bell Labs. For some reason, the patents were not filed until June of 1936, and eventually U.S. Patent #2,114,471 was issued to Keller and Rafuse on April 18, 1938. As is fairly common knowledge, Alan Blumlein of England is generally credited with the invention of the 45/45 stereo disc system in 1933. So who was first is a moot point, but in any case both parties invented essentially the same device. Several excerpts from the Keller-Rafuse patent are pertinent to a general idea of the 45/45 stereo system:

"In accordance with the general features of the invention, the two recordings are formed by a single stylus which vibrates in two planes at an angle to each other and at equal angles to its own axis and to the surface of the record. In the preferred embodiment the planes of vibration are normal to each other and at 45 degrees to the surface of the record. The recorder may consist of two suitable recorder units of any known type connected by suitable linkages to the common stylus, and the reproducer also preferably has two generating elements each responsive to undulations in only one of the groove walls so that the two records may be reproduced separately without using external networks.

"Since the recordings are disposed at the same angle to the record surface, quality differences may be substantially eliminated, and for this reason the invention is particularly useful in stereophonic reproducing systems.

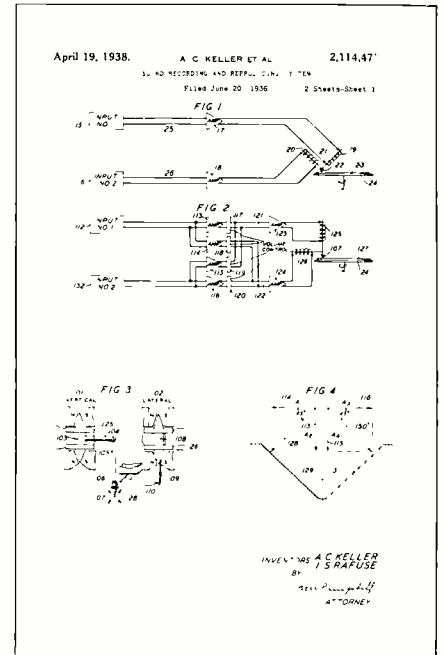
"While the principal advantage of this invention over the combination hill-and-dale/lateral system is its ability to give two reproductions of identical quality as required in certain applications such as stereophonic reproduction, the invention may be used in various other ways. For example, one of the recording units may be used to make a record in which the volume range is compressed and the other unit may cut a control record to effect a complementary expansion in the volume range during reproduction.

"Since the two recordings have vertical components in common, surface noise in reproduction can be materially reduced by cutting a sound record in only one of the recording planes and feeding back in reverse phase the output of the reproducer unit which is driven in the other plane into the circuit of the reproducer unit which is reproducing the recorded sounds."

This rather astonishing proposed alternate use of the 45/45 stereo system could have been the precursor of a present day disc noise-reduction system.

With the advances in disc-cutting technology at Bell Labs came the need for records with quieter surfaces. Thus, shellac records with their noisy built-in abrasives were abandoned. In the early 1930s clear cellulose acetate without abrasives was tried for records. The acetate proved to be considerably quieter than shellac, but it was a hygroscopic material and in conditions of high humidity absorbed moisture differentially and caused warpage. Bell Labs personnel determined that the usual processing of the wax masters contributed noise. The practice at the time was to make the wax electrically conductive by rubbing the surface with finely divided graphite. Fine as it was, there still was enough gross particulate graphite to cause noise.

Once again, it was Arthur Keller to the rescue with his invention of the gold-sputtering record-coating apparatus. There had been previous attempts at sputtering, but they were unsatisfactory. Keller's device was essentially a chamber in which a high vacuum could be created, a holder for the wax master, and a spiral grid of electrodes covered with gold. The electrodes were attached to a transformer which would step up the a.c. to a high voltage, and the spiral grid was placed approximately an inch above the wax master surface. The secret of Keller's success with this process was that when the high voltage was applied, the cathodic particles of gold were evenly deposited on the recorded wax surface because of the spiral configuration of the electrodes. In this manner, a molecular film of gold was plated on the wax master, and, in turn, the gold was heavily copperplated by conventional electroplating. With this process at hand, Keller devised a new method of preparing wax masters. The standard practice was to use a cake of wax, approximately



Schematic of the 45/45 stereo system patented by Arthur Keller and Ira Rafuse.

two inches thick, for recording the masters. If a mistake was made in recording, the modulated surface of the wax was "shaved" with an agate knife, thus presenting a new surface. This shaving did not produce a plane surface which was flat enough to suit Keller, so he made up metal plate molds with a 1/4-inch lip and into these he flowed wax to create a super-smooth surface. (In conversations, Keller told me the "wax" was a mixture of wax and several other compounds, more closely resembling a hard soap than a wax in the usual sense.) Once these wax masters had been gold-sputtered and copperplated, live steam and caustic soda were used to remove the wax and clean the grooves, revealing the bright gold surface of the negative master. Bell Labs generally did not process these discs any further, but used them directly to produce records. One day, representatives of Union Carbide showed up with a new plastic they called Vinylite and suggested it would be good for molding telephone instruments. It found immediate use in pure form to mold records, and at last, Bell Labs had their quiet records and were able to take advantage of the wide dynamic range possible with the new recording techniques.

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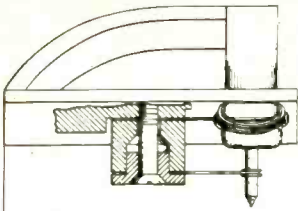
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Early in Bell Labs' effort to improve disc recording and reproduction, they decided to concentrate on vertical cut hill-and-dale records rather than lateral cut discs. The reasons for this are not hard to understand. In vertical cut records, the stylus is riding smoothly up and down (hill and dale) with the depth of the cut varying with the amplitude of the signal to be recorded. With this technique low-frequency, high-energy signals do not cause violent excursions of the stylus so that overcutting into adjacent grooves occurs as in the lateral cut records. Groove pinch effect is considerably less of a problem, and there is less high-frequency inner-groove distortion. The vertical cut records of that period had a frequency range of 30 to 10,000 or 12,000 cycles and an amazing dynamic range of 60 dB, almost the same as the best of today's records!

For optimum playback of the vertical cut records, Arthur Keller invented the moving-coil magnetic cartridge. The first embodiment was the 7A Reproducer with a diamond or sapphire stylus and which had an effective mass of less than 12.5 milligrams. Later on, the 9A Universal Phonograph Reproducer could play either vertical or lateral cut records, vertical-lateral stereo records with the requisite circuitry, or even 45/45 stereo records. Both of these moving-coil systems were said to track at less than 10 grams. Keller also described the "hairpin" moving-coil magnetic pickup which had but a single turn of wire on its coil, hence the "hairpin" designation. I remarked that the output of the cartridge must have been very low indeed, and he said that was no problem because his vacuum tube amplifier gave him "gain to burn." This hairpin cartridge could track at two grams, and it was able to play wax masters without damage so they could still be successfully processed into Vinylite records.

Among other inventions of Arthur Keller's which contributed greatly to the improvement of disc record quality was an "air advance ball," which used the Bernoulli principle. This replaced the old jewel advance ball which preceded the cutting stylus to adjust the depth of the cut. In so doing, the advance ball slightly scored the wax surface, enough to cause noise in the finished record. The air advance ball used low air pressure through a small tube terminated by a

flange placed close to the cutting stylus. The air pressure maintained about a 2-mil separation between the flange on the cutting head and the wax surface. Thus, depth of cut was accomplished without noise-producing damage to the wax surface.

With all of the elements for a high-fidelity disc-recording and reproducing system on hand, Arthur Keller was ready for the historic collaboration between Leopold Stokowski and the Philadelphia Orchestra with Bell Labs.

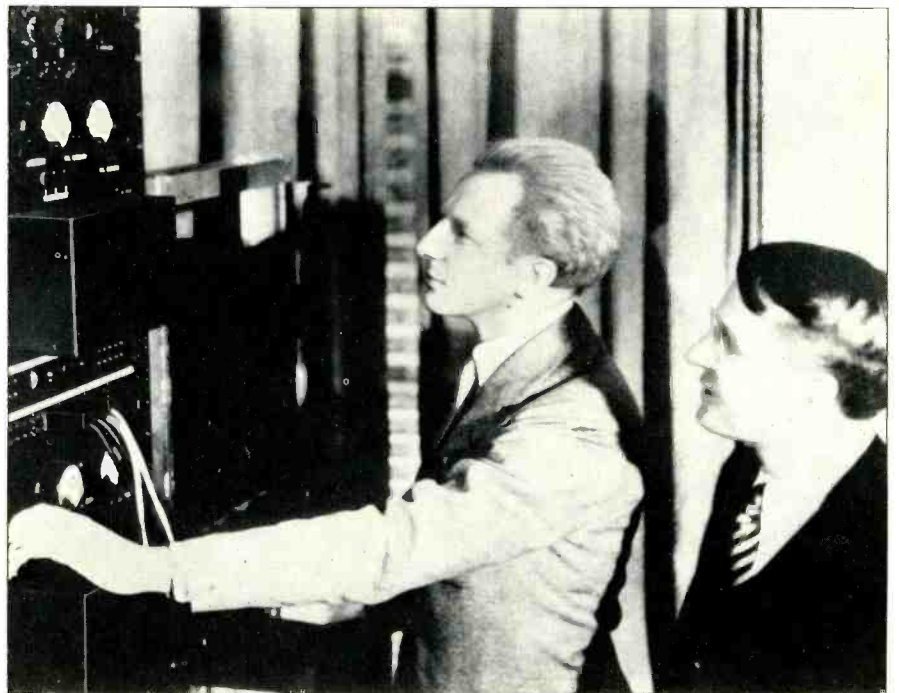
It seems that early in 1930 Dr. Harvey Fletcher of Bell Labs approached Serge Koussevitsky, conductor of the Boston Symphony Orchestra, with the idea of enlisting his assistance in carrying out some experiments. Koussevitsky did not respond positively, and Fletcher subsequently approached Stokowski who gave him a favorable response. Stokowski visited Bell Labs early in April 1930 to meet with Fletcher and other Bell Labs executives and was given demonstrations of some experimental work in progress. In a letter of April 8, 1931, Stokowski made an offer of help to Harold Arnold, one of the Directors of Bell Labs:

"If I or the Philadelphia Orchestra can be of any service to you in any sound experiments, we are always at your dis-

posal. These experiments could be made during the rehearsals, so there would be no expense incurred whatever. We never have anybody at the rehearsals so the experiments could be private and the results could be kept confidential if you so wish." Events moved rapidly after this overture. Within several months Bell Telephone Laboratories had established a room filled with electrical apparatus in the basement of Philadelphia's Academy of Music.

A memo from Dr. Arnold of Bell Labs in 1932 noted that, "Fortunately, through the friendly cooperation of Dr. Stokowski we were permitted to install our apparatus in the Academy of Music in Philadelphia, to place microphones as we pleased in the auditorium and use them both at rehearsals and at regular performances, and to make use of the large foyer in the Academy building for listening purposes." Thus Stokowski's April 1931 invitation dovetailed with Bell Labs' desire to make "proper evaluation of the frequency and dynamic ranges re-

Leopold Stokowski (left) and Harvey Fletcher, then director of physical research for Bell Labs, at Washington's Constitution Hall with Stokowski adjusting the controls of early stereo equipment.

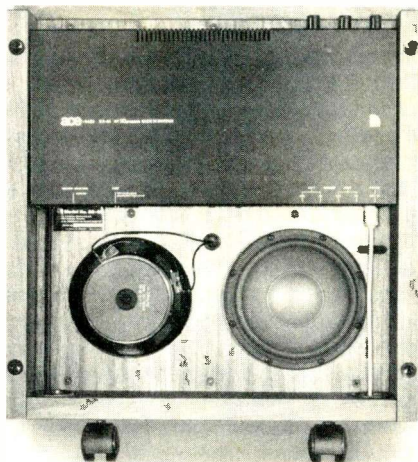


THE LOWDOWN ON DEEP BASS

(and subwoofers.)

Too many audiophiles believe that the sole reason for adding a subwoofer to their systems is to add more "punch" to rock and jazz music or to hear the lowest octave of bass, such as deep organ notes in classical music. While this position is completely true, it is very far from the complete truth.

Because of these widespread beliefs, many system owners rationalize their delay in purchasing a subwoofer with statements such as, "My room is too small." "There is not that much deep bass in most music, anyway." "My system sounds pretty good now, so I'll wait." It is clear that these people have never heard a good subwoofer in operation.



There is no single piece of equipment which you can add to a good stereo system that will make a greater improvement in that system's overall sound than a good subwoofer.

A good subwoofer will make any system sound better because it makes the system operate more efficiently and effortlessly. Since the bass passages (the most demanding portions of the music spectrum on both speakers and amplifiers) are handled by the subwoofer, the rest of the system has much lighter demands placed upon its capabilities. Thus, primary speakers operate with less distortion and appear to have had their efficiencies greatly in-

creased, while amplifiers have a much lighter load placed upon them and can "loaf" along, well within their optimum operating range.

Thus, besides delivering the lowest octave of deep bass, a good subwoofer improves every other operating aspect of a music system—from the amplifier to the primary speakers—accurately recreating not just the music, but the "ambiance" of the actual studio or performance arena.

B2-50. A SUBWOOFER FOR ALL SYSTEMS.

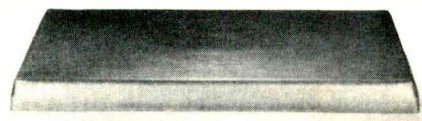
Unlike most subwoofers, which require an extra amplifier (for power) and a crossover (to divide the deep bass signals from the rest of the music), the Audio Pro B2-50 has all that built in. As a result the B2-50 does the best job of blending right in with the rest of your system. (*High Fidelity* said so, and, for that matter, most magazines which reviewed the B2-50 felt it was the best in the world. We would be happy to send you a packet of reprints of these reviews at no charge.)

In fact, the B2-50 blends in so beautifully with your system that you can place it virtually anywhere in the room, even behind the listening area. The reason is that deep bass sound waves are so long (larger than most rooms) that you cannot easily localize them.



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For a limited time only, Audio Pro will give you a free Turntable Isolation base with the purchase of a B2-50 (in either walnut or black ash). Without a subwoofer you don't need this base, because it is designed to prevent acoustical feedback. If your system doesn't generate much deep bass, we're offering you a cure for a problem you don't have. (This is an intentional exaggeration, because virtually every turntable will benefit from better isolation from the environment.)

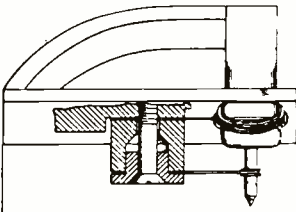
However, with your new B2-50, your system will be delivering huge amounts of deep bass (up to a 100 db at 20Hz) and a turntable isolation base will probably be the next accessory you go out to buy.

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quired in music reproduction." Bell Labs' interest in such tests was fourfold: First, a desire to determine what changes, if any, should be made in the operating telephone companies' "program circuits" carrying music from performance locations to radio broadcasting stations; second, speculation that "wire distribution circuits" to individual homes (shades of today's cable service!) might eventually prove a better alternative than radio for the transmission of high-quality music ("This is the strongly expressed opinion of Dr. Stokowski and some of his assistants, who feel that there is a vast difference in musical quality between that demonstrated in these experiments and the best they had ever heard by phonograph and radio"); third, interest in improving the sound quality in motion pictures, and fourth, desire to effect the improvement of records for home and broadcast use.

In the autumn of 1931 Arthur Keller and Ira Rafuse were at Philadelphia's Academy of Music to begin their historic recording sessions or, more properly, experiments. Keller had set up his recorder-cutter to make vertical-cut recordings and dual concentric stereo recordings. Strategically positioned in the Academy were two Bell Labs 618-A moving-coil microphones, and from what I can determine this mike was a precursor of the cardioid microphone. The 618-A apparently was essentially flat from 35 to beyond 10,000 cycles. I was a bit surprised that the famous 640-AA condenser calibration microphone was not used for these recordings, as it was a wider range mike than the 618-A. However, there may have been good reason for this since the 640-AA required the close proximity of its amplifier, and they may therefore have chosen the less obtrusive 618-A. I say this because Keller made experimental recordings of virtually the entire 1931-32 concert season, with the full cooperation of the Maestro, but unbeknownst to the orchestra members at Stokowski's request. Keller especially recalls a rehearsal on December 1, 1931, in which he asked Maestro Stokowski to play something he thought would demonstrate the widest frequency response and dynamic range capabilities of his orchestra. Stokowski responded with Berlioz' "Roman Carnival Overture." Keller recalled that he "was sitting in the middle of the orchestra seats while

Rafuse monitored the controls in the basement. After the magnificent 10-minute performance, I checked with Rafuse and he said, 'It looks like a good recording.' We came back to tell Stokowski, and he was completely exhausted, soaked with perspiration."

In all, Arthur Keller made 128 recordings of the Philadelphia Orchestra. The flowed-wax master recordings were taken to Bell Labs and processed to gold-sputtered negatives, electroplated, and pressed on vinyl. Along with approximately 6,000 other gold-sputtered masters, these 128 recordings have been stored at Bell Labs in Murray Hill for 50 years. When it was decided to present some of these historic recordings to the Rodgers and Hammerstein Archives of Recorded Music at Lincoln Center in N.Y., experiments with pressing directly from the gold-sputtered masters were not too successful, mainly because of noise problems. Evidently, even with the permanency of gold, some deterioration had occurred. Apparently the flow characteristics of modern vinyl formulas, with their plasticizers, lubricants, etc., were not the same as the pure vinyl used in the old days. It must also be noted that these Philadelphia Orchestra recordings were never intended for commercial release, and therefore there are no complete recordings in the usual sense. There are individual whole short works and "bits and pieces" of others. The Bell folks decided to play the gold-sputtered negatives with the Stanton special "saddle" stylus made for this purpose and to record the signals onto standard magnetic tape. In this way, some of the individual excerpts could be spliced together to create a continuous performance. The job of collating and assembling the music and making the disc-to-tape transfer was handled by H. Ward Marsten IV of Philadelphia. From the edited tapes two records of the Stokowski/Philadelphia Orchestra performances have been made. The first volume has some stereo selections but is mainly vertical-cut monophonic. Included are the Berlioz "Roman Carnival Overture," Weber's "Invitation to the Dance," Mendelssohn's scherzo from "A Midsummer Night's Dream," the prelude and "Liebestod" from Wagner's "Tristan and Isolde," two excerpts from Scriabin's "Symphony #5, Prometheus: The Poem of Fire," and four

excerpts from Moussorgsky's "Pictures at an Exhibition." The second volume is all Wagner with excerpts from the "Ring of the Nibelungen."

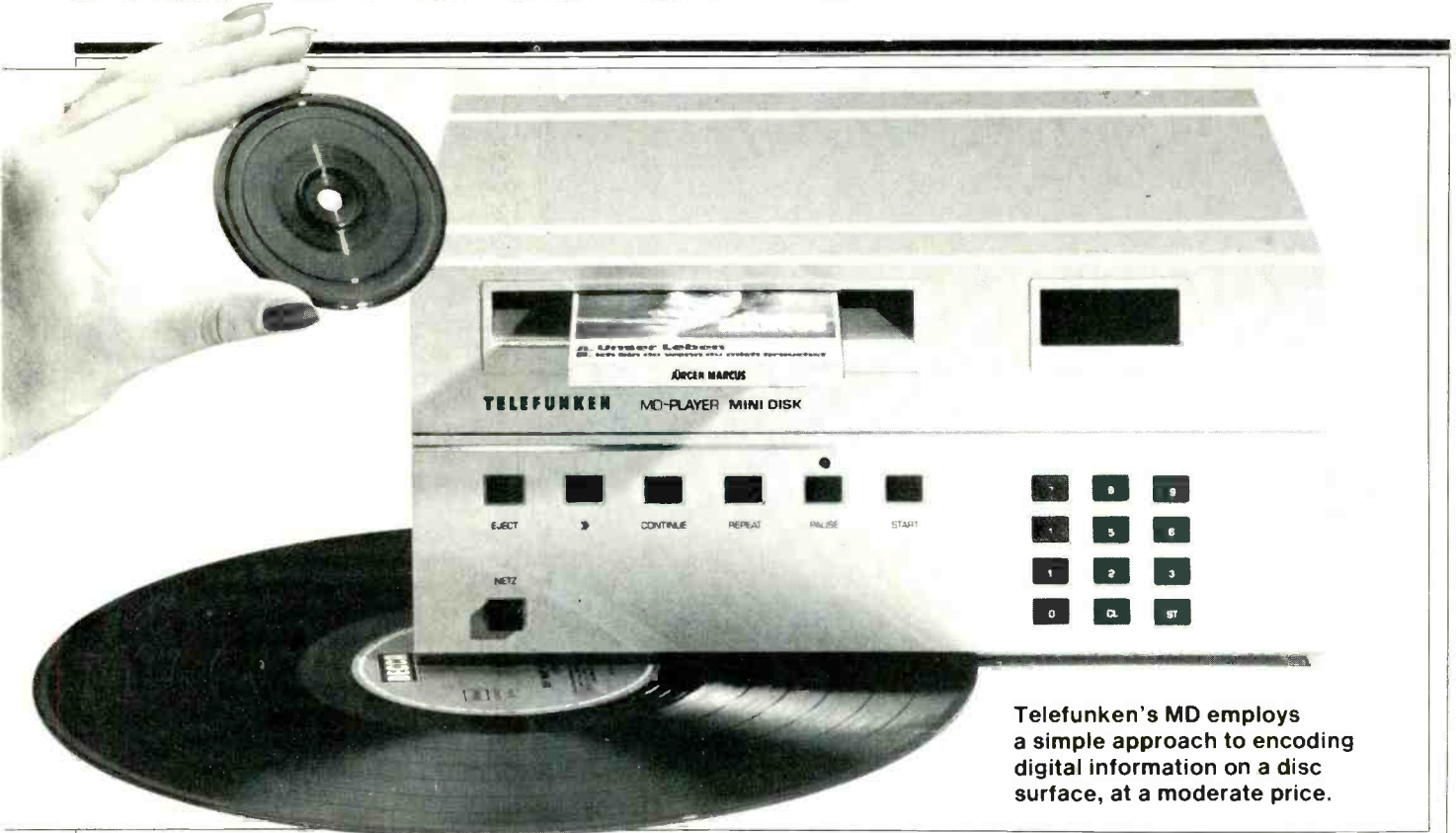
Unfortunately, these two volumes of Stokowski and the Philadelphia Orchestra are not available to the general public. They were issued for historic and commemorative purposes, and in a ceremony at Lincoln Center in New York on January 16, 1980, Dr. William O. Baker, Chairman of the Board of Bell Labs, presented the two albums to David Hall, Curator of the Rodgers and Hammerstein Archives of Recorded Sound. Overall the performances on these discs are simply mind boggling! The virtuosity of the Philadelphia Orchestra at the height of its powers under the magic spell of Stokowski is just breathtaking. What incredible playing! What precision of ensemble! What ravishing tonalities! The sound is amazingly good. The records are a bit noisy, the first volume more so than the second. Frequency range is quite extended, and there is none of the thin pinched sound typical of standard records of that era. The stereo sound in both albums is quite good, with well-defined left vs. right positioning and surprisingly little of the "hole in the middle" problem. Most impressive of all are the sonorities and really wide dynamic range in the Wagnerian excerpts on the second album. The first album presents the acoustics of the Academy of Music *au naturel*, a mite dry; the second album has a little reverb added which makes for a fuller sound. The recordings are a good reflection of the technical capabilities of Bell Labs and show what we might have had in the consumer record market if the Depression had not intervened.

Certainly, one must admire the talent shown, as well as the pioneering advances in recording technology that were the result of the work done at Bell Labs by men like Arthur Keller and his colleagues. ▲

(Some of the quotes and material in this article are used with the kind permission of Robert McGinn of Stanford University and are excerpted from his talk "Stokowski and Bell Laboratories, Collaboration in the Development of High Fidelity Sound, 1930 to 1940," which was presented at the annual meeting of the History of Science Society in New York City, December 29, 1979.)

TELEFUNKEN DIGITAL MINI DISC

GARY STOCK



Telefunken's MD employs a simple approach to encoding digital information on a disc surface, at a moderate price.

Observers of the Japanese electronics industry found an intriguing and puzzling item in the October 23, 1980 issue of *Dempa Shim-bun*, Japan's leading electronics trade newspaper. An article quoted spokesmen for the "DAD Committee," a government-sanctioned study group formed to make recommendations on a standard for digital audio discs, as saying that the committee had narrowed the field to three contenders. Two of those contenders were familiar: One was the optical 4½-inch diameter Compact Disc (CD) system developed by Philips and backed by Sony and Studer/Revox, among others; and the second Japanese Victor Company's Audio High Density (AHD) capacitance system, developed as a spinoff of the massive JVC videodisc development program. The third was a little-known "dark horse," backed by no one but its developer, that had been demonstrated to the DAD Committee for the first time a few days earlier on the 17th of October, Telefunken of Germany's MD (for Minidisk or Mikrodisk) format. Overnight, the MD format, which had previously been considered one of numerous prototype design exercises

with relatively little commercial importance, acquired strategic significance to the world's major audio manufacturers.

MD is the product of a decade-long research project by Telefunken's and Decca's cooperative development wing, Teldec. Primarily the brainchild of noted Telefunken engineer Horst Redlich, MD employs a relatively simple mechanical approach to encoding digital information on the disc surface, in the interest of obtaining a moderate final price. According to the comments of Telefunken officials, one primary requisite for MD was that it have final hardware and software costs comparable to those for high-quality analog turntables and LP records.

The MD disc comes in two sizes, a 135-millimeter (5.3-inch) diameter Minidisk, which holds one hour of music per side in stereo, and a 75-millimeter (3-inch) diameter Mikrodisk, which is analogous to a regular 45-rpm single in terms of usage and holds 10 minutes per side in stereo. Both are enclosed in a cassette-type case, similar to the "caddy" used by RCA for its videodiscs, that prevents groove damage or contamination; both are played in the same player. The transduction system, to put it simply, is a

piezoceramic cartridge, equipped with a long cantilever assembly and a diamond stylus tip, that plays a vertically modulated (hill and dale) groove. The servo-mechanisms needed to guide the stylus inward are considerably simplified by this spiral-groove arrangement.

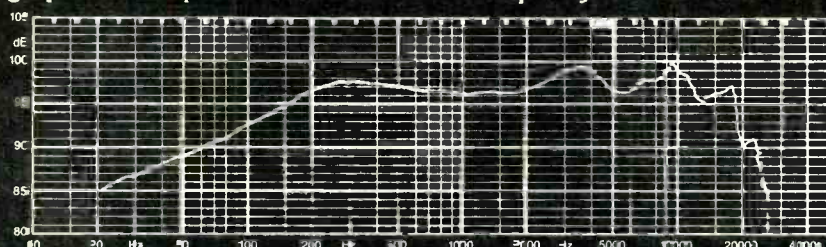
Discs are mastered on a modified record-cutting lathe, in real time, using a copper master disc blank (the stylus is not heated; it produces a thin thread of copper as it inscribes the groove). A ridge arrangement at the center of the master disc provides automatic centering of the intermediate mothers and stampers as well as the final vinyl disc. A conventional record press can be used for pressing — even the disc raw material is identical to that used for LPs — and according to Telefunken, a press of conventional size can press either three Minidisks or six Mikrodisk per cycle, thus bringing the actual production cost of a Minidisk below that of an analog record (at least until the unspecified cost of the cassette structure is added).

On the electronic side, the MD format uses a 14-bit linear encoding system, with fairly elaborate error correction, and provides a theoretical signal-to-noise ra-

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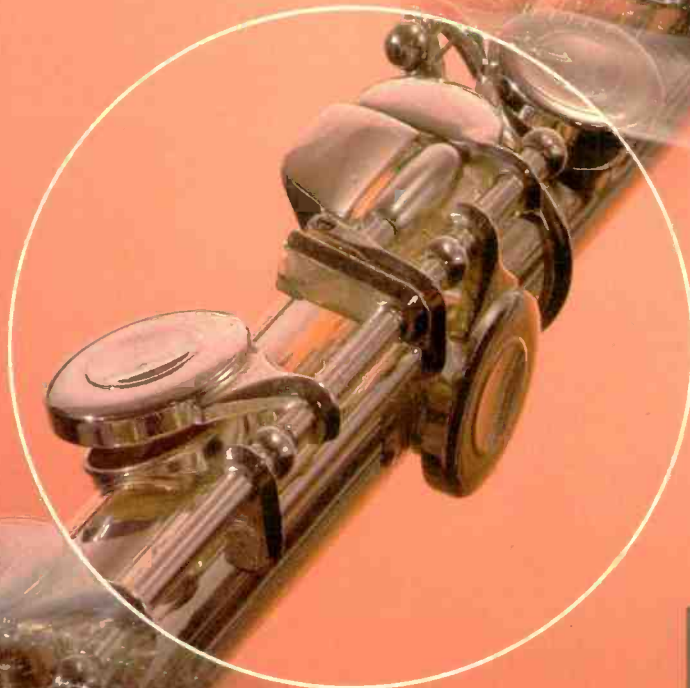


ratio of about 85 dB — far better than analog recordings but not quite up to the 90-dB S/N ratios of the JVC system and Philips Compact Disc. Like the Philips format, Telefunken's MD has a complete random-access system.

Philips has made a point in discussions of the Compact Disc of noting its suitability to automotive and other portable applications — an idea presently dismissed by some as not needed by the consumer, but one that will certainly be relevant 10 years from now when the format standards have been set and the technology begins to filter over to automotive and budget equipment. Telefunken claims that MD can be made usable in portable systems as well, though the groove-contact format would not seem to lend itself easily to such applications.

No one really knows how good Telefunken's chances of being selected as the DAD Committee's favored system are, but most industry observers see it as the least likely of the three to be backed, despite the approach's demonstrated practicality and moderate cost. For one thing, Telefunken is not viewed as the preeminent trend-setting power among European electronics suppliers; Philips is, so most other European and British manufacturers are more likely to back a Philips-sponsored system, irrespective of its technical particulars, than one from Telefunken. Recent announcements by Sony officials that "more than 20" Japanese manufacturers had been signed up as Compact Disc supporters also seem to bode ill for MD's chances. (See this month's VideoScenes for particulars on Matsushita's prototype Compact Disc entry.) For the domestic Japanese market, VHD must be considered the odds-on favorite to become the videodisc standard, and AHD's chances are therefore substantially enhanced by "coat-tail" effect, especially since the same actual player would be used to play both VHD and AHD software. MD is clearly a brilliant, cost-effective design, but it may have come into the fray just a bit too late and with too few big-league friends to achieve supremacy. Its best shot at victory may be the traditional tactic for "dark horse" entrants in any competition — to be perceived as a reasonable compromise if the conflict between more powerful contenders becomes too protracted.

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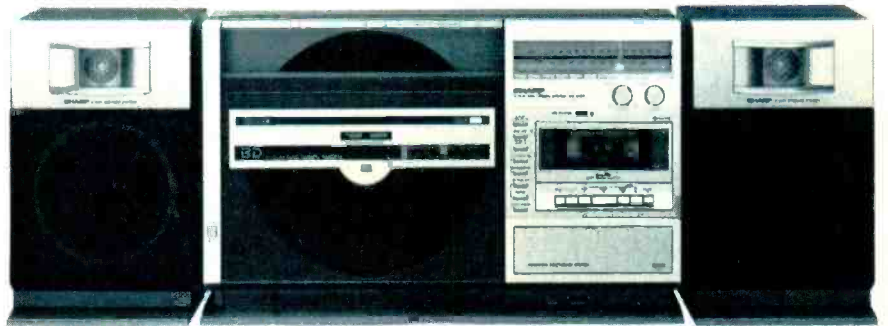
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LINEAR TRACKING TURNTABLES

GARY STOCK

Sharp VZ-3000



By many indications, 1981 will be the year of the straight-line tracking (SLT) turntable — not only among serious audio enthusiasts but also among those who favor compact hi-fi systems. After a long period of dormancy, the radial track is back and available in exotic separate versions as well as moderately priced high-style forms.

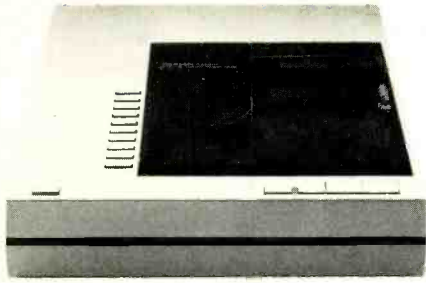
The reasons behind this SLT renaissance aren't that hard to discern. As is common in audio development, it is a combination of technical and market-related factors that have revived the concept rapidly and with broad support. On the one hand, cartridge and disc quality have both improved enormously in the past five years, "upping the ante" for turntable and tonearm makers in terms of the audibility of tracking and platter-system aberrations. A well-designed straight-line tracking turntable can now — for reasons we will discuss in greater detail a bit further on — be expected to sound better on many recordings than its conventionally pivoted counterpart, where a few years ago the subtle distinctions between the two arm types would probably have been lost in the haze of

cartridge- and disc-induced colorations.

Technology spun out of other fields has also made improvements in SLT performance and simplicity of construction possible. Most contact-style videodisc formats, including JVC's VHD system and RCA's SelectaVision, use fairly elaborate servo systems to drive their radial arms since the stylus pressures of videodiscs are too small to permit free (wholly groove-controlled) tracking. This technology has already been worked into some of the currently available SLT turntables, most notably into Mitsubishi's vertical units and JVC's LE-5, and other SLTs are likely to benefit from it as well.

The biggest impetus to the SLT's return, however, probably has to do with its attractiveness as a distinctive concept in the marketplace. The major Far Eastern and European suppliers of turntables understand well that newness is the sizzle which sells the audio industry's steak. The introduction of metal-particle tape acted to generate very high sales volume in replacement cassette decks; it was a well-promoted, distinctive concept that promised real and audible benefits to those who bought it — and it also

Technics SL-15



Straight-line tracking turntables offer sleek cosmetics as well as the promise of better-sounding music.

occurred at a time when technology in the cassette deck field had been stagnant (or at least slowly evolutionary) in most areas for several years. The turntable business is at that same point in 1981 — waiting for the next big, distinctively marketable idea to come along now that the direct-drive concept has been widely accepted. And the straight-line tracking turntable offers not only sleek cosmetics, an easily explained scientific *raison d'être* (it plays the record the same way it was made — what could be simpler than a straight line?), and a well-researched foundation in currently available technology but also the promise of better-sounding music.

It's not surprising, then, that many of the major manufacturers have made in-

cursions into the field. Technics has had their record-jacket-sized SL-10, with a short SLT arm and integral moving-coil cartridge mounted in the dust cover, on the market for more than a year. It is being joined this year by a smaller, less expensive version, the SL-7, and a more complex programmable unit, the SL-15. Two other larger SLTs will later appear in the Technics line-up, both with features oriented toward the serious audio enthusiast. Pioneer has been selling their massive Linear 1 SLT in Japan for some time but has chosen for the moment to market its innovative arm mechanism in this country as part of the Model 8000 turntable from their subsidiary, Phase Linear. JVC has not only a micro-component system with miniature SLT turn-

table, but a new separate turntable, the LE-5, based on the component system's unit. Yamaha has the PX-2, complete with massive undercarriage and an elaborate superstructure. Mitsubishi Audio has charged into the field with two separate turntables — including the LT-5V that plays the disc vertically and a conventional horizontal player, as well as a complete integrated music system with vertical SLT turntable. Sharp has an SLT music system, the V2-3000, which plays both sides of a disc without turning it. Also in on the radial-tracking ground floor are Aiwa, which has had their programmable LP-3000U out for more than a year; Benjamin Electroproducts with their pull-out 4100 automatic; Revox, which makes two units, both with an un-

THREE APPROACHES TO ARM ACTUATION

In A, the arm is propelled inward or outward by rotation of a threaded rod or worm gear arrangement, sometimes with the motor attached directly to the thread-

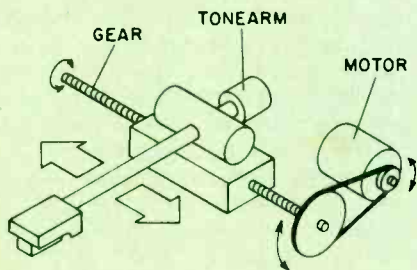


Fig. A — Gear drive method.

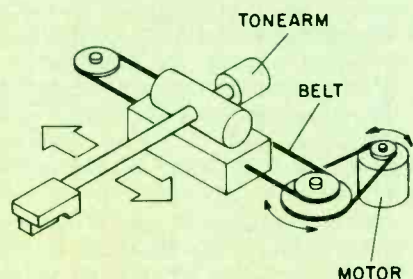


Fig. B — Belt drive method.

ed shaft itself. Also common, approach B uses a stretched cord or wire attached by an arrangement of pulleys to a motor; this may improve arm/motor isolation

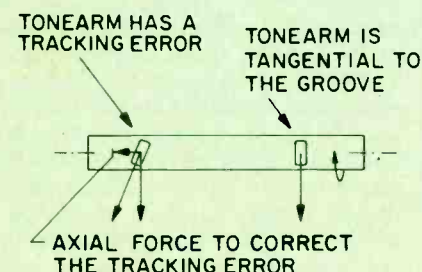
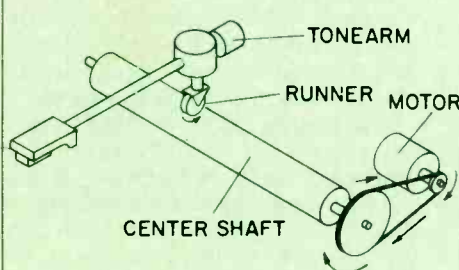


Fig. C — The runner method.

somewhat, depending on the specifics of the design. Approach C employs a constantly rotating shaft of larger diameter contacted by a wheel whenever the arm deviates from tangency. It is proprietary to Harman-Kardon turntables. Approach D, used by Pioneer, employs a long electromagnet to induce motion by magnetic force. A fifth approach, used only by Dennesen at present, is to permit the arm to freely respond to groove motion without any servo mechanisms. A low-friction bearing permits independent arm motion.

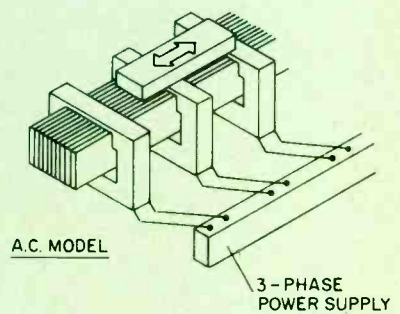


Fig. D — Structure of the linear motor.

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Harman-Kardon ST-8



Technology spun out of the videodisc has made improvements in SLT performance and construction possible.

usual and sophisticated light-controlled arm assembly called the Linatrak, and Bang & Olufsen, whose early Beogram 4000, available since 1973, has now been supplanted by two units (the Beogram 4004 and Beogram 8000) designed to work with B & O's own cartridge series. The builders of the ground floor — Harman-Kardon, whose now-absorbed subsidiary Rabco originally popularized the concept in the mid-'60s — have remained in the field with two units that employ a mechanical servo arrangement, the ST-7 and ST-8. At the esoteric end of the SLT line-up are two newcomers: Dennesen, with its gold-plated, air-column supported ABLT-1, and the French firm Goldmund, which markets a separate SLT arm with out-board control box. On the horizon are introductions from several of the other large Japanese suppliers, some at prices expected to be in the middle ranges.

SLTs can be divided into two basic camps relative to their theory of operation. The first and predominant category encompasses servo-controlled units, those in which some control mechanism observes the tonearm's motion as it deviates from tangency and then acts to correct that deviation by moving the tonearm inward. Servo mechanisms need not be electronic in nature, though most SLT servo systems are; there are mechanical, hydraulic, and thermal servo devices in use in a wide variety of industrial products. The original Rabco arm used an extremely straightforward servo system: When the arm deviated, it fetched a gold wire hanging vertically up against a platinum spring, thus completing an electrical circuit which supplied current through a one-transistor amplifier to the tracking motor. Contemporary servo mechanisms are more complex. As shown in the accompanying figure, the Linatrak from Revox uses a complex LED-photodiode assembly that in turn activates the motor through a controlling integrated circuit. Other systems are equally involved and often microprocessor activated.

A second, rare category of SLT has what might be called a "freewheeling"

A SHORT HISTORY OF THE SLT

The concept of a radial-tracking tonearm is one of such simplicity that it's been attracting inventors and amateur constructors since the dawn of hi-fi.

One man closely associated with the popularization of the SLT arm was Jacob Rabinow, the celebrated servo-systems engineer who founded Rabco (later absorbed by Harman-Kardon) and designed the original SL-8E separate SLT tonearm and the ST-4 integrated SLT turntable. His patents in the tonearm field date back to the early '60s and cover not only radial tracking systems but also counterweight decoupling and an extraordinary tonearm system that supports a cartridge on a sort of trapeze made of cords. Rabinow's basic theory — an SLT that uses mechanical means

Marantz SLT-12



to servo-correct — survives to this date in the Harman-Kardon ST-7 and ST-8.

Rabinow was not the first SLT developer, however. Aside from unverified reports of prewar SLTs, there is a 1958 patent issued to Orthosonic that describes a mechanically actuated SLT; seasoned audiophiles may remember the Bard SLT arm. *Audio* presented a construction project in May 1966 called "The Servo Groove Tracker," and Great Britain's *Wireless World* also carried a long and detailed letter describing a home-brew SLT arm in January of that year. Our own 1969 review of the first SL-8E comments 20 years in advance on current SLT servo systems, with the author of the review noting that "Mr. Johnson [in his earlier construction article] suggested a lamp which illuminated either of two photocells depending on

the position of a mask. The idea would have worked perfectly, although the device would have been unduly complicated." Marantz took a stab at SLT development in the mid-'60s with their SLT-12, which employed a gear mechanism to move an arm that extended out over the record like a fishing pole. SLT tech-

Rabco ST-4



nology reached the apogee of complexity with Elwood Norris' fabled, ill-fated SSI tonearm. Patent literature shows a number of Norris patents on a complete changer mechanism for the SSI, but the concept and the company never quite got rolling.

The microprocessor-integrated circuit, which permits engineers to construct "smart" yet inexpensive servo systems, capable of remembering multiple commands and executing multiple simultaneous actions, will probably put an end to the tradition of SLT basement tinkers, but we'll always have an intriguingly diverse history of development to look back upon. G.S.



SSI MM 3000

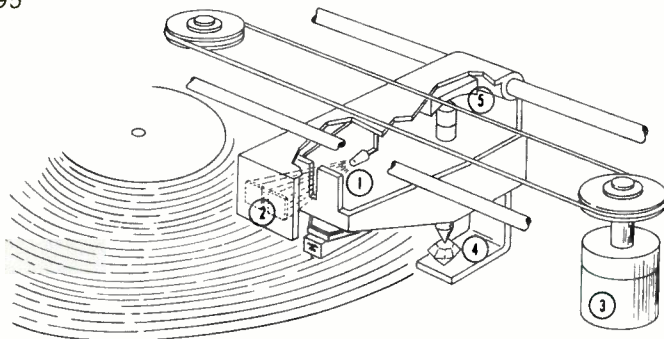
SLT

Yamaha PX-2



The radial-tracking approach may well represent the Best That Will Ever Be in terms of disc playback quality.

Exploded view of Linatrak mechanism featured on Revox B790 and B795 turntables. Legend: 1 is LED, 2 is photo diode, 3 is arm drive motor, 4 is jewel pivot, and 5 is magnetic support.



tonearm, in which the entire arm assembly is drawn inward by the groove pulling on the stylus. The problem with the freewheeling approach is friction; it must be extremely low (on the order of a few milligrams) to prevent a high-compliance stylus assembly from bending sideways instead of pulling the arm along with it as the groove spirals inward as it ought. Only Dennessen, whose air-bearing arrangement is essentially frictionless, uses this approach currently.

Why should a straight-line tracking arm sound better than a conventional one? Skeptics note that the actual angular deviation in many SLTs is almost as large as in a conventional arm; a 10-inch pivoted arm has a maximum tracking error of 1.72 degrees, according to standard theory. Straight-line tracking arms are set up to correct their position only when deviation from tangency exceeds a degree or so — meaning that they are almost constantly in a condition of substantial angular error. The pivoted arm proponents also note that the quality of performance with a properly designed pivoted arm does not suddenly and radically improve at the two points where such an arm is precisely tangent to the record groove.

Supporters of the SLT concept reply by noting that the virtues of this concept may have little to do with the notion of angular accuracy. Rather, it may be the often unmentioned absence of skating and anti-skating forces that gives the

best radial-tracking turntables their transparent sound. In a pivoted arm, skating forces that vary widely from one moment to the next (dependent, according to classic studies, upon groove radius, modulation of the groove, and a variety of other factors) vary the degree of lateral pressure upon the stylus assembly, while a single, unchanging (and therefore approximate) anti-skating force provides long-term compensation but not moment-to-moment correction. Hence the stylus is almost continuously in the midst of a lateral tug of war between opposed forces. A straight-line tracking arm eliminates that pair of opposed forces and allows the stylus to do only what it is intended to do — track the groove. Such a theory is difficult to prove directly, but it's interesting to note that the one type of conventional tonearm also theoretically free of this tug-of-war effect, the electronically servo-controlled arm format of Sony and JVC, also seems to exhibit an improved transparency in the view of many listeners.

The next big step in record-playing technology after the SLT will probably be their march into oblivion, since digital audio discs and consumer PCM recorders are coming on more rapidly than many observers had expected. For the hundreds of millions of phonograph records in existence, though, the radial-tracking approach may well represent the Best That Will Ever Be in terms of disc playback quality. **A**

20 Hz flat.



Loudspeaker reproduction of 20-Hz energy at full strength is so rare that most people have never heard it (actually, never *felt* it would be a better phrase). Speaker output always decreases in the lowest octave.

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1

NAKAMICHI 1000 ZXL CASSETTE DECK

Manufacturer's Specifications

Frequency Response: 20 Hz to 20 kHz, ± 0.75 dB, with Nakamichi tapes.

Harmonic Distortion: 0.8 percent at Dolby level with 400 Hz.

Signal/Noise Ratio: 66 dB with Dolby NR.

Separation: 37 dB.

Crosstalk: 60 dB.

Erase: 60 dB.

Input Sensitivity: Mike, 0.2 mV; line, 50 mV; external NR, 100 mV.

Output Level: Line, 1.0 V; external NR, 100 mV; headphones, 45 mW.

Flutter: 0.04 percent W rms, 0.08 percent wtd. peak.

Dimensions: 20 $\frac{3}{4}$ in. (527 mm) W x 10-3/16 in. (258 mm) H x 12-11/16 in. (322 mm) D.

Weight: 41.9 lbs. (19 kg).

Price: \$3,800.00.

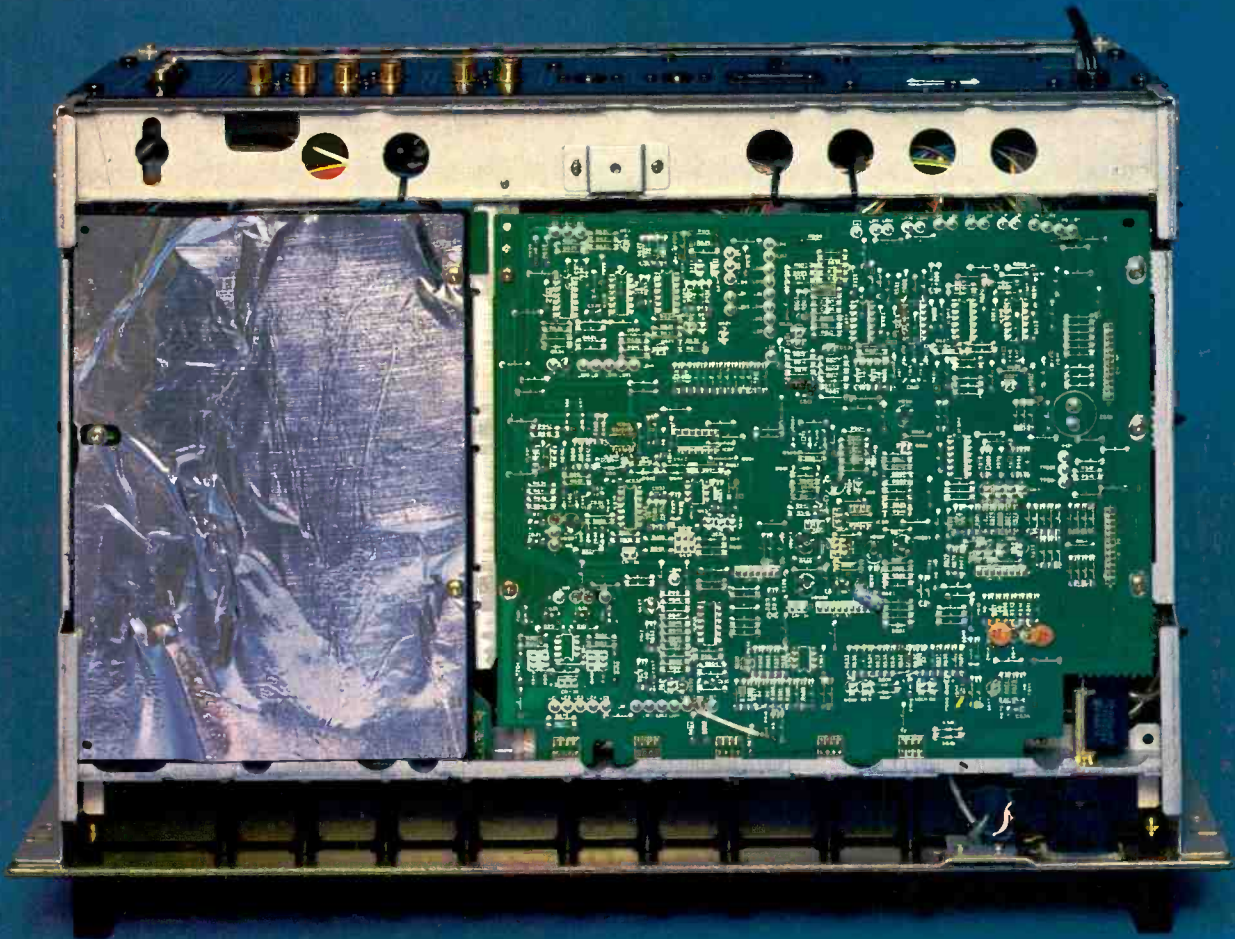


Immediately, the Nakamichi 1000 ZXL computing cassette deck is most impressive: The physical size and weight, the features included, the specified performance, and the price. The unit is supplied in a rugged wooden cabinet, and it is rack-mountable if that is desired. The front panel is the standard Nakamichi black with white lettering, which is easy to read even in fairly dim light. Behind a clear cover along the top of the deck are the display panel for A.B.L.E. and RAMM, the 4-digit electronic counter, and the fluorescent level indicators. The acronym A.B.L.E. stands for the microprocessor-controlled Azimuth, Bias, Level and Equalization adjustment system which automatically adjusts any and all of these parameters for best performance with the tape being used. RAMM (Random Access Music Memory) allows location/identification of up to 15 separate programs on a tape and putting up to 30 commands for playing programs in memory. The displays for these functions are groups of bright annunciators that are very easy to read. The A.B.L.E. row is on top, that for RAMM is just below. These functions and their displays will be covered in more detail in the "Circuit Description" section of this report.

The fourth digit of the tape counter provides increased resolution of tape position at the beginning of the cassette. The red

digits were a bit dim, however, causing reading difficulty with medium to bright room lighting. The fluorescent level meters, on the other hand, appear to have exactly the right brightness for all lighting conditions. The 56-segment bar graph, with individual thresholds, provides the best resolution for such devices seen to date. The scale is expanded (smaller dB steps) between "-10" and "+10" which increases its value to the recordist. Below are the slider-type input and output level controls. There are separate line and microphone faders (pots, if you prefer), so it is a simple matter to mix as desired. There is also the exclusive Nakamichi *Blend* mike input, which is fed equally to both channels at the same time that the other two mike inputs are used as desired. It is an appealing feature which gives the recordist much more flexibility on mike placement and the resultant sound. The sliders are positioned in pairs so that the left and right knobs in any set are easily held simultaneously for smooth fading of both channels at the same time. The RAMM controls are to the left of the faders, and those for A.B.L.E. are below — more about these later.

The logic-controlled, light-touch transport switches are unusual in several respects. First of all, they are larger than most, with plenty of area for a finger to push. They are also coded by



**The Nakamichi 1000 ZXL
computing cassette deck
offers a level of
performance unmatched by
any other deck.**

shape and color. *Stop* and *Pause* (with an added white vertical bar) are rectangular with status indicators that are actually light-green surrounds. *Play*, *Rewind* and *F.Fwd* are good-size arrow shapes, with similar surround-type light-green status indicators. The wind buttons also have white arrows on the button faces. *Record* is oval shaped with a red bar in the center and a red surround-type status indicator. There is no doubt about their being different from most transport switches, and their status can be seen from anywhere in the room, a feature of possible value to some users. A second push of *Record* obtains muting while held in. The logic system does not permit making flying start recordings, consistent with other Nakamichi decks, which is a possible limitation for some users. A pitch control, with center detent, provides ± 6 percent adjustment in tape play speed; it is not operational in the record mode to prevent making unwanted errors. *Eject* obtained a smooth opening and tilting of the cassette carrier. Loading was smooth, and access was excellent for maintenance tasks. Pushing *Pause* when in fast wind obtains cue mode with the play head moved closer to the tape and wind speed reduced to one-third. Holding a wind button at

that point reduces the speed to one-fifth of normal. Rocking the tape is possible with the two wind buttons. All in all, this is an excellent cue system.

Along the bottom of the front panel are the power switch, the headphones jack, and nine rotary switches with pointer knobs. They provide selections for *Timer* (record/off/play), *Memory* (stop/off/play), *Test Tone* (off/400 Hz), *Bias Set* (under/normal/over), *EQ* (70/120 μ S), *Filter* (subsonic/off/MPX/MPX & subsonic), *Noise Reduction* (external/out/Dolby NR), *Meter* (peak/hold, VU/peak), and *Monitor* (tape/source). Most of the designations are self-explanatory, but some added comments are in order. *Bias Set* allows shifting the normal range of bias used by A.B.L.E. up or down 12.5 percent for tapes with unusual bias needs or special recording needs. The 400-Hz test tone is for calibrating other equipment for use with the 1000 ZXL, in particular a Nakamichi High Com II system. Thus, there is an *Ext.* position on the noise-reduction switch for this or other NR systems. In *Peak/Hold* mode, the meters are peak responding, and there is an additional cursor which indicates peaks and then decays at a rate that is 10 times slower than the peak-

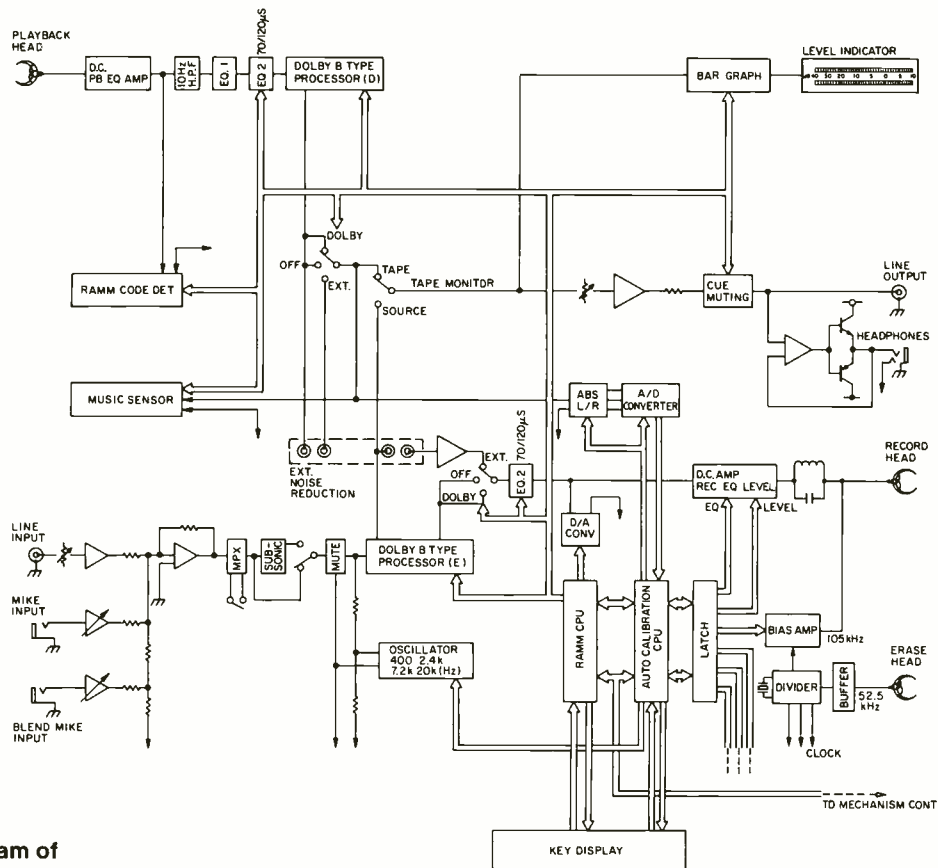


Fig. 1—Block diagram of one channel, Nakamichi 1000 ZXL cassette deck.

meter indication, effectively holding the peak for some time, but not for an extended period. In *VU/Peak*, the meters have VU ballistics, but the cursor is peak responding. This is a desirable combination at times, for it gives continual indication of both averaged and peak levels.

On the back panel are stereo sets of line-in/line-out jacks as well as encoder in/out and decoder in/out jacks for external noise-reduction systems, with all jacks gold-plated — a good way to improve the reliability of such connections. There are also sockets for mechanism and RAMM remote controls as well as a holder for the batteries used to keep the A.B.L.E. memories alive when a.c. power is off. The final item is a ground post.

The 1000 ZXL was carefully removed from its cabinet for a look at the construction. Everything appeared to be of high quality, and the soldering on the many p.c. boards was excellent, with very little flux residue. Interconnections were mostly multipin with some wirewrap. Parts and adjustments were labeled on both sides of the cards, and five soldered-in fuses were noted. Shielding was used around some circuits, with the fluorescent display and its drivers completely enclosed. This high-quality design and construction help prevent switching noises from getting into the audio.

Circuit Description

Figure 1 is a block diagram of one channel of the 1000 ZXL. A perusal of the elements shown will demonstrate why Nakamichi classifies the unit as a "computing" cassette deck. There are the RAMM and auto calibration computer processing units and A/D, D/A converters. Some of the circuitry shown is standard for all three-head decks, so space will not be taken to follow such signal paths.

As Nakamichi states in their literature, this unit is the first tape recorder with a specified response of 20 Hz to 20 kHz, ± 0.75 dB, which does raise more than a few eyebrows. The microprocessor-controlled A.B.L.E. auto calibration scheme includes azimuth alignment of the record head, adjustment of bias current and recording equalization, and setting record sensitivity for level matching and best Dolby tracking. Initiating the process is most simple: From *Record/Pause* to *Record*, push *Play* while holding the auto cal *Run* button. The first step is azimuth alignment of the record head, and a flashing indicator shows that alignment is in process. Next, bias is adjusted and annunciators flash on and off from channel to channel. EQ is next and then level, with some final trimming back and forth between these two. Note in the figure that the oscillator has frequencies of 400 Hz and 2.4, 7.2, and 20 kHz. This is part of the sophistication that obtains the outstanding response, as the adjustments are made to meet criteria at all four points. There is a latch function, of course, for all of the adjustments, and when they are complete as shown by the annunciators, the information on all of the adjustments can be put into any one of four memories. Playback EQ and noise-reduction mode can also be stored at the same time. Once the calibration has been stored for a particular formulation, it will probably only be necessary to touch up azimuth alignment with the *Azimuth* auto cal button and then punch in the appropriate tape memory. If you change your mind on EQ or NR, there is an *EQ/NR Manual Set* for such a purpose. It is of some interest to note that bias to the erase head is at one-half the frequency of bias to the record head. The lower frequency, which is frequency and phase locked, gains greater efficiency in

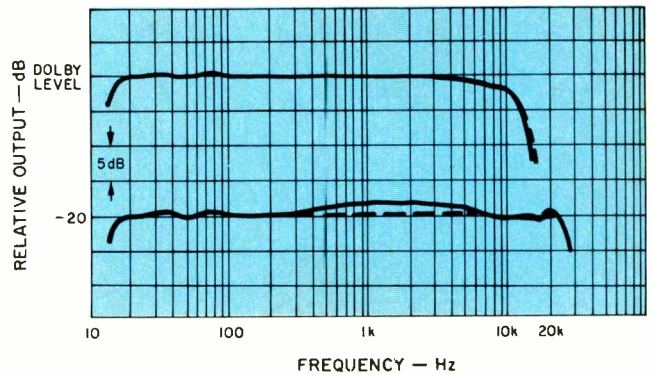


Fig. 2—Frequency response with and without (---) Dolby NR using Nakamichi EXII tape.

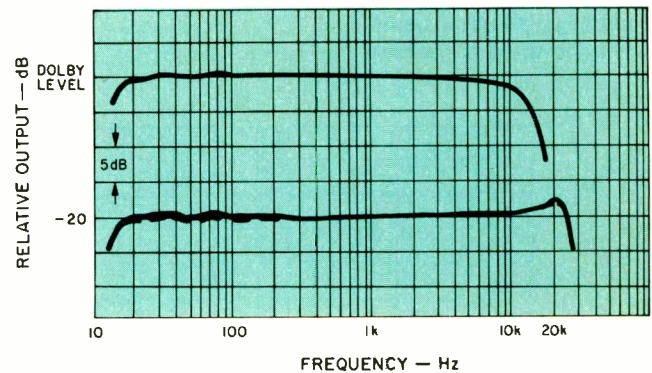


Fig. 3—Frequency response with and without (---) Dolby NR using Nakamichi SX tape.

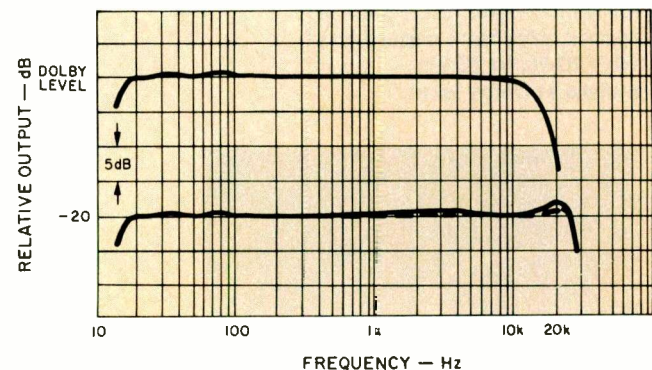


Fig. 4—Frequency response with and without (---) Dolby NR using Nakamichi ZX tape.

Frequency response tests of the Nakamichi 1000 ZXL with three tapes provided the best results to date — bar none.

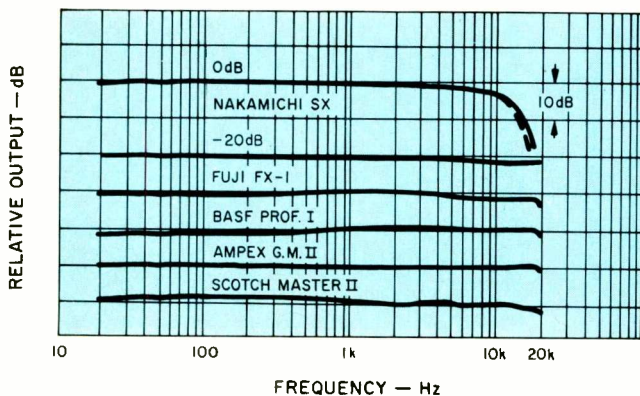


Fig. 5—Frequency responses of various tapes in Dolby mode with auto calibration. Nakamichi SX tape shows effects of under and over (— —) bias settings; all other tapes with normal bias setting.

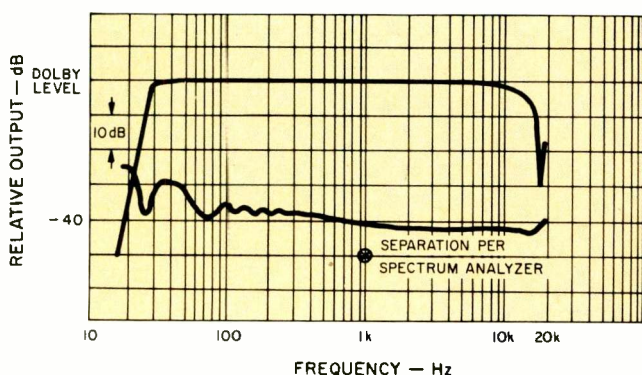


Fig. 6—Frequency response of subsonic and MPX filters and interchannel record/playback separation with 20-Hz to 20-kHz sweep at Dolby level.

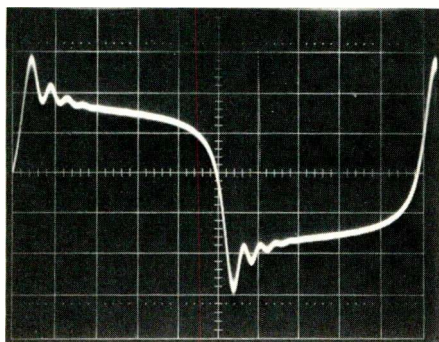


Fig. 7—Record/playback of 1-kHz square wave.

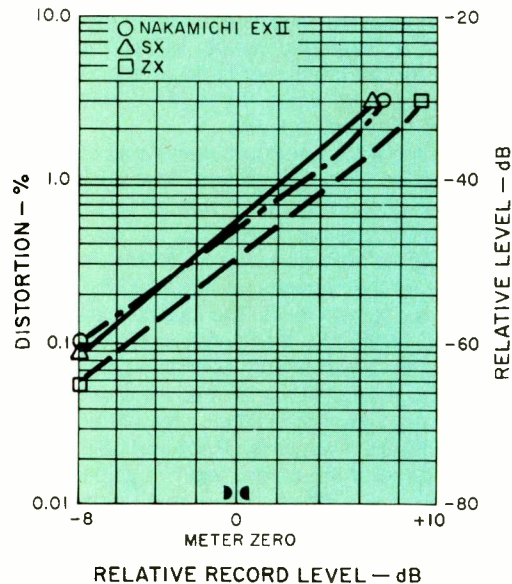


Fig. 8—Third harmonic distortion vs. level in Dolby mode at 1 kHz with Nakamichi EXII, SX, and ZX tapes.

erasing, while the 105 kHz to the record head minimizes bias birdies.

Because RAMM is microprocessor controlled, some functions are possible that are outside the capability of other systems for similar purposes. As many as 15 separate programs or selections can be identified by RAMM, and up to 30 commands can be stored for any order of playing, repeating any as desired. The RAMM encoding uses a sub-audible (5-Hz) frequency which can be inserted anywhere on a tape. Normally, that would be in a silent space of 2 to 4.5 seconds, but it can even be in the middle of a selection. Encoding can be either automatic or manual, and annunciators continually show the status of that process or the decoding when there is playback of an encoded tape. The encoding/decoding not only gives the location of each of the programs, but the EQ and NR settings used to make the recording will be matched for proper playback even if the panel switches are set differently. To keep the 5-Hz RAMM signals out of the audio signal in playback, there is a 10-Hz high-pass filter after the d.c. playback equalization amplifier. The subsonic recording filter is used to keep out such things as record-warp/arm-resonance effects which could introduce spurious signals into the encoding. There is a push-button switch to enter the RAMM mode and set, reset, up, and down switches to do the encoding.

Performance

The playback response with standard alignment tapes was well within 2 dB at all points, usually within a fraction of a dB.

Level indications on the meters were about 0.5 dB high. Tape play speed was 0.5 percent fast. The deck was supplied with Nakamichi EXII, SX and ZX tapes, and the great majority of the tests were run with them. To give a fast check to the auto calibration system, many tapes were run through the calibration cycle, and then the record/playback response was checked with pink noise and a 1/3-octave RTA. All results were at least very good — usually excellent, including operation in Dolby mode. The average time to do the complete auto calibration was about 40 seconds, with azimuth alignment in only 10 seconds or less.

Nakamichi EXII was put through auto cal, and the results were stored in *Tape Memory A*. SX and ZX tapes were put through the same process, and the results were stored in memories *B* and *C*, respectively. Memory *D* was retained for use in any crosschecks to be made. Record/playback responses were taken at Dolby level and at 20 dB below that, both with and without Dolby NR. The plotted responses appear in Figs. 2 to 4, and the -3 dB response limits are listed in Table I. The EXII plots (Fig. 2) show the poorer of the two channels, and the center-frequency rise with the other channel was limited to 0.7 dB. The Dolby tracking with the SX and ZX tapes is superb. Outside of the subdued peak at 20 kHz with SX tape, all responses at -20 dB without NR were within ±0.75 dB from about 17 Hz to 22 kHz. At this same level, the -3 dB points were at 13 Hz and 26 to 27 kHz for all tapes. The responses at 0 dB are also very impressive, not only for the extended headroom but for the flatness of the responses before roll-off. These are the best responses to date — bar none. Fig. 5 shows what might happen if the bias set switch was moved to "under" or "over." Actually, the computer system made them both good, with just a very slight difference at 0 dB. The figure also has the -20 dB responses of a number of tapes selected at random to put through A.B.L.E. All deviations are within about 1.5 dB in Dolby mode as shown; responses without NR were measurably flatter.

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

Tape Type	With Dolby NR				Without Dolby NR			
	Dolby Lvl		-20 dB		Dolby Lvl		-20 dB	
	Hz	kHz	Hz	kHz	Hz	kHz	Hz	kHz
Nakamichi EX II	13	11.4	13	26.4	13	11.4	13	26.4
Nakamichi SX	13	12.0	13	27.0	13	12.0	13	27.0
Nakamichi ZX	13	14.1	13	26.7	13	14.1	13	26.7

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

Tape Type	IEC A Wtd. (dBA)				CCIR/ARM (dB)			
	W/Dolby NR		Without NR		W/Dolby NR		Without NR	
	@ DL	HD=3%	@ DL	HD=3%	@ DL	HD=3%	@ DL	HD=3%
Nakamichi EX II	58.3	65.3	49.1	56.1	57.5	64.5	47.2	54.2
Nakamichi SX	61.3	66.6	52.4	57.7	61.2	66.5	50.7	56.0
Nakamichi ZX	60.3	68.5	51.5	59.7	59.8	68.0	49.6	57.8

Figure 6 is a plot of the frequency response of the subsonic and multiplex filters. The attenuation at 20 Hz seems excessive, but this roll-off may be necessary to ensure reliable operation of the RAMM system in case of record warps, etc. The record/playback separation from one channel to the other is also plotted. This must be considered as an "at-least" plotting because a spectrum analyzer check at 1 kHz gave a significantly lower

figure. The auto azimuth alignment consistently positioned the record head so that the playback of a recorded 10-kHz tone had 90 degrees phase difference between channels. A check at lower frequencies showed that the interchannel time error was consistently 25 to 35 μS. This alignment error is not large, but it seems that the alignment system should have done better. Phase jitter of the 10-kHz tone was just 15 degrees, less than most decks. Bias in the output was exceedingly low. Figure 7 is the playback of a 1-kHz square wave, notable for its good shape and steadiness. The output in *Tape* was the same polarity as the input, but the polarity was reversed in *Source*. The 400-Hz (396-Hz actual) test tone gave a 0-dB indication on the meters and had 0.7 percent distortion, plenty good enough.

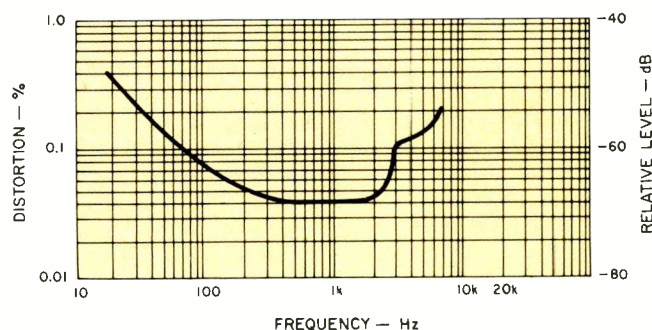


Fig. 9—Third harmonic distortion vs. frequency in Dolby mode at 10 dB below Dolby level with Nakamichi ZX tape.

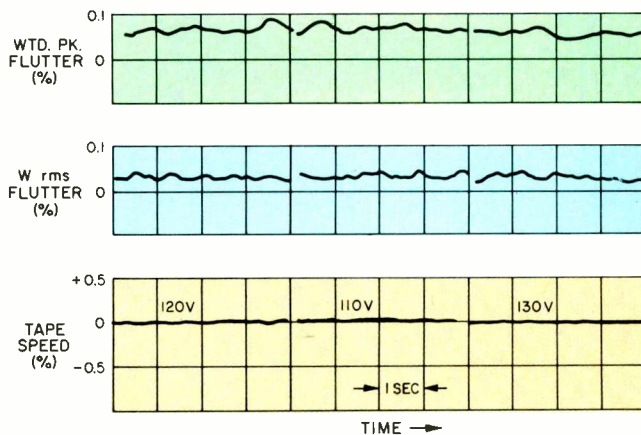


Fig. 10—Tape play speed vs. time and line voltage, and wtd. rms and wtd. peak flutter (three trials each).

I was impressed that the recorder could be turned on and off, days would pass, and information in tape memory could still be called forth with superb results.

With the use of a spectrum analyzer and a 1-kHz test tone, the measured channel separation was 50 dB and cross-talk was down at least 72 dB, both excellent figures. Erasure was checked at 100 Hz with ZX metal tape. The resultant figure of 74 dB supports the manufacturer's claim of superior erase head design. Attention was then given to checking the level of third harmonic distortion (HDL₃) vs. record level from -8 dB re: Dolby level up to the point where the distortion reached 3 percent. Examination of this figure and comparison with other data taken in the past will prove how excellent these results are, particularly for metal tape. All too many recorders are touted as metal-tape compatible but have very high distortion with that formulation. Data were obtained on HDL₃ vs. frequency (Fig. 9) with ZX tape in Dolby mode at -10 dB, and because of tape noise, getting valid figures was a bit of a challenge from 400 Hz to 1 kHz, where the distortion level was just 0.040 percent. The distortion was also comparatively low at the frequency extremes. Other harmonics were low in all cases, especially so with ZX tape. Without Dolby NR, distortion figures were up to 30 percent higher in the mid frequencies.

The signal-to-noise ratios were measured for the three tapes with both IEC A and CCIR/ARM weightings, with and without Dolby NR. The results listed in Table II were based upon measurements of playback with the 1-kHz test tone recorded at both Dolby level and the point at which HDL₃ = 3 percent. The results are excellent, and the good utilization of tape capabilities is indicated with the increasing values from Type I to Type II to Type IV formulations.

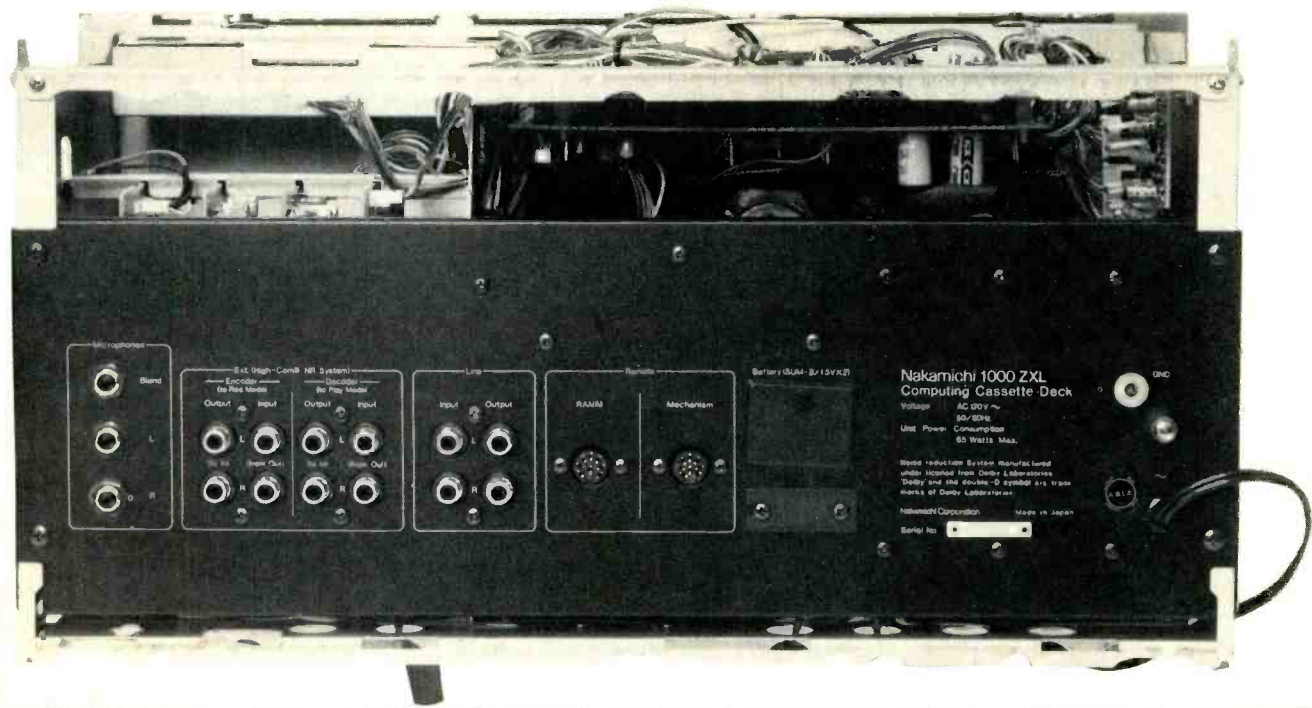
The input sensitivities were 0.18 mV for left and right mikes, 0.22 mV for the blend mike, and 55 mV for line. The input overloads were 30.4 V for line and an astounding 2.05 V for mike, by a wide margin the highest ever measured. The output clipped at a level equivalent to +17 dB re: meter zero. While

being held at the same time with a thumb and index finger, the input-level pot tracked within a dB for about 40 dB — showing that well-balanced fades were very possible. The output-level pots gave similar results. The line outputs were 1.00 V at meter zero, dropping to 0.85 V with a 10-kilohm load. This result, consistent with the specified output impedance of 2 kilohms, should be no cause for concern in audiophile usage, but it's on the high side in studio use where there might be a few 10-kilohm loads in parallel. The headphone output was 0.62 V or 48 mW to 8 ohms. All phones tried could be driven to very high levels, easily controlled with the output faders. The dynamic response of the fluorescent meters was to standard with the VU setting. In peak mode, the attack time was to standard, but the 2.9-second result for 20-dB decay was on the high side. Frequency response was 3 dB down at 7 Hz and 30.4 kHz. The 56 segments in each bar graph provided excellent resolution, and they were very accurate from "-20" to "+10." At the lowest levels, readings were slightly high, more so in peak mode.

Tape speed appeared to increase slightly with line voltage reduced to 110 V during the plotting (Fig. 10), but the counter monitor of the 3,000 Hz increased only one digit, a minuscule increase. The flutter was quite consistent from trial to trial, and typical figures were outstanding: 0.03 percent wtd. rms and 0.06 percent wtd. peak. The wind times for a C-60 cassette averaged 48 seconds, fast and smooth. The tape-play speed control had a range from -6.4 to +7.1 percent, a bit over a semi-tone (5.9 percent) each way. All operations of the transport control/logic system took less than a second, including wind run-out to stop.

Use and Listening Tests

All in/out cassette handling and maintenance tasks were conveniently done and there was automatic tape-slack take-up,



another nice feature. The slider-type level controls were a distinct pleasure to use, working smoothly and setting levels quickly. The rotary switches showed good detenting, and the pointer knobs facilitated fast checks of position. The surround-type indicators on the transport controls aided operation in dim lighting. The purposeful attempts to cause some sort of hang-up caused no problems whatsoever with these or the switches for auto calibration and RAMM. Everything just kept working smoothly, with occasional "chiding" from the annunciators that I had made a mistake. The cueing facilities of this Nakamichi deck are unusual, and they were put to good use on a number of occasions. I did miss the lack of a flying-start scheme, but others may not notice. Pushing *Record* again to get muting seemed slightly odd in ways, but it certainly worked.

The level meters generated a fair amount of enthusiasm in use — their wide range, resolution, brightness, and the excellent implementation of both VU and peak-responding displays. I was continually impressed that the recorder could be turned on and off, that days could pass, and that the information in tape memory could still be called forth to ensure superb results. The instruction book has very good text and illustrations, with a number of helpful added footnotes. There is quite a bit on RAMM, which is good, because many such systems have inadequate explanation. There is no schematic, but there is a good block diagram — actually more useful to the audiophile.

In addition to a few pink noise checks of Dolby NR in/out effects, listening tests were conducted primarily with discs as source material. The music included the dbx-encoded *Baroque Brass* with the Empire Brass Quintet, *The Organ at Chester Cathedral* with Roger Fisher, and some of the Maxell sampler records. Everything sounded so good that there was a little confusion on the position of the monitor switch at times. With pink noise and vocals, it was possible to hear the slight boost in Dolby mode with EXII tape, but not at other times. ZX tape showed some of its superiority with triangle and finger cymbals in one selection. The sound of the organ's pedal range was particularly good with this Nakamichi deck. Record and stop clicks were in tape noise; pause sounds were not detected. There was an 8-second delay after timer start, into *Play* or *Record* as selected.

The Nakamichi 1000 ZXL computing cassette deck offers a level of performance unmatched by any other deck. The flatness of the frequency responses is superlative, the distortion is superbly low, the A.B.L.E. automatic calibration system is simple to use and amazingly accurate, flutter is very low, and there are many other attractive features of this most unusual deck. Nakamichi calls the 1000 ZXL "The Ultimate Recording Investment," and an excellent investment it can be.

Howard A. Roberson

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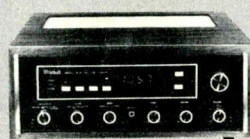
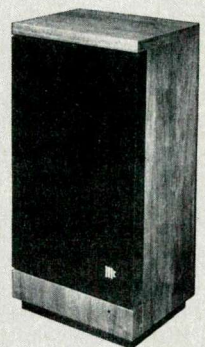
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2

SHURE MV30HE PHONO CARTRIDGE / SME 3009 III TONEARM COMBINATION

Manufacturer's Specifications

MV30HE Phono Cartridge

- Generating System:** Moving magnet.
- Output Voltage:** 3.5 mV (1 kHz, 5 cm/S peak).
- Channel Separation:** 25 dB at 1 kHz, 15 dB at 10 kHz.
- Recommended Load Resistance:** 47 kilohms.
- Recommended Load Capacitance:** 250 pF.
- Recommended Tracking Force:** 3/4 to 1 1/4 grams.
- Playback Frequency Response:** 10 Hz to 25 kHz.
- Trackability at 1 Gram:** 29 cm/S peak at 400 Hz, 42 cm/S peak at 1 kHz, 47

cm/S peak at 5 kHz, 37 cm/S peak at 10 kHz.

Weight: 11.8 grams including carrying arm.

Price: \$230.00 including arm; replacement stylus N30HE, \$60.00.

3009 III Tonearm

See May 1981 issue, page 44.

The Shure MV30HE cartridge was an excellent performer both during evaluation by the listening panel and during the technical measurements.



When Shure Brothers, Inc. made its debut into the high-fidelity magnetic cartridge market back in the late 1950s, the firm had been manufacturing other types of phono cartridges and a wide variety of microphones for many years. About 1959, Shure introduced a phonographic tour de force in the form of two integrated tonearm/cartridge combinations, one 16 inches and the other 12 inches long, which they called Studio Dynetic Reproducers. They were, at the time, truly extraordinary examples of performance and reliability. Reliability is an interesting subject and one which has been rarely discussed in product reports. Over the years, there have been many phono cartridges which, while providing increased performance in one area or another, proved to be unreliable after a relatively short period of time and to deteriorate rather rapidly into a state of unlistenability. To a tiny group of audiophiles who change their equipment, especially phono cartridges, only slightly less often than their socks, this lack of durability probably doesn't mean much. But to the majority, reliability and durability are major considerations. To their credit, Shure Brothers has always put reliability very high on its list of engineering requirements. Materials which give improved performance are never incorporated into a product design until the long-term stability characteristics of such materials are tested and verified.

All this leads to the subject of this present report, a brand-new integrated tonearm/cartridge offering from Shure Brothers. In this case, rather than making a complete new tonearm for the new cartridge design, they have mounted the cartridge into a carrying arm for the SME 3009 III or III S tonearms. British-made units distributed in the U.S.A. by Shure Brothers. The SME 3009 III tonearm, which was reported on last issue, is a very sophisticated design which eschews the usual removable headshell in favor of what the people at SME call a "carrying arm." The carrying arm normally supplied with the SME 3009 III unit consists of an S-shaped tube with a tight, slip-fit plug on one end and an integrally mounted, nonremovable headshell at the other end. For this new low-mass integrated design, Shure has replaced the usual carbon-fiber headshell with an extremely light cartridge, the MV30HE, permanently mounted to a special SME carrying arm. The plug end of the carrying arm mounts to the

main part of the tonearm, close to the pivots. Since the coupling elements and signal-transfer plug and socket are close to the pivots, and since there is no separate headshell or mounting hardware at the cartridge end of the tonearm, the new design certainly must qualify as an integrated tonearm/cartridge combination, and a low-mass one at that. The advantages inherent in an integrated tonearm/cartridge design can be significant. The new Shure MV30HE, while based upon the now-famous V15 Type IV, was designed specifically to complement the SME 3009 III tonearm. It is supplied only as an integral part of a carrying arm for the SME 3009 III so that none of the normal compromises, necessary so that a cartridge can be used in a variety of tonearms, had to be made by Shure in this design.

Although the Shure MV30HE shares some common design parameters with the V15 Type IV, such as a similar magnetic design and the same hyperelliptical stylus, they differ radically in appearance. The MV30HE has none of the mounting accoutrements normally needed by a cartridge to allow it to be mounted in a standard tonearm or headshell, and therefore the new pick-up is very streamlined in appearance. The MV30HE does not offer the dynamic stabilizer which is a feature of the V15 Type IV, but its low mass means that the ill effects upon performance usually caused by record surface irregularities are less severe than would be the case for a more massive design. The build-up of lint and dust, which is all but eliminated by the dynamic stabilizer used with the V15 Type IV, did not seem to be a problem with the MV30HE.

The effective dynamic mass of a tonearm/cartridge combination is the total mass as seen at the stylus and is composed of the distributed mass of the tonearm and cartridge. The dynamic mass of the SME 3009 III carrying arm is on the order of only 5 grams. If the total mass of the MV30HE cartridge, 2.7 grams, is added to this, the total is only 7.7 grams, which is extremely low. The MV30HE weighs only 42 percent as much as the V15 Type IV, which weighs 6.35 grams. The low effective mass of the new MV30HE/3009 III combination results in a very low Q at the main low-frequency resonance of the cartridge/tonearm system. The optimum adjustment of the SME 3009 III tonearm for the lighter mass of the MV30HE required that the coun-

MEASURED DATA

Shure MV30HE Cartridge/Arm Combination

Serial No.: 1

	Left	Right
Inductance, mH	310	310
Resistance, ohms	1056	1056
Output, mV/cm/S at 45° (B&K 2009, band 3)	1.0	1.0

Dynamic Tracking Force

Grams required to track B&K 2010

(Grams x 980 = dynes; 0 dB cm/S lateral or 7.07 cm/S at 45°.)

	Vertical Force	Sidethrust
Band 3, +8 dB	1.25	1.25
Band 4, +6 dB	0.9	0.9

Band 5, +4 dB	0.65	0.65
Band 6, +2 dB	0.45	0.45
Band 7, 0 dB	0.3	0.3

Cartridge Mass: 2.0 grams.

Microphonic Rejection: Excellent.

Hum Rejection: Excellent.

High-Frequency Resonance: 24.4 kHz.

Low-Frequency Resonance: 11.5 Hz with Q of 1.8.

Rise Time: 18 μS.

Recommended Load Resistance: 47 kilohms.

Recommended Load Capacitance: 250 pF.

Polarity: Negative for inward groove modulation.

Recommended Tracking Force: 1.1 grams.

NOTE: Measured data for this arm portion is largely the same as was presented last month; differences are discussed in the text.

The Shure MV30HE/SME 3009 III combination not only equaled the reference system in almost every category, it beat the reference in most.

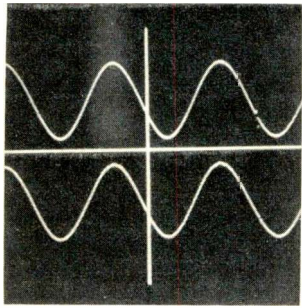


Fig. 1A—Tracking of CBS STR-112 band 9, 300 Hz at +18 dB re: 11.2 μm; 1.0 g tracking force, 1.0 g sidethrust. This photo and Fig. 1B show very good tracking when playing the highest level bands on these test records.

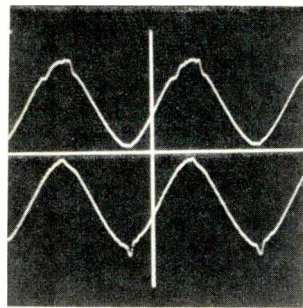


Fig. 1B—Tracking for B&K 2010 band 3, 1 kHz at +8 dB (17.76 cm/S @ 45°); 1.25 g tracking force, 1.25 g sidethrust.

terweights be changed from those used with the V15 Type IV. This also results in an improvement in the performance due to the overall lowering of the effective dynamic mass.

Shure provides a novel plastic guide which can be used to set the correct stylus azimuth when viewing the cartridge from the front. With the plastic guide temporarily fastened to the MV30HE, the cartridge is rotated in the carrying arm until the horizontal part of the carrying arm is parallel to the record surface. This adjustment should optimize the crosstalk between the right and left channels of stereo records. Of course, there are variations from disc to disc in the azimuth of different disc-cutting systems, but the validity of making this adjustment was verified to some extent by checking the vertical output from some mono records. The Shure device, when used with the MV30HE as recommended, proved to be very accurate in setting the optimum azimuth.

Figure 1A shows the left (upper trace) and right (lower trace) channel outputs for the 300-Hz tone on band 5, the highest level band, of CBS test record STR-112. As in all of the previous reports, the upper trace will be the left channel unless noted differently. Band 5 is recorded at a level of +18 dB referenced

2A

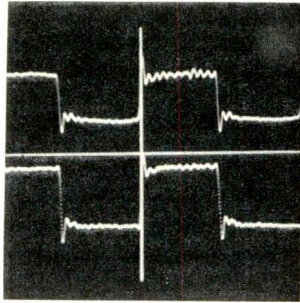
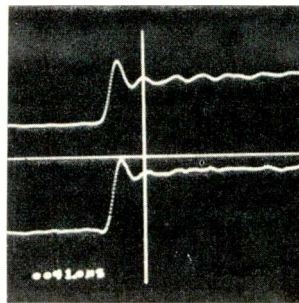


Fig. 2A—CBS STR-112 band 1, 1-kHz square wave; 3.54 cm/S modulation in each

2B



channel. Input loading is R = 47 kilohms, C = 250 pF for Figs. 2A, 2B, and 2C.

2C

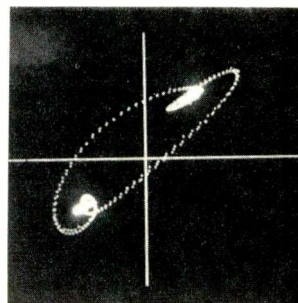


Fig. 2B—Expanded view of 2A; 41 μs is the time of one period at the 24.4-kHz high-frequency resonance.

Fig. 2C—Same as 2A except left vs. right channel showing interchannel phase relationships.

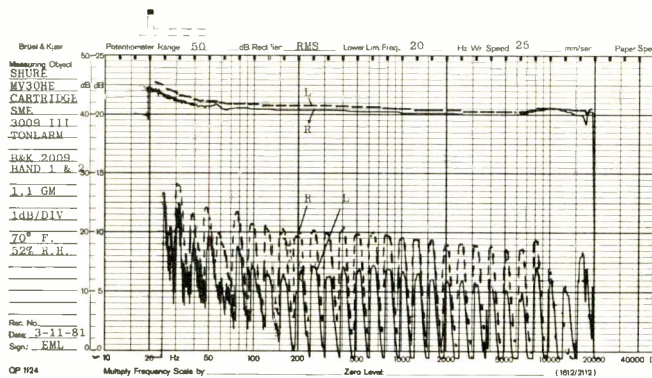


Fig. 3—Amplitude vs. frequency response, and interchannel crosstalk with input loading as in

Fig. 2. The dip at 18 kHz is an artifact of the B&K 2009 test record.

to a groove modulation amplitude of 11.2 μm. The Shure MV30HE tracked this band at only 1.25 grams. This is almost as low as the Shure V15 Type IV, which tracked it at 1.1 grams. There was only a small amount of jitter evident when tracking this band, much less than that seen from other tonearm/cartridge combinations and only slightly more than that observed during the testing of the V15 Type IV/3009 III combination, which was excellent in this respect. It should be remembered that the Shure V15 Type IV had the benefit of the integrally mounted dynamic stabilizer which was very effective in removing jitter induced by record surface irregularities. The antistatic properties of the dynamic stabilizer were also missed at times when playing certain records, which seemed particularly prone to the buildup of electrostatic charges. In the past, with the exception of the SME 3009 III tonearm/Shure V15 Type IV cartridge report, I have shown the results of attempts to accurately track the 300-Hz tone of both band 4 (+15 dB) and band 5 (+18 dB) of the CBS STR-112 test record. Usually, band 5 causes most tonearm/cartridges to severely mistrack. Once again an SME/Shure combination is an exception. Most combinations are also unable to negotiate the highest level, band 3, of the B&K 2010 test record — at any vertical tracking force. In this case, Fig. 1B shows that the MV30HE/3009 III combination was bettered by only the V15 Type IV/3009 III which is the best tracking combination I have measured so far. During the listen-

ing evaluations, no comments were made by the listening panel which could be attributed specifically to mistracking.

Figure 2 shows the response of the MV30HE/3009 III to the 1-kHz square wave on the CBS STR-112 test record. Figure 2B, which is an expanded view of Figure 2A, shows what is commonly called "ringing" at high frequencies. Comparing Fig. 2B of this report to Fig. 8B of the previous V15 Type IV report shows that extreme high frequencies above 20 kHz are coming through the electromechanical system of the MV30HE cartridge. The initial overshoot is at a frequency related to the natural resonance of the interaction between the effective tip mass of the stylus and the compliance of the stylus shank. The resonance of the stylus mass and record material compliance is at an even higher frequency and is insignificant. One way of analyzing such "ringing" is to consider it as a signal delay phenomenon. The same electromechanical parameters which cause the roll-off of the higher frequencies present in the square wave also cause them to be delayed in time. What one sees, then, can be considered as the initial absence of the high frequency, due to delay, and its appearance at a later time. Of course, a perfect square wave requires that all its individual frequency components be present in the right amounts (amplitude) and at the proper time (phase). If the high frequency is delayed, it leaves a hole, so to speak, and what is seen initially is its absence. If the high-frequency resonance is filtered out almost completely by the electromechanical parameters of the cartridge design, then a vacant spot will appear on the square wave immediately after the overshoot portion. In the case of the MV30HE cartridge, the resonance occurs at 24.4 kHz and Fig. 2B shows that it is not greatly attenuated. This is verified by Fig. 4 which shows that the output at 24.4 kHz from the MV30HE is not attenuated as much as the 23-kHz output from the V15 Type IV (Fig. 11 of the previous report).

Figure 3 shows the response and crosstalk between channels for the MV30HE. The input loading was 47 kilohms and 250 pF. The B&K 2009 test record was used so a comparison might be made with the V15 Type IV, although this record seems to have high amounts of crosstalk recorded right in the grooves. This is borne out by a comparison to Fig. 4 which shows tests made for crosstalk using the B&K 2010 test record. Also notice the difference in the high-frequency response between the two records which shows the 2010 record to be down about 3 dB at 20 kHz from the B&K 2009 record. This inconsistency between test records is one of the main obstacles which prevents valid judgments of the quality of phono systems based solely upon objective technical measurements. If records vary this much, even from the same company, imagine the variety which must exist in commercial records! Of course, the test records are valuable in helping to relate technical parameters to subjectively perceived performance as long as the discs' limitations are known and appreciated. Comments from some of the members of the listening panel regarding the good stability of the stereo image on some records could be directly related to the excellent separation indicated by the data of Fig. 4, and to something else which cannot be shown directly in this report, the lack of jitter. This lack of jitter, which can cause a lack of clarity and a smearing of the images, must be credited to a great extent to the SME damping system and to the low effective mass of the MV30HE/3009 III combination.

A change in tracking force from 0.75 to 1.25 grams caused

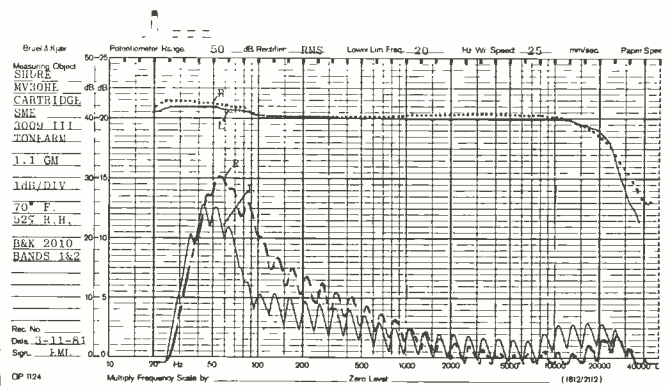


Fig. 4—Amplitude vs. frequency response, and interchannel crosstalk with input loading as in Fig. 2. This test record,

B&K's 2010, has lower crosstalk and has a recorded output of 20 Hz to 45 kHz.

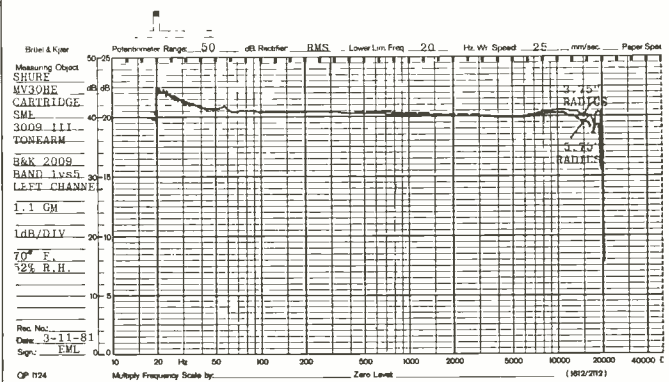


Fig. 5—Scanning loss vs. record diameter, 5.75- and 3.75-inch radii.

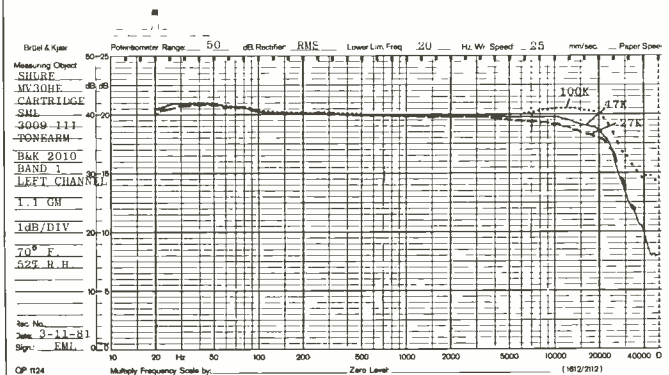


Fig. 6—Effect of resistive loading upon the output using B&K 2010 test record, C = 250 pF constant.

This combination has many of the musical qualities sought by moving-coil cartridge advocates but has tracking capabilities far superior to most MC models.

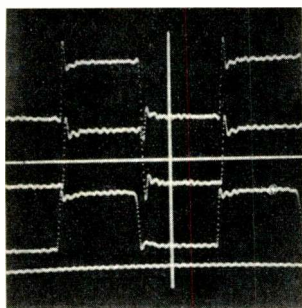


Fig. 7—Effect of resistive loading with CBS STR-112 band 1 record. Top: 100 kilohms; middle, 47 kilohms; bottom, 27 kilohms; C = 250 pF constant.

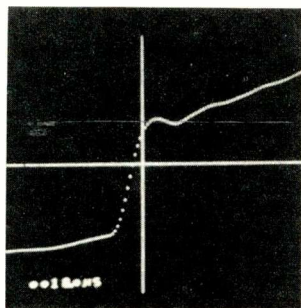


Fig. 8—Rise time is 18 μ s with load of 250 pF and 47 kilohms, very good performance.

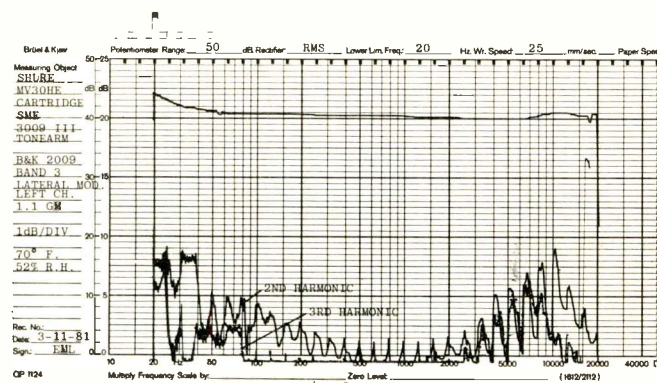


Fig. 9—Second and third harmonic distortion with lateral modulation from band 3 of the B&K 2009.

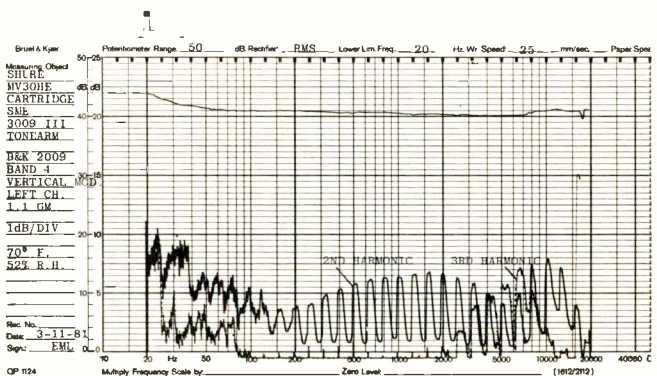


Fig. 10—Second and third harmonic distortion with vertical modulation from band 4 of the B&K 2009.

little change in the amplitude vs. frequency response and is therefore not shown in this report, but the variation of frequency response with record diameter is shown in Fig. 5. The scanning loss characteristic, due to tracing loss or "pinch effect" at the inside record diameter, is not as great as has been seen with some cartridges and must be credited to excellent shape characteristics and orientation of the stylus of the MV30HE.

After measuring the variations in amplitude vs. frequency response with changes in input resistance loading (shown in Fig. 6), as well as making many other measurements related to the values of resistance and capacitance input loading, too numerous to include in this report, the values recommended by Shure of 47 kilohms and 250 pF were confirmed as being the best. These values were used for the remaining technical measurements and for the listening panel evaluations. Although it might appear from Fig. 6 that 100 kilohms would be a better choice, this value allows the input capacitance to have a greater effect upon the high-frequency response and therefore should be avoided. Also, other test records do not show as much high-frequency roll-off as the B&K 2010 test record. The listening panel comments regarding the extreme high frequencies verified the choice of 47 kilohms and 250 pF for the input loading values. All agreed that the top end response was excellent, and such comments as "extended," "clear and precise," and "clean," were noted. The sound was so clear, in fact, that comments were made about what was thought to be modulation noise from the tape master on some records. This type of noise was, of course, absent from some direct-to-disc records to which the panel listened.

Figure 7 shows the effect upon the 1-kHz square wave on the CBS STR-112 test record of variations in the input resistance loading. While making these measurements, the frequency of the "ringing" was checked at 33 1/3 and 45 rpm. No correlation could be found which would be related to the difference in speed, which would be the case if the "ringing" were actually caused by modulation recorded into the grooves. Both the lateral and vertical modulation bands of the CBS STR-112 test record were checked since we had seen information to the effect that high-frequency modulation had been found in the grooves by another laboratory. Our tests were necessarily brief, but they seem to indicate that the high frequencies on the square waves of Fig. 7 are not modulated in the grooves of our copies of the CBS STR-112 test records.

The rise time of 18 μ s, shown in Fig. 8, for the Shure MV30HE cartridge is about 1.4 times faster than the 25- μ s rise time of their V15 Type IV into a similar input load and very good for this general type of magnetic cartridge design. This seems to relate well with the comments of the listening panel regarding the top end performance of the MV30HE cartridge. This rise time is partly related to the inductance of the coils, which measured 310 mH compared to 480 mH for the V15 Type IV.

The effective mass of the MV30HE stylus is about the same as that of the V15 Type IV, since the high-frequency resonances are about the same at 23 kHz and 24.4 kHz respectively. The 1.0 mV/cm/S @ 45° output of the MV30HE is only slightly less than the 1.2 mV/cm/S @ 45° output of the V15 Type IV.

Figures 9 and 10 show the second and third harmonic distortion of the lateral and vertical modulation bands of the B&K 2009 test record respectively. While much of the distortion is likely due to the record cutting system, it is possible to see a

difference in distortion between the MV30HE and the V15 Type IV, particularly in the range between 2 and 6 kHz, with the MV30HE having the lower distortion. Listening panel comments, particularly with respect to the clarity and sheen to the sound of massed strings, could perhaps be related to the relatively low distortion in what is considered to be the "brightness" range.

In past reports we have presented a sequence of photos showing the left and right channel outputs and the left vs. right phase information for 3, 5, 10, and 20 kHz. These were obtained by capturing and storing the signals from the B&K 2009 sweep frequency test record that is used to obtain the amplitude vs. frequency response graphs shown elsewhere in the reports. This way, the same record can be used to generate the data for both forms of presentation. To do this, a computer-controlled Nicolet Explorer III digital storage system is used, allowing the signal to be captured when it is precisely at the required frequency. Since the data at 3, 5, and 10 kHz were so similar for the MV30HE and the V15 Type IV, only the data for 20 kHz are shown in Fig. 11 for the Shure MV30HE.

Figure 12 indicates the excellent damping of the MV30HE/3009 III combination using the smallest damping paddle, which was also used during the listening evaluations, and Fig. 13 shows the response of the MV30HE to the 10.8-kHz tone burst of Shure test record TTR-103. Comments from the panel regarding the superb reproduction in the bass range can be related to the good damping at the low-frequency resonance, which occurs at 11.5 Hz. The Q at this resonance is 1.8 and the roll-off of lower frequencies is quite steep, being down about 20 dB at the main record warp frequencies around 4 to 5 Hz. The isolation from the effects of the sound field at the cartridge position were excellent and are so similar to the data for the V15 Type IV/3009 III combination that they are not shown here.

For this report, the polarity determining signal was obtained by using band 12 of the JVC TRS-1004 test record. Figure 14 shows the output from the MV30HE for the asymmetrical signal on this record. This signal is repetitive at 370 Hz but has a 3/7 duty cycle for the positive vs. negative parts of the waveform. The recorded polarity follows the recommendations for the CD-4 four-channel disc format, and the Shure MV30HE adheres to this convention.

The new Shure MV30HE was a pleasure to set up and test, proving itself an excellent performer both during the subjective evaluation by the listening panel and during the technical measurements. The MV30HE/3009 III combination not only equaled the reference system in almost every category, it beat the reference in most. The deep bass was as good as the reference system. The performance in the upper bass, for example in the lower range of the guitar, was judged superior to the reference system. Reproduction of solo voice was judged as good, while reproduction of massed voices was judged superior to the reference system. The clarity of the upper registers was considered superb by some members of the listening panel. The general consensus of this panel, which is certainly borne out by the technical measurements, is that the Shure MV30HE/SME 3009 III combination has many of the musical qualities sought by moving-coil cartridge advocates but with tracking capabilities far superior to most MC cartridges. What is also very good is that these fine attributes are available at what seems to be a very reasonable price.

Edward M. Long

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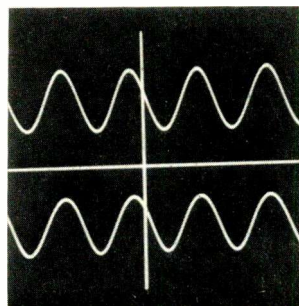


Fig. 11A—Left and right channels at 20 kHz, stop action of sweep tone on B&K 2009.

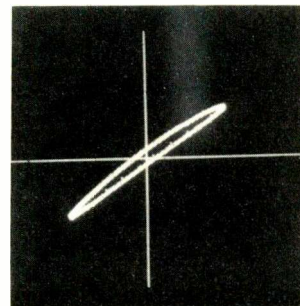


Fig. 11B—Left vs. right channels at 20 kHz, as in Fig. 11A. The interchannel phase response is slightly off.

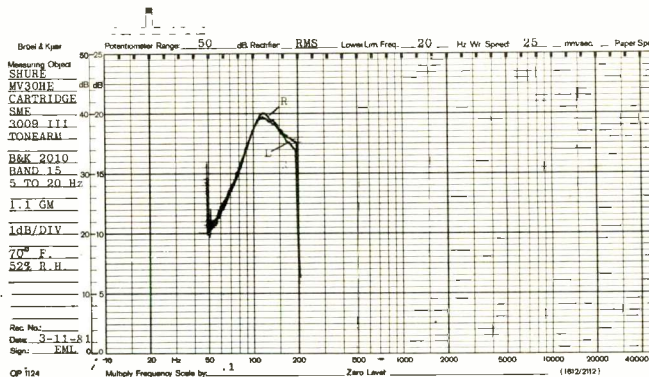


Fig. 12—Low-frequency resonance is at 11.5 Hz with a Q of 1.8 using small paddle of the SME 3009 III.

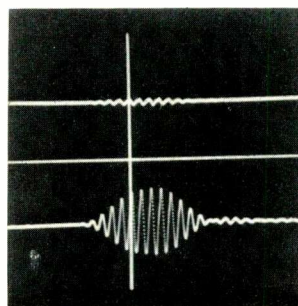


Fig. 13—Response to 10.8-kHz tone burst from Shure TTR-103 test record, band 4, 30 cm/S peak @ 45°. Right channel, below, shows output, while left channel shows crosstalk.

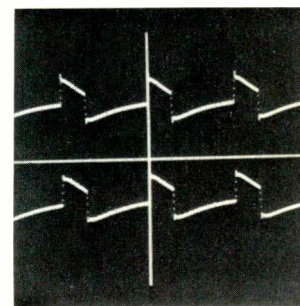


Fig. 14—Polarity test using band 12 of JVC's TRS-1004 test disc, 370 Hz, with a 3/7 duty cycle. Output is negative for modulation of the groove toward the center of the record.

3

**MITSUBISHI
LT-30
TURNTABLE**

Manufacturer's Specifications

Type: Two speed.

Motor Type: Direct drive, d.c. servo, quartz PLL.

Wow & Flutter: 0.04 percent W rms.

Rumble: 78 dB (DIN "B").

Platter: Aluminum diecast, 3.3 lbs. (1.48 kg).

Arm: Straight stainless tube.

Headshell: Magnesium diecast.

Dimensions: 19 in. (48.26 cm) x 16¼ in. (41.27 cm) x 5¾ in. (14.60 cm).

Weight: 33 lbs. (14.85 kg).

Price: \$690.00.

The Mitsubishi LT-30 must take its place among the top few turntables now available.

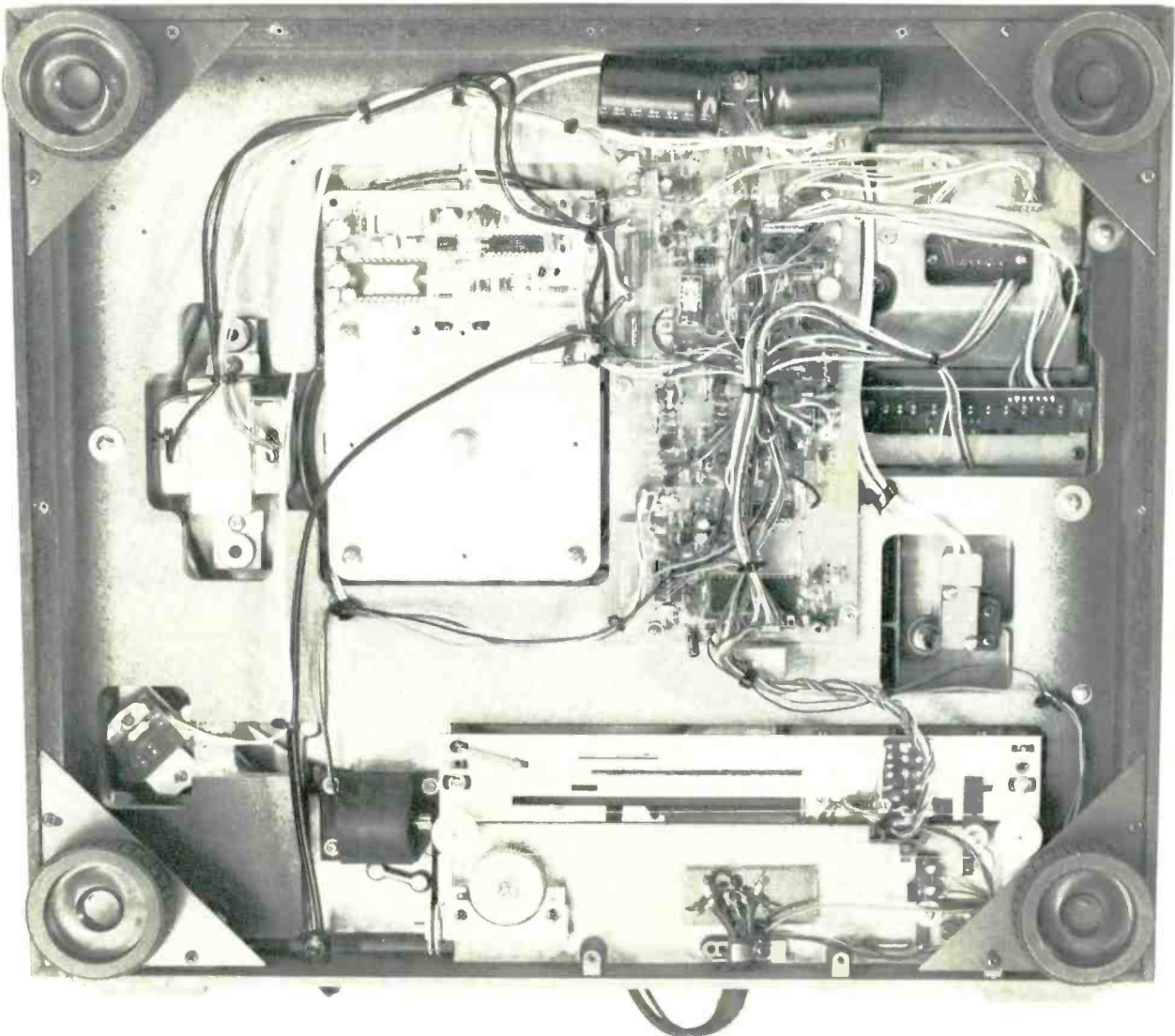


During the past two years, a surprising number of straight-line tracking turntables have appeared on the scene, and more are on the way. Most use optical sensors to keep the cartridge aligned, while the arm is moved by a separate slide motor. Each revolution of the record brings the stylus one groove nearer the center and thus tends to pivot the arm a fraction of a degree. This operates the sensors which in turn activate the motor to move the arm. The technique is now firmly established, and, provided the mechanical parts are properly designed and engineered, it can work very well indeed. Whether the advantages of tangential tracking are more theoretical than real is debated in some circles, but it certainly disposes of the anti-skating complications—no magnets, springs, or hanging wire outriggers! There is another very real advantage: Most turntables of this type are a real delight to use because of the simple, positive cueing.

The model selected for review, the Mitsubishi LT-30, is a trifle

larger than conventional turntables, measuring 19 inches by 16¼ inches by 5¾ inches. The motor board is made from diecast aluminum, styled in charcoal gray and silver, and it contrasts with the wooden base covered with an attractive rosewood vinyl veneer. The unit stands on four large isolating feet. The arm assembly is mounted on nylon rollers which move on two parallel rods at the rear, and it is provided with both height and tracking angle adjustments. The arm itself is made from stainless steel and measures 6⅞ inches from pivot center to stylus. It is a statically balanced type with a calibrated balance weight at the rear.

Over on the left-hand side, near the platter, is a light, mounted in a plastic deflector, which functions with a sensing circuit to gauge the record size and determine the speed and correct lead-in position of the arm. Small prisms mounted on the turntable mat project through the platter to receive light from the aforementioned deflector. If a 12-inch record is placed on the



Most tangential tracking turntables are a real delight to use because of the simple, positive cueing.

platter, all the prisms are covered so a logic circuit switches the speed to 33 rpm and sets the arm lead-in position accordingly. A small 45-rpm record will not cover all the prisms, so the speed would automatically be changed and the arm would move to the appropriate position.

At the front of the unit, on the right, is a control panel containing six push buttons for speed, repeat, cue, start, stop and platter on-off. This last switch allows the platter to rotate without the arm moving, thereby facilitating record cleaning. Just behind the group of push buttons is an illuminated display showing the speed (33 or 45 rpm), quartz-lock indication, direction of the arm, and tracking error. If tracking is correct, a vertical line illuminates. If one of the associated arrows lights up more than momentarily, the arm must be adjusted accordingly. The motor is a direct-drive type, servo controlled by a PLL circuit.

In-Use Tests

For test purposes, an Adcom XC-E moving-coil cartridge was mounted on the headshell and the tracking force set to 1.7 grams. After checking the operation of the unit, adjusting the height and so on, wow and flutter was measured. The combined figure was a very good 0.035 percent (DIN 45-507). Rumble was a very low 64 dB (ARRL), and the arm resonance was at 8 Hz with a rise of 3.5 dB. Calibration of the balance weight was found to be accurate within 5 percent. Speed was right on the nose and showed no measurable drift.

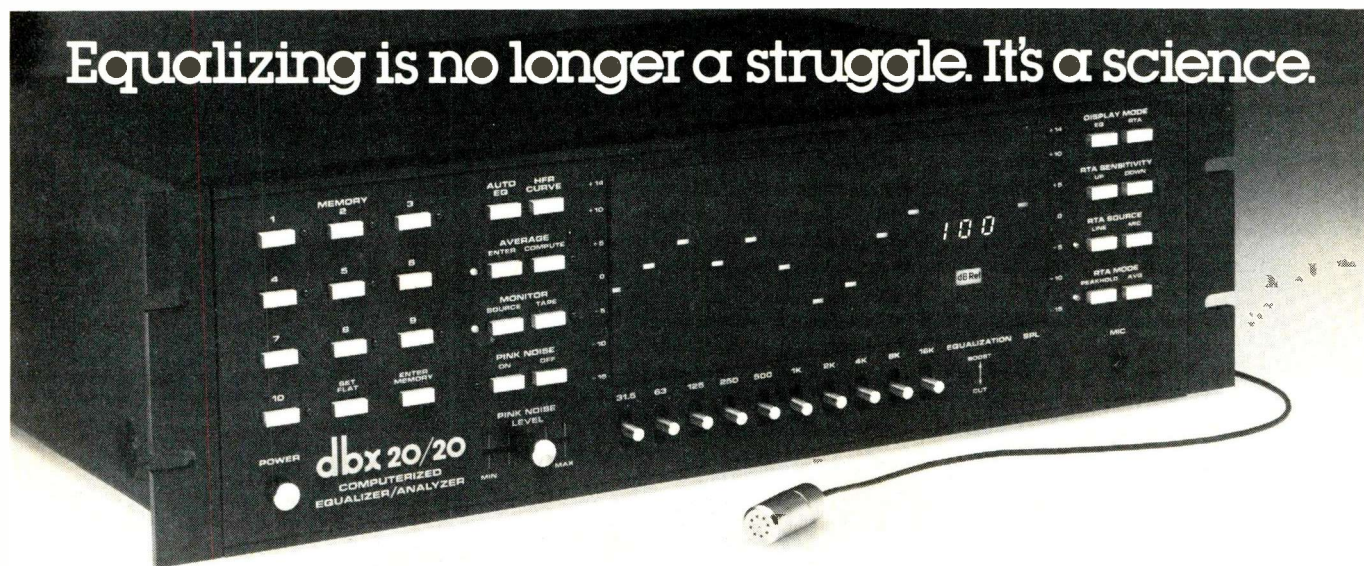
To operate, the start button is depressed and the arm moves over until it lowers the stylus into the lead-in groove. At the end of play, the arm returns to its rest, taking about 20 seconds. If you keep the start button depressed, the arm will continue to move (at half speed beyond the lead-in groove) until your finger is removed and then a touch of the cue button will cause the arm to be lowered. If you want to backtrack, it is only necessary to press the stop button and the arm will rise and move into reverse until the cue button is pressed. Thus, the arm is nicely controlled in both directions, smoothly and without fuss, bounce or backlash. The unit was used to transfer a number of record selections to tape for a local college. This exercise required accurate cueing with a speech commentary, and the LT-30 proved to be a real pleasure to use.

Because of the logic control circuit with the platter sensors, colored discs, 12-inch 45-rpm or 10-inch records cannot be used in the full automatic mode, and the speed must be set manually. According to Mitsubishi, transparent discs can be played if a circle of black paper is placed underneath. I tried a Scotch anti-static foam pad and had no problems.

The unit was relatively insensitive to acoustical feedback, and the base could be knocked quite hard before mistracking occurred. Unquestionably, the Mitsubishi LT-30 must take its place among the top few turntables now available and it well deserves a really high-grade cartridge.

George W. Tillett

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THE COLUMN

MICHAEL TEARSON
JON TIVEN



Spirit of St. Louis: Ellen Foley
Epic/Cleveland NJE 36984, stereo,
\$5.98.

Sound: B- Performance: A-

That Ellen Foley's second album abandons the power rocker stance of both her first album and her work with Meat Loaf is a surprise considering the success of Pat Benatar.

Spirit of St. Louis is a startling change of direction. Production is handled by "My Boyfriend," a.k.a. Mick Jones of The Clash who also co-wrote half the album with Clash band-mate Joe Strummer. The musicians include all of The Clash plus assorted members of Ian Dury's Blockheads and violinist Tymon Dogg. With such a New Wave line-up the big surprise is that the sound is more on the lines of what is called Adult Contemporary than power rock.

Tenderness is the dominant emotion of the album. And it is most prominent in the songs of Jones and Strummer, particularly "The Shattered Palace" and "Torchlight." The former is very European sounding — The Clash meet ABBA. "Torchlight," a pure love song, features Jones as lead singer in a remarkable duet with Foley, much as Foley sings lead on "Hitsville U.K." on The Clash's *Sandinista*. In fact, Foley's album was cut in and around the *Sandinista* sessions. Another standout is the Strummer-Jones paean to driving, "M.P.H." Ellen herself wrote the powerful "Phases of Travel."

What is most obvious is the maturity in Ellen's singing this time around. Instead of the mindless power vocals that made songs like "Under My Thumb" ludicrous on her previous Ian Hunter-produced album, The Clash's Jones has opted for more of a cabaret feel, a more adult approach. Indeed, "My Legionnaire" at the close of side one is a fine example of an art song. The songs selected for the album display emotional consideration and depth, qualities conspicuously absent from Ellen's prior work. She has matured from a one-dimensional belter into a womanly singer. The album goes completely against the grain of the marketplace, which probably will limit seriously its prospects for success: a shame. It is almost an indictment of the tunnel vision that dominates the record business here in the 1980's.

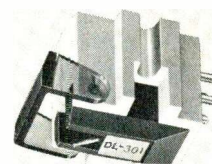
Can an album of other than obvious merits find its audience? Stay tuned for our next thrill-packed episode. . . .M.T

Competition: Tom Dickie & The Desires
Phonogram SRM-1 4018, stereo,
\$8.98.

Sound: B Performance: A-

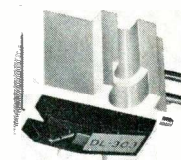
If Nick Lowe had done things right, he might have been Tom Dickie. Forget about power pop bands, New Wave, and all the late '70s trends that have come down the pike and just get in there and boogie with AC/DC, Rainbow, and Blackfoot! The difference is that al-

THE DL-300 SERIES

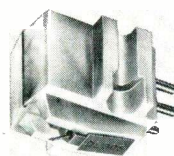


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though they've got the heavy metal/flanged guitar sound in the bag, Tom Dickie and cohort John Macey are strong melodic writers who could appeal to the Bram Tchaikovsky/Alex Chilton/Badfinger crowd as well. Dickie has got all the smoothie inflections of a singer like Paul McCartney (or Nick Lowe). Despite the fact that this is a good record, it might even sell a few copies as long as the band isn't put on tour with Dirty Looks or Elvis Costello since they're more likely to appeal to a (heh, hem) Bad Company crowd.

Check out side one, f'rinstance. "Downtown Talk" is your basic riff-rock song, charging down the line with a fa-

miliar lick (could that be from The Move?) and a vocal delivery a la Tom Petty, but is something every Rush fan could get into. The title track is a reggae thing, so we'll skip that even though it's good, but the next one, "House of Mirrors," sounds like Heart or Led Zeppe-
lin! But what's Nick Lowe doing singing?

Of course there are some lighter, poppier moments: "Inside" (vintage Declan McManus), "On the Other Side" (Beatles '65), and "Burnin' Up" (Mott The Hoople) to keep the hepcatz happy. Then the question arises: Is Tom Dickie & The Desires a melodic group for the qualude set or a heavy group for New Wavers? Obviously they're hedging all

their bets, and it will be up to the record-buying public to decide. One thing is for certain: This is no one-hit wonder, this is a force to be reckoned with. Forewarned is forearmed.
Jon & Sally Tiven



Some People: The Johnny Average Band

Bearsville BRK 3514, stereo, \$8.98

Sound: B

Performance: C-

When Johnny sings, it's Average all right — they've got the unmistakable delivery of a bar band trying to inconspicuously drift into the New Wave vein. His songs aren't knockout, particularly when it comes to lyrics (example: "Whatcha gonna do when the reggae breaks your heart"), but the band plays fairly well with famed sidemen like Wells Kelly and Shane Fontayne helping them out. But only when Average's girlfriend Nikki Wills sings does any distinctive sound emerge, and they only let her really open her mouth on one tune ("Ch Ch Cherie") on which Blondie's "Heart of Glass" is simulated with authenticity. Mr. Average should stick to guitar playing and let Nikki sing all the time, and maybe next time around they'll sound (dare we say it) better than Average.

Jon & Sally Tiven

Honi Soit: John Cale

A & M SP-4849, stereo, \$8.98.

Sound: B+

Performance: B

John Cale has been an extremely erratic artist, not only in his musical stylings (which have ranged from obscure classically oriented electronics to heavy metal) but even in the frequency of his releases (this is his first studio album in five years or so). This is closest in approach to his *Paris 1919* (Jim Morrison sings Procol Harum), though the substance of that work seemed a little more inspired than what is here. He's still going for that bombastic "grand piano in an airplane hangar" sound, although without British engineers/producers it isn't quite the same. Still, Cale does

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have his gutsy moments and his songwriting evinces the same emotions as it always has, but somehow he's the most convincing when he's at his most minimalistic. Witness the pure force of *Fear*, which is mostly guitar, keys and voice, or better still, his finest moments with his three-piece band (fronted by Chris Spedding) or jamming with Mick Ronson at the Ocean Club. One can only regret that more of these moments weren't preserved for all time. In the meanwhile, *Honi Soit* isn't bad at all.

Jon & Sally Tiven

Escape Artist: Garland Jeffries
Epic JE 36983, stereo, \$8.98.

Sound: B+ Performance: A-

All of a sudden Garland Jeffries is a trendy "must-hear" as opposed to the brilliant (but decidedly underrated) singer/songwriter who's been releasing excellent albums over the past 10 years. Granted, being backed by The Rumour certainly puts points in his favor with the people who closely scrutinize such goings-on, and covering "96 Tears" ingratiates him to the punk rockers, but certainly he's made records that sound as good many times before. So why the fuss? Although this is a very good Garland Jeffries record (aren't they all?), the major difference is that his record com-



pany is putting a lot of money into a campaign that will make sure that you are at least aware of the album's existence, if not constantly bombarded by it on the radio (a la Bruce Springsteen).

They couldn't have chosen a better artist to put their guns behind, because Garland Jeffries is a rare breed of songwriter who not only has struggled enough to deserve such a break, but has kept both feet on the ground during his recording career and is still a wholly viable talent. Bob Clearmountain has given him the production bite that brings out the character in his songs, and Jeffries' voice is sort of a Jagger-meets-Marley

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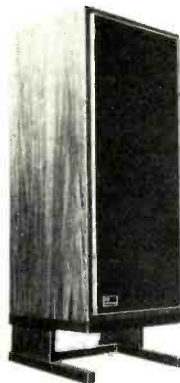
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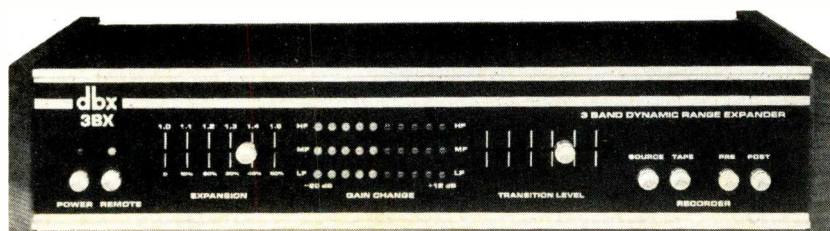
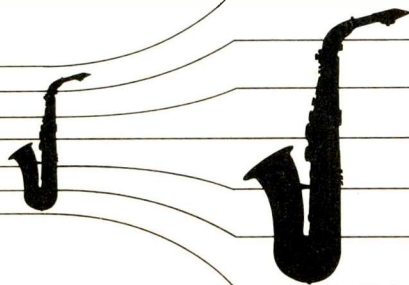
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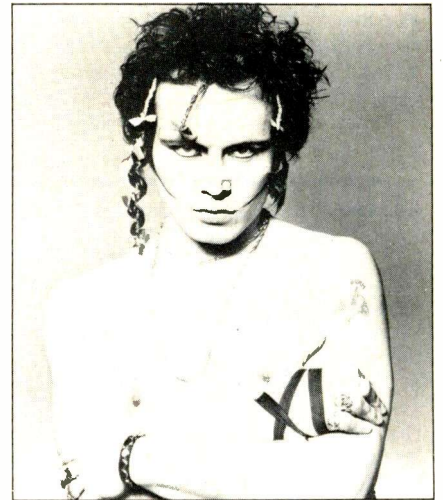
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tool. *Escape Artist* is a fine record, and his fans from way back shouldn't be offended by his new-found fame. But if we start hearing about Garland hanging out at all the wrong places with Margaret Trudeau and Britt Ekland, we may have to change our tune when his next record comes out. *Jon & Sally Tiven*



Kings of the Wild Frontier: Adam & The Ants

Epic NJE 37033, stereo, \$5.98.

Sound: B-

Performance: A-

Adam & The Ants possess a rare combination of concept, image and timing. With a clutch of songs that specialize in sloganeering and swaggering — "Antmusic for sexpeople" — they automatically establish a cult situation from the first notes of either side of the album just as David Bowie did with *Ziggy Stardust*, the album which catapulted him to the foreground nine years ago. As with Bowie, costuming is an essential element to their success, as is the spirited playing by the band — particularly the drummers.

Back when *Ziggy* appeared it scared the pants out of radio programmers. It took a few fanatics to play it, and once heard it took off. The same is likely to be the case with Adam & The Ants. Bowie outgrew the *Ziggy* persona and kept on growing and changing; whether Adam Ant has this long-term potential is questionable, but youth and a canny sense of outrage are on his side. The combination of American Indian imagery and rhythms with pirate outfits and motifs is a fascinating heady brew.

Three of Kings' songs have rocketed to #1 in England with the album a solid #1 for three months running as I write, and Australia has fallen to the *Insect Prayer*, too. Can America be far behind? I think not.

As Adam Ant says, "You may not like it now but you will/The future will not stand still." Truer words are hard to find.

M. T.

Joan Jett

Boardwalk JJ 707, stereo, \$8.98.

Sound: B- Performance: C+

Joan Jett's career began as a puppet for Kim Fowley, whose fantasies for an all-girl rock band were lived out through The Runaways. It wasn't long before those girls were biting the hand that fed them, disowning poor Kim and "breaking out on their own." The group eventually fell apart, and two years later Joan, the spokesperson for the group, has at last released her own artistic statement, a solo album with The Blackhearts.

Once again, she's merely the front figure for someone else's idea of what she should sound like. Producers Kenny Laguna and Ritchie Cordell (best known for their work with Tommy James & The Shondells) mire her voice in echo, write the bulk of the songs themselves (Ms. Jett gets a total of four co-writing credits), and generally make the record sound like a British pop production of 1972. The two tracks produced by The Sex Pistols are slightly better sonically, but still very little of Joan Jett is heard, merely a wall of reverb and various ses-



sion musicians. As far as the overall quality of the record goes, side one isn't bad for this sort of thing, but on side two everything falls apart; the songs, arrangements, and playing are wholly lackluster. Perhaps with her next album Joan Jett will be able to abandon her mentors and for once make a record on which she can be heard
Jon & Sally Tiven

Sinsemilla: Black Uhuru

Mango MLPS 9593, stereo, \$7.98.

Sound: B+ Performance: B+

Reggae, like soccer, has been the next big thing for most of the last decade. While developing, a rabid cult following, only Bob Marley has made forays into the mass consciousness if you discount the appropriations of people like Elvis Costello and The Police. Reggae, when performed in its true Jamaican spirit, is simply too ethnic for most people. Like the blues, it speaks in a dialectic that lacks familiar reference points in both content and presentation.

Black Uhuru, a vocal trio led by the sweet voice of Michael Rose, has re-

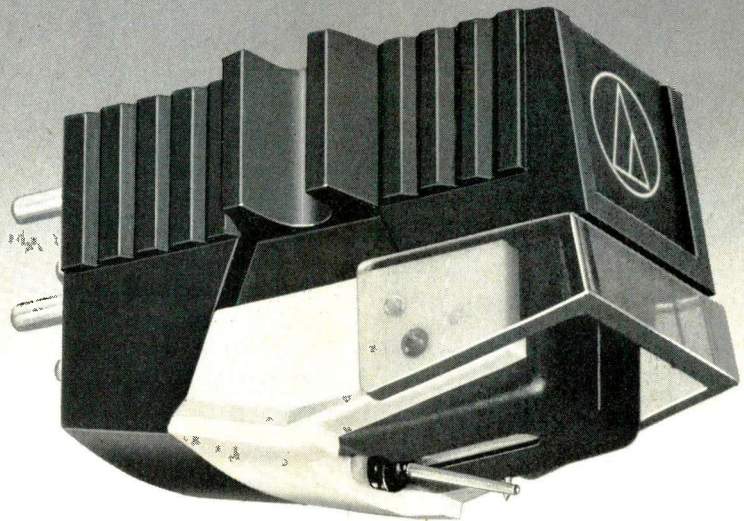
leased its first LP in the U.S. Unlike its predecessor, *Showcase*, which was dark and texturally dense, *Sinsemilla* has a lightness and clarity to it that emphasizes the unique Jamaican rhythms even more. With drummer Sly Dunbar and bassist Robbie Shakespeare at the production helm, Black Uhuru builds everything around the beat. Rhythms are deceptively simple until you realize that everything is designed to support and enhance the beat in a carefully interlocking superstructure. Bass and drums are mixed high and crisp. The piano is intentionally tinny and percussive and the guitar is used for single note ornaments. Using the dub technique of dropping instru-

ments in and out of the mix, tension is created without resorting to the now cliched use of heavy echo.

Michael Rose's melodies are happy and fervent as he loops his light Rastafarian lyrics around the rhythms. The remaining two-thirds of *Black Uhuru* provide a sparse, supple harmonic cushion that paraphrases Michael's lyrics.

Black Uhuru is not about to break the U.S. commercial barrier with *Sinsemilla*, an album that closely adheres to the formulas and philosophy of the blackest Jamaican reggae. But with crisp production and poignant songs, they have carved their own statement within this very personal music.
John Diliberto

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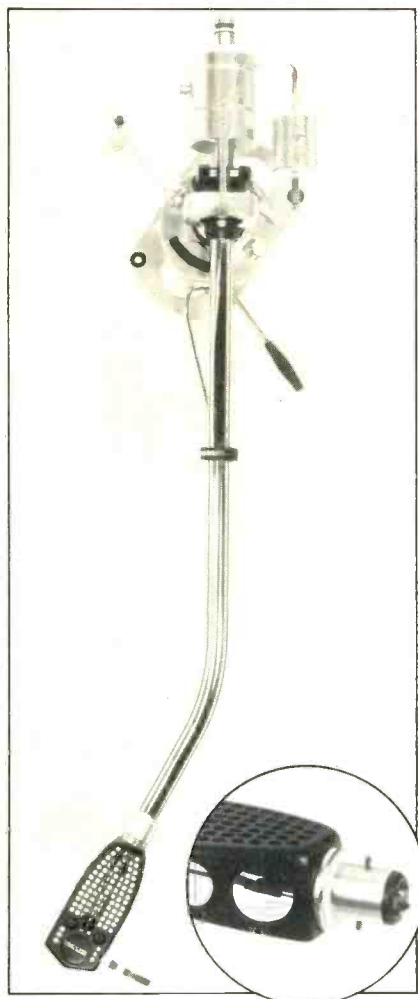
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TOM BINGHAM



Gospel Nights: Maria Muldaur with The Chambers Brothers

Takoma TAK 7084, stereo, \$7.98.

Sound: B

Performance: B+

Freed of the obligations of big-time pop stardom with both its illusions and delusions, Maria Muldaur has made this handsome album of new and old gospel songs. Her singing has only rarely sounded so heartfelt and forceful.

The Chambers Brothers join her for several selections, and on others she has The Burns Sisters backing so that both black and white gospel styles are represented. The Brothers are featured additionally in several tunes on their own. Their signature arrangement of Curtis Mayfield's "People Get Ready" sounds as glorious as ever.

The album was recorded live during a very special night or two at Santa Monica's magical guitar shop, McCabe's. Thus the recording quality is a bit raw, but wonderfully atmospheric and honest to the event and the artists. On *Gospel Nights*, everyone shines.

Michael Tearson

Long Time Gone: John Starling
Sugar Hill SH-3714, stereo, \$7.98.

Sound: A-

Performance: A-

John Starling rose to bluegrass fame as the lower-voiced lead singer and guitarist for The Seldom Scene.

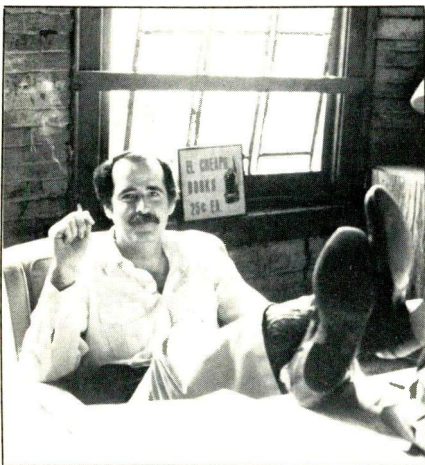
On his first album since leaving this group, Starling moves from bluegrass toward country music, albeit a folk-, rock-, and bluegrass-influenced brand of country. It is generally closer in feel and spirit (but not in instrumentation) to The Seldom Scene's newgrass approach than to Nashville country. Assisting Starling is an all-star cast including Emmylou Harris, Herb Pedersen, the late Lowell George (who co-produced the album with Audie Ashworth), Ricky Skaggs, Tony Rice, Buddy Emmons, The New Grass Revival, and, on a revamped arrangement of The Seldom Scene classic "He Rode All the Way to Texas," The Seldom Scene themselves (minus Starling's replacement, Phil Rosenthal).

Starling has a mellow baritone with resonant low tones and a bluegrass-extended top, a voice best suited for gentle

sad songs with a Don Williams ring to them (though the only Williams-associated song here is Jim Rushing's "Turned You to Stone"). There's a good mix of material from such diverse sources as Dickie Betts (the title song), Paul Craft ("Brother Jukebox"), Dixie Flyers harpman Willie P. Bennett ("White Line"), and traditional gospel ("Jordan," with superb traditional bluegrass harmonies by Skaggs and Craft). There are also a couple of excellent pieces by lesser-known writers, Sam Weedman's "Hobo on a Freight Train to Heaven" and "Last Thing I Needed" by Gary Nunn and Donna Ciscel Acklin.

The arrangements skillfully juggle the acoustic and the electric. Some tracks have a full rhythm section, while others have a sparse pre-bluegrass instrumentation. Starling's reflective, unadorned singing combined with the tastefully uncluttered production supply the glue which unites these varied influences and settings into a coherent unit.

As might be expected, Starling's change in musical direction has met with considerable resistance in bluegrass circles, much as The Seldom Scene did



when they emerged a decade ago. Nashville, in the meantime, finds it convenient to ignore a small-label recording by an "outsider." In any case, I feel safe in recommending this to country, folk, newgrass, and soft-rock fans alike. It would be a shame if an album this solid were to go undiscovered for lack of a pigeonhole. (Sugar Hill Records, P.O. Box 4040, Duke Station, Durham, N.C. 27706; \$6.50 incl. postage.)

Tom Bingham

Magic/In Concert: Jim Post
Flying Fish FF 216, stereo, \$7.98.

Sound: B Performance: A-

Better check the locks on the asylum doors. Jim Post got loose again.

The Texas-born, Chicago-based singer-songwriter is comparatively sober on his studio albums (no doubt the guards

John Starling's reflective, unadorned singing, combined with the tastefully uncluttered production, unites these varied influences and settings.

can keep a close watch on him in this controlled environment.) But put him in front of a tape recorder and an unruly audience of (gulp) college students laughing, singing, clapping at (double gulp) antidraft and antinuke rallies, and Post becomes a living testament to track two of this album's first side, "Brain Damage."

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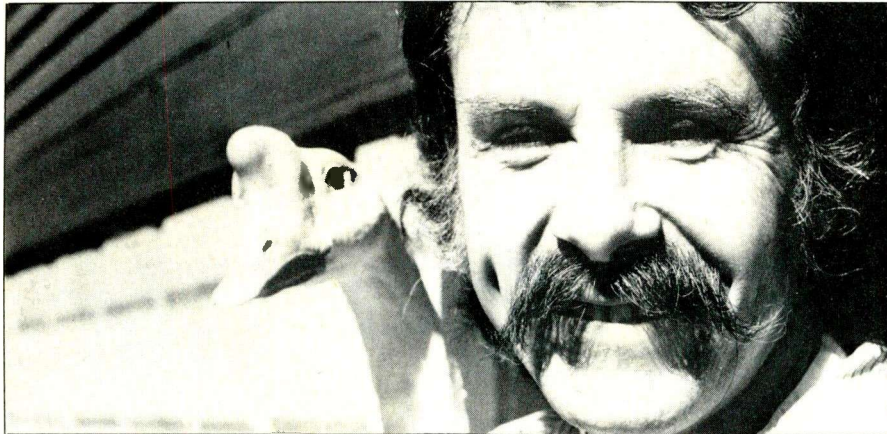
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This is about as close to a definitive Jim Post concert as you're likely to hear. But recommend it? Hardly — I've got a reputation to protect.



There are a few nonwarped, nonpolitical songs on this album, but aside from Post's poignant "Three Soft Touches," these are the products of other, ostensibly saner minds — namely Kendall Kardt, Douglas Steiger, and Dick Nevell, though the latter is suspect, since he produced this album. For the most part, Post is on his soapbox, and in several

cases deserves to get his mouth washed out with the soap from that box. Oh, sure, he's funny, he's clever, he gets his point across to the obvious delight of his audience. But do you *really* want your impressionable college-age children listening to this foul-mouthed, left-wing lunatic? Horrors, he even goes so far as to include Tom Paxton's "Let the Sun

Shine," a deceptively jolly yet insidious ode to solar energy! Worse yet, on a couple of cuts he even makes light of religion — better start stoking those bonfires!

Seriously, folks, Jim Post has been developing increased subtlety as a performer, though admittedly anyone hearing Jim Post for the first time is likely to regard subtlety to be the *least* audible of Post's distinctive traits. His singing is now far less over-theatrical than on his Mountain Railroad albums, while his comedic timing is becoming sharper, more judicious. You may not like *what* he's doing, but you'll have to acknowledge he certainly knows *how* to do it.

Post's voice is spotlighted as it should be, but his guitar (there are no other accompanists) strikes me as too far removed from the vocals in most cases. Songs such as "Get Off, Lay Back" and "Let the Sun Shine" are more realistically balanced, perhaps because Post strums more vociferously on these.

Tom Bingham

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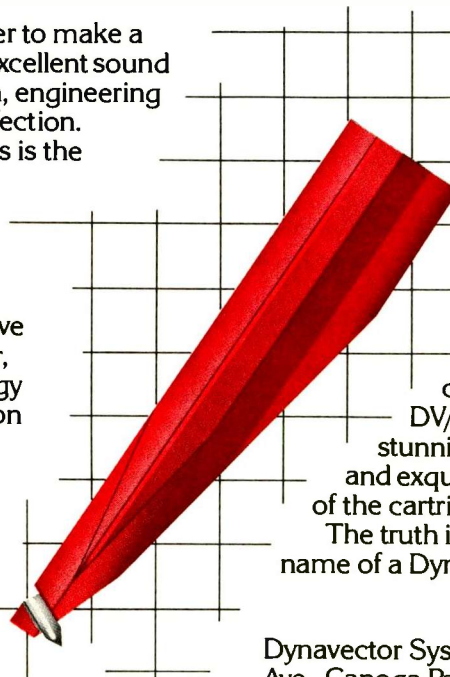
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Starting with Bulletin 1, dated January 15, 1981, The Audio Critic has become a biweekly newsletter. Everything is still the same—the hard-nosed equipment reviews, the sophisticated laboratory measurements to back up the listening tests, the eschewal of paid advertising—only the format has changed. Now it's just a few reviews at a time, but every other week!

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Rivers of Memory: Jessica Williams
Clean-Cuts C-701, stereo, \$7.98.

Sound: B+ Performance: B-

Jessica Williams is a growing pianist who has three fine but overlooked albums, including this one which was released early in 1980. Her first album, *The Portal of Antrim*, was an interesting but flawed attempt at multi-keyboard fusion music. Her second release was two discs' worth of exquisite solo piano introspectively titled *Portraits*.

On her third outing, Williams is still trying to find her own style, but the search is getting more exciting. Obviously not one to stand still, Williams combines the formats of her first releases into an album of multi-keyboard forays with only the occasional backing of a drummer. Her influences range from the opening piano reverie, "Memory of Tomorrow," with its Keith Jarrett derived romanticism, to the Chick Corea dynamics of "Starcloud." In the latter piece, stormy crescendos that build around swirling electric organ and hard-edged piano give way dramatically to a precious little filigree until the drums rush back in.

Elsewhere, Williams nods to the early funk-jazz work of Horace Silver and Jimmy Smith on "Rainforest," where bub-

bling organ alternates with rhythmic piano melodies. Most of the second side is given to straight-ahead piano pieces with Williams using the synthesizer for her bass patterns; this might account for the stiffness which seems to pervade much of her rhythm work. In addition, the three drummers seem a little too rigid in adhering to the beat, restricting the flow of Williams' keyboard work.

This stiffness may also result from the ultra-clean recording techniques employed. The drums are almost too crisp and sharp. Williams' piano is clearly recorded but seems to have no acoustic space around it. This could merely be a matter of listening perception, but when compared to the Jarrett and Corea ECM recordings of acoustic piano, there's clearly a resonance and lushness lacking here. The dryness extends to Williams' blends of acoustic and electric textures, especially on "Starcloud" where the lines are too sharply etched for a real meshing of sound fabric to occur. Conversely, the totally hiss-free pressing helps to balance this out.

But these are all minor flaws in an album of exciting music from an artist who is emerging in her own right without the years of coming up through the ranks.

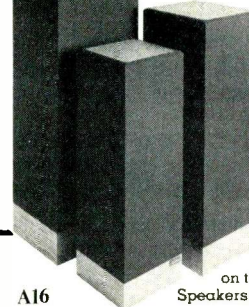
John Diliberto

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The Lester Young Story

Vol. 4, Lester Leaps In

Columbia JG 34843, two discs, mono, \$9.98.

Vol. 5, Evening of a Basie-ite

Columbia C2 34849, two discs, mono, \$9.98.

Sound: A-

Performances: A+

The Lester Young story continues in these two double albums issued in the Columbia Contemporary Masters series. This is not only essential material for any jazz record library, but a wonderful way to sample the spirit and spontaneity of some of the Swing Era's greatest music. The albums, focusing on Count Basie's tenor saxophonist Lester Young, offer everything Young recorded chronologically (for companies now owned by Columbia), from June of 1939 until March of 1941. Much of the material is with Basie, and we are treated to the sound of Young's graceful, airborne solos as they soar and float over the rocking ensembles and background riffs of the powerful Basie band. The relaxed, mellow Basie sax section and the vigorous, hard-charging attack of the Basie brass are a joy to hear on instrumentals like "Louisiana," "Easy Does It," "The Apple Jump," "Riff Interlude," "Broadway," "Ham 'N Eggs," "Hollywood Jump," "Blow Top," and "Clap Hands, Here Comes Charlie," an uptempo tour de force. To please Young devotees, Columbia offers chronological completeness, running two, three and even four takes of the same number consecutively. This is fine in most cases, but who wants to listen to three consecutive versions of a dog tune like "The Five O'Clock Whistle" which Basie recorded in November of 1940? Not even Lester Young can save that one.

Volume 4 has the Basie/Young Kansas City Seven classics, "Dickie's Dream" and "Lester Leaps In"; the lightness and crispness of these 41-year-old septet performances make them sound as fresh as today. On both volumes there are several small-band sessions with a group of all-star musicians backing Billie Holiday; titles include "All of Me," "Laughing at Life," "You're a Lucky Guy," "I Never Knew," and "You're a No Account." Young's legendary rapport with Lady Day is strongly in evidence here. The intimate, lyrical playing one hears on these small band dates makes an interesting contrast to his more aggressive, flamboyant work with the Basie big band.

Volume 4 also has three of the six sides Young recorded for Columbia-Vocalian in 1939 with Glenn Hardman and his Hammond Organ Five. These obscure sides are collector's items (three of them came out in the Lester Young

Story, Volume 3). I find the Hammond organ a lumbering, plodding instrument unsuited to jazz, and at times Hardman sounds as if he's playing intermission at Radio City Music Hall. Young, however, carries the day with fluid, adroitly inventive solos, and trumpeter Lee Castle, in those days a sideman with Benny Goodman, surprises with a series of bright, bristling choruses.

Columbia's remastering and reprocessing from the original 78-rpm discs is first-rate, and both sets offer good, clean mono sound. *John Lissner*

What It Is: David Liebman
Columbia JC 36581, stereo, \$8.98

Sound: B+ Performance: C

The last time David Liebman appeared on a record sleeve lighting up a cigarette, he almost put an end to what had been a very inspired recording career. *Light'n Up Please!* was the name of that record, and it signaled the demise of the previously innovative Horizon label with Liebman's recording of the most abysmal disco-funk. Liebman was silent as a solo artist for more than four years after that '76 album until the 1980 release of a straight-ahead jamming session on the Artists House label, recorded in '78.


On *What It Is*, Liebman, with cigarette in mouth, tries again to enter the commercial jazz mainstream. But this time around he's not willing to give up so much. Instead of doing the normal formula funk album with its cold multi-tracking techniques and faceless session musicians, Liebman has gotten the session musicians and made them play in real time without any overdubbing. This results in an album that is slick and funky, yet it almost lives up to the claim that disco-funk is just another form of jazz. There is some genuine solo work here as Liebman develops his themes without regard to their length.

Don't get the idea that there is any intense inspiration here, however. *What It Is* is a laid-back, funky jamming session with a strong backbeat and some inventive, if restrained soprano and tenor work from Liebman. John Scofield also stretches out a bit, but his tone is thin and dry on this relatively lush backdrop.

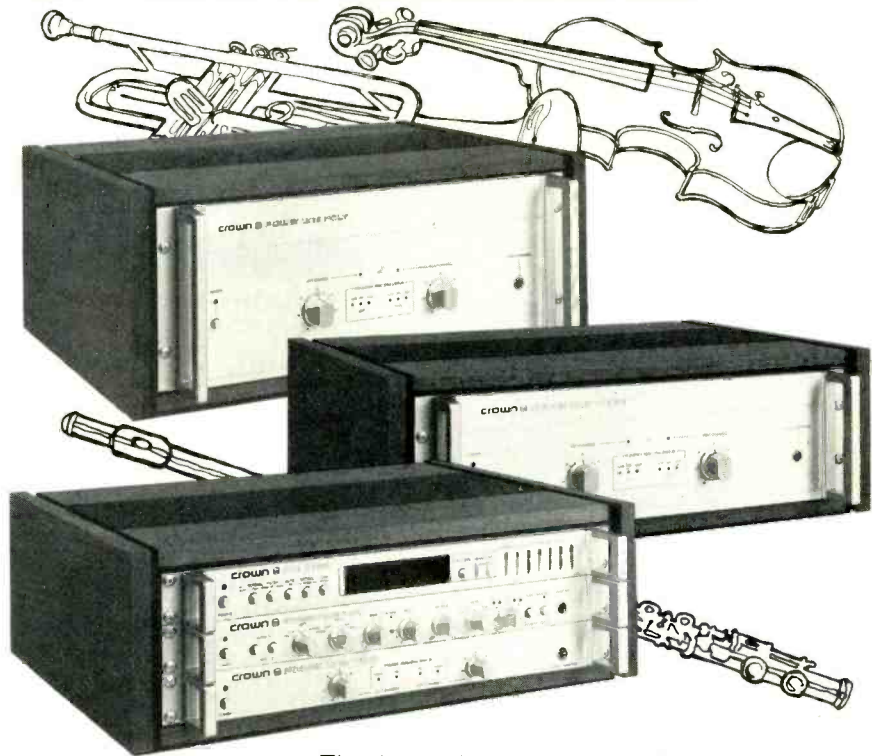
Though the recording of *What It Is* is simple, the sound is rich and full-bodied with Liebman's soprano benefiting from just the right amount of resonance. Marcus Miller's electric bass is especially well-recorded on the intro to "A Dance for Your Thoughts," maintaining a front line presence without losing the bottom. For all its simplicity, *What It Is* is a casual shot at commercial success.

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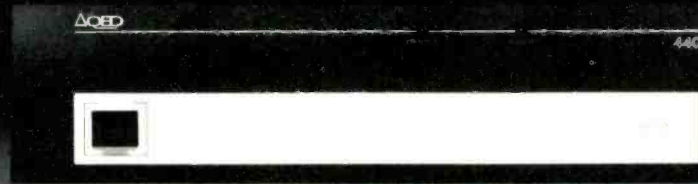
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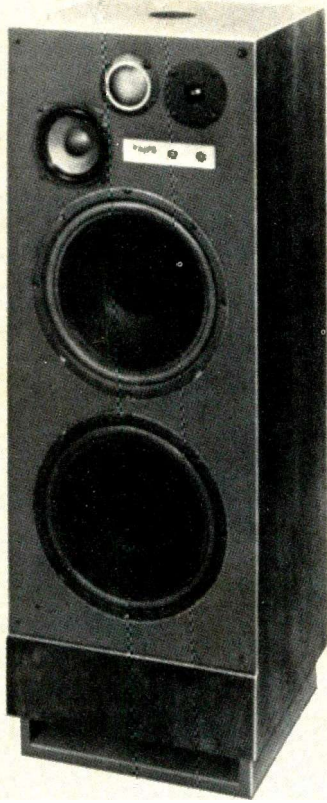
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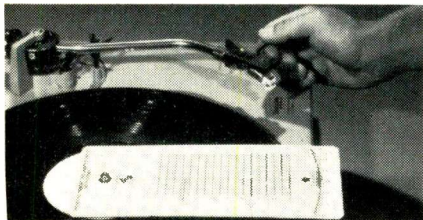
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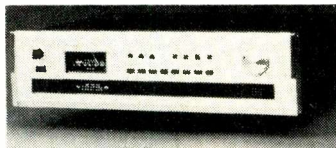
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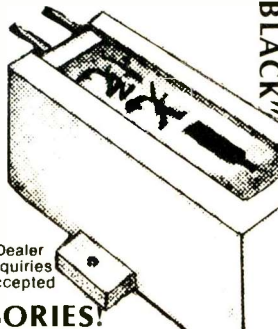
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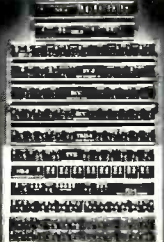
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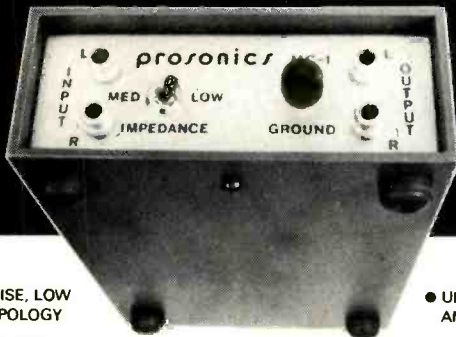
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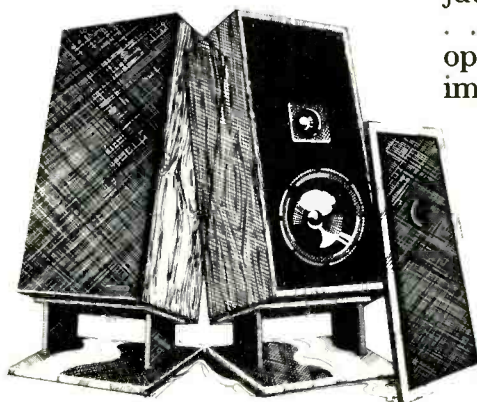
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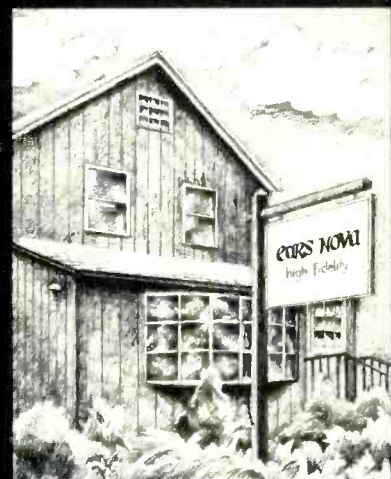
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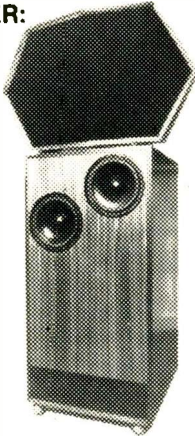
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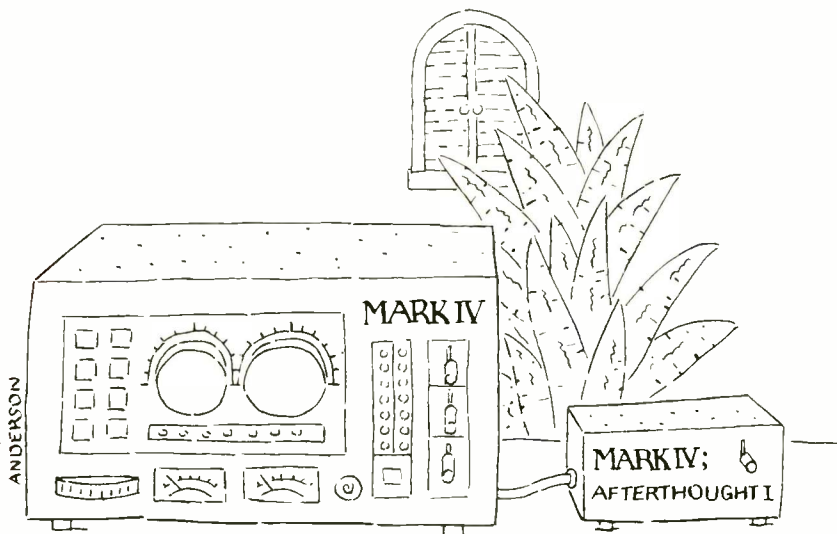
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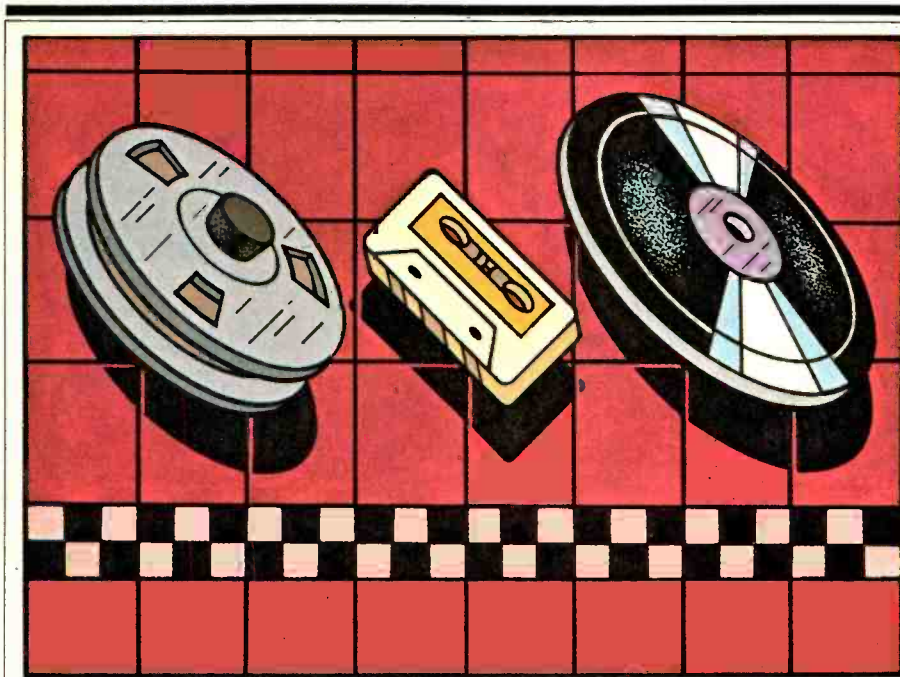
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BEHIND THE SCENES

BERT WHYTE



For many years now, audiophiles have lamented the fact that phonograph records and prerecorded open-reel and cassette tapes have been the limiting factor in their quest for realism in the reproduction of music. To their way of thinking, their high-fidelity sound equipment was infinitely superior to all commercial formats of recorded "software." Of phonograph records, they complained about the lack of wide frequency response and wide dynamic range. Fortissimo passages were overcut and full of distortion. Physically, the records had various forms of warpage, eccentric center holes, and steady-state surface noise, as well as pops, ticks and assorted sonic hash. If their prerecorded open-reel tapes gave them somewhat wider frequency response and dynamic range than discs, it also gave them print-through, interchannel leakage, and the accursed omnipresent tape hiss. As for the lowly prerecorded cassette, no self-respecting audiophile would ever consider it a high-fidelity medium.

Now in 1981, audiophiles who own the very best high-end playback equipment have relatively less justification to malign recorded software. For the most part, music software has not only caught up with high-quality playback equipment, but in many cases has severely taxed the capabilities of such systems.

What follows is a sort of "state of music software" report, and there is such a diverse selection there is almost an embarrassment of riches.

Despite many of the controversial aspects of digital sound (many of the more far-out audiophiles purport to hear such anomalies as "high frequency glare" and "graininess," and "compression" of perspective and ambience), more and more record companies are issuing analog phonograph records made from digitally recorded masters. In addition, many of these companies are lavishing extra care and stricter quality control in the production of these records. High-quality disc-cutting techniques, including half-speed mastering, plus precision electroplating and the use of special vinyl formulations for high-quality pressings are commonplace.

With the exception of London/Decca Records, which has its own proprietary digital recording system, most record companies have not elected to adopt an official digital recording system but are using a number of the systems now available. The Soundstream digital system has been used by Telarc, RCA, Philips, Varese/Sarabande, Chalfont, Digi-tech, Delos, and quite a few other companies. The 3M digital system has been used by WEA, CBS, DGG, and others. Sony has digital credits with CBS, Phi-

lips, M&K, DGG, RCA, and others. JVC has the newest professional digital recording system which thus far has been used by EMI, Capitol, Nonesuch, Vox, and Smithsonian Institution Recordings. Half-speed mastering, with its purported gains in quality, is the special province of Mobile Fidelity records, and now they have been joined in using this technique by CBS Mastersound recordings. The special qualities of dbx-encoded records can be had from such record labels as M&K, Sarabande, Chalfont, Vox, Nonesuch, Ultragroove, and others. Sheffield Labs and Crystal Clear still hold up the banner for direct-to-disc recording. The AudioSource Company can supply special high-quality imported recordings from Japanese Philips, Proprius and Lyricon. The audiophile seeking high-quality recordings can also often find gems in the regular catalog output of London/Decca, EMI, Philips, and Deutsche Grammophon.

Open-reel prerecorded tapes still have their loyal supporters, and the Barclay Crocker people keep faith with them. The quality of their duplications is at a very high level indeed, and with their newly acquired rights to the Philips catalog, there are some superb recordings from this company.

Prerecorded cassettes have come a long way from the efforts of a few years ago, but then so have the cassette players. The level of quality in this medium is most largely dependent on a high degree of synergism between cassette and player. One thing certain is that there is no lack of variety in prerecorded cassettes. So-called standard cassettes, usually issued on a normal ferric oxide tape with 120- μ S equalization, are available on a regular basis from CBS, RCA, DGG, Philips, and London/Decca. Audiophile cassettes are issued on chromium dioxide tape with 70- μ S equalization. Usually some attention is paid to better construction for the shell, and duplicating speed ratios are less than the standard 64 to 1; in the case of the CBS Mastersound cassettes it is 16 to 1. Both Mobile Fidelity and In Sync prerecorded cassettes are duplicated on a one-to-one or real-time basis. Prerecorded cassettes using metal-particle tape are a relatively recent development, and they are now available from JVC, which duplicates these cassettes at a 16-to-1 ratio, and from Audible Images, which duplicates

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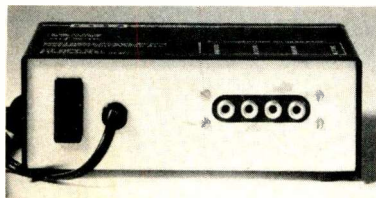
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their cassettes on a one-to-one real-time basis. In another new development, dbx-encoded cassettes are available from Ultragroove, Sarabande, M&K, Chalfont, and several others. Certainly, all the foregoing discs and tapes constitute a pretty impressive array of what is available in high-quality recorded software.

Let's take a closer look at some outstanding recordings from each category. In digital/analog hybrid discs, Telarc continues to issue some generally impressive recordings. A case in point is their DG10054 of Stravinsky's *The Rite of Spring*, with the Cleveland Orchestra conducted by Lorin Maazel. There are about a zillion recordings of this orchestral tour de force, and on balance, at least in matters of sound, this is the best. The spacious acoustics of Severance Hall in Cleveland give a nice warmth to the strings and woodwinds, but don't excessively soften the contours of the brass and percussion which are so important in this score. Dynamic range is as wide as you can put on an analog disc, and some of the thunderous climaxes combining tympani and bass drum are awesome in their impact. Maazel does all of the necessary things in his performance, but if it lacks a bit in thrust and verve, the splendid playing he elicits from the Cleveland Orchestra makes up for this.

Still in the category of digital/analog hybrid discs is a real rouser from Philips. They used the Soundstream system to record the Boston Pops with its new conductor John Williams. Side one of 6302 082 contains classical material with, alas, the great "Orb and Sceptre" march of William Walton taken at such a breakneck tempo that it loses all its majesty. The album is entitled *Pops on the March*, and the second side has some of the great numbers the Pops does so well. "The St. Louis Blues March" and the "South Rampart Street Parade" are cleverly arranged and played with great zest, and the sound will knock your socks off! The recording is of the close-up highly detailed variety, but they have managed to preserve the splendid acoustics of Boston Symphony Hall. Wide dynamic range here as well as room-rattling fortissimos.

From London/Decca come two digital/analog hybrid recordings of tremendous impact that are definitely in the "don't miss" class. One is LDR10015 of Shostakovich's *Symphony #7* (Leningrad) and the *Age of Gold Ballet* by the London Philharmonic conducted by Bernard Haitink. The utterly clean sound is very wide in dynamic range, and the heaven-storming climaxes of the frenetic first movement will leave you limp! The other production, LDR10031, is of Bruckner's *Symphony #5* by the Chica-

go Symphony conducted by Georg Solti. Not only does this recording have a wide dynamic range, it has a very high-level output. This is very useful in the great Brucknerian brass chorales in many parts of the score. You have never heard such brass! Simply overwhelming, and the rest of the recording is on the same elevated plane.

If you want a foretaste of what true digital recording may sound like, try some dbx-encoded discs. You will need a dbx decoder like the \$109 Model 21 or the more versatile Model 224 (it can encode dbx as well as decode) at \$279. I'm sure you all know that the dbx is a compander 2-to-1 and 1-to-2 system which affords 30 dB of noise reduction and a dynamic range on their encoded disc of more than 90 dB. If there is by chance some residual noise on the master tapes that are dbx encoded, it is possible to hear the noise being modulated, although the effect is more noticeable on some types of music than others. With discs encoded from digitally recorded masters, there is virtually no noise. In fact, it is uncanny with some of these dbx-encoded discs that start off with a loud vigorous declamation from the orchestra and then sort of "lunge" at you from a background of dead silence. Two really spectacular dbx-encoded discs are *The Empire Strikes Back* on Chalfont SDG313 and *Boy With Goldfish* on Sarabande VCDM 1000 30. Both were recorded with the Soundstream digital system, and when you say wide dynamic range here, you mean 90 dB. In fact, while some of the fortissimos here are quite awesome (in particular *Boy With Goldfish* affording some of the most stupendous bass drum ever put on a record), it is the extreme pianissimos with a total lack of noise that are the most intriguing aspects of the discs. As to the report in some quarters that the dbx decoder attenuates bass, a single listen to these discs will put that story to rest and will also refute the claim made by some that ambience information is diminished. These discs will stress any sound system to the utmost.

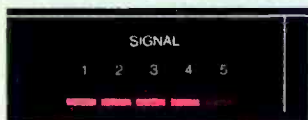
As to how prerecorded metal cassettes sound, on the evidence of JVC MDS-7 *Mountain Dance* with Dave Grusin, the answer is just splendid. The Dolby B encoded tape is quiet and the sound pristine clean, with especially sharp "punchy" transient response. High-frequency response is especially well maintained, which is one of the things you would expect with metal tape.

Well, there you have it. Try any of the recordings in the various mediums mentioned above, and you will find much that will please you from the technical viewpoint in the present state of the art in software. **A**



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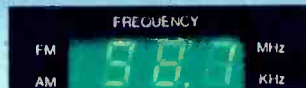
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Technics by Panasonic's Japanese parent company, Matsushita Electric Industrial Co., showed a prototype of a digital audio disc using the Philips-Sony Compact Disc system during a special press seminar in Osaka, Japan, on Friday, March 13th. While company representatives stressed that the unit shown was "only a prototype," they also said that actual production units could easily look very much like the sample displayed. Asked about their earlier commitment to the JVC Audio High Density (AHD) digital disc system, the representatives replied that they were exploring a variety of approaches in the field and that they were still firm in their commitment to the JVC AHD system.

The first player designed for the Compact Disc system was shown in 1979 by Philips, while Sony had their unit on display at the Japan Audio Fair in Tokyo last fall. Both these firms have said that their units will reach the marketplace sometime in 1982, while Matsushita indicated that they would have a Technics Compact Disc player ready within the next year. Software would come from CBS/Sony and Polygram.

The Compact Disc system uses a 4 1/2-inch disc which is scanned by laser optics and has a capability of 60 minutes on each side. While Matsushita representatives felt that it was too early to set a firm price on their unit, such a player will probably cost between \$400 and \$600.

Matsushita looks for a long period of coexistence for standard analog and digital discs and stressed the fact that there is a large consumer as well as manufacturer investment in the present analog system. The reason they are moving toward a digital audio disc, they say, is



S. Obata with the prototype Compact Disc System.

because "music is a universal language," which is to say that there is a viable, i.e. worldwide, market for the musically programmed digital disc. Videodiscs, on the other hand, present special problems to marketing managers who attempt to sell such programming on a worldwide basis since, obviously, shows in Japanese would find no substantial audience in North America and shows popular in one culture would not necessarily be popular in another.

Matsushita officials were also wary about the rapid changes in technology of the digital systems for both video and audio, saying that while careful and extensive research is necessary, software will apparently play a key role in overall system success.

Matsushita also gave the press a first look at the Technics SV-P100 digital audio cassette recorder, a fairly compact unit in a vertical format using VHS videocassettes. No price was announced but it is expected to be in the \$4,000 to \$5,000 range; availability was similarly unannounced.


The SV-P100 uses as a signal format the standard NTSC television signal with coding to the Electronic Industries Assn. of Japan STC-007 standard, 14-bit linear quantizing and 44.056-kHz sampling rate. The unit uses a rotary head and essentially has a built-in VHS mechanism in contrast to the Technics professional-grade digital audio recorder that has a stationary head.

The major advances of the SV-P100,



Technics SV-P100.

compact design and low price, were made possible by Matsushita's development of three large-scale integration semiconductors for PCM digital signal processing and A/D, D/A converter accessory circuitry. While PCM adapters have been shown by several Japanese companies, they have been adapter-only units without the record function so that a video recorder was required additionally. Such adapters were placed in the \$4,000 to \$6,000 price range, plus \$800 to \$1,200 for the video recorder.

Other interesting features of the SV-P100 include electronic editing facilities so that undesired portions can be "jumped" using electronic marks. The same marks can also be used to find a reference point in a "search" mode, while the "locate" function finds a tape location by reference to the tape counter. For digital dubbing, there are digital in and out terminals on the rear panel. 



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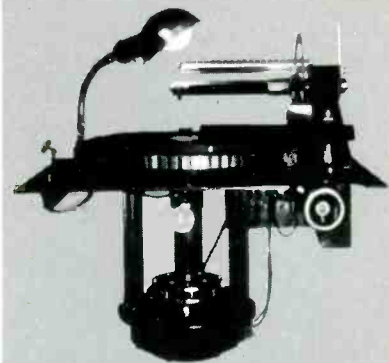
WALTER I. SEIGAL

Radio station WABC was one of the first to have a large, high-power antenna. This 50-kilowatt vertical radiator was located in Wayne, N.J. and was 625 feet high overall. The structural part of the mast was 550 feet high, and this was topped with a 75-foot pole on top of which was a 14-inch diameter metal ball. Four guy wires, each broken into four sections with insulators, were used to support the structure, which weighed 137 tons, including the guys, and rested on a 9-inch diameter insulator.

The tower itself was 24-inches square at the base and increased to 27 feet on a side at a point 270 feet above the ground, which is where the guy wires were connected. The mast was constructed of hot-dipped galvanized steel, with 1/2-inch aluminum bonding cable extending up the entire height of the structure to ensure good electrical continuity.



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