

Audio

Scenes on
Pre-preamplifiers

\$1.25

NOVEMBER 1978

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THE AUTHORITATIVE MAGAZINE ABOUT HIGH FIDELITY

A Primer On
Stereo Mikes

DIRECTORY OF TAPE
& ANCILLARY
EQUIPMENT

NEW



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MR WILLIAM A KAYSER
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AND IT'S WHAT GOES
INTO HPM SPEAKERS THAT
MAKES THEM SOUND GREAT ON
EVERY PART OF THE MUSIC.

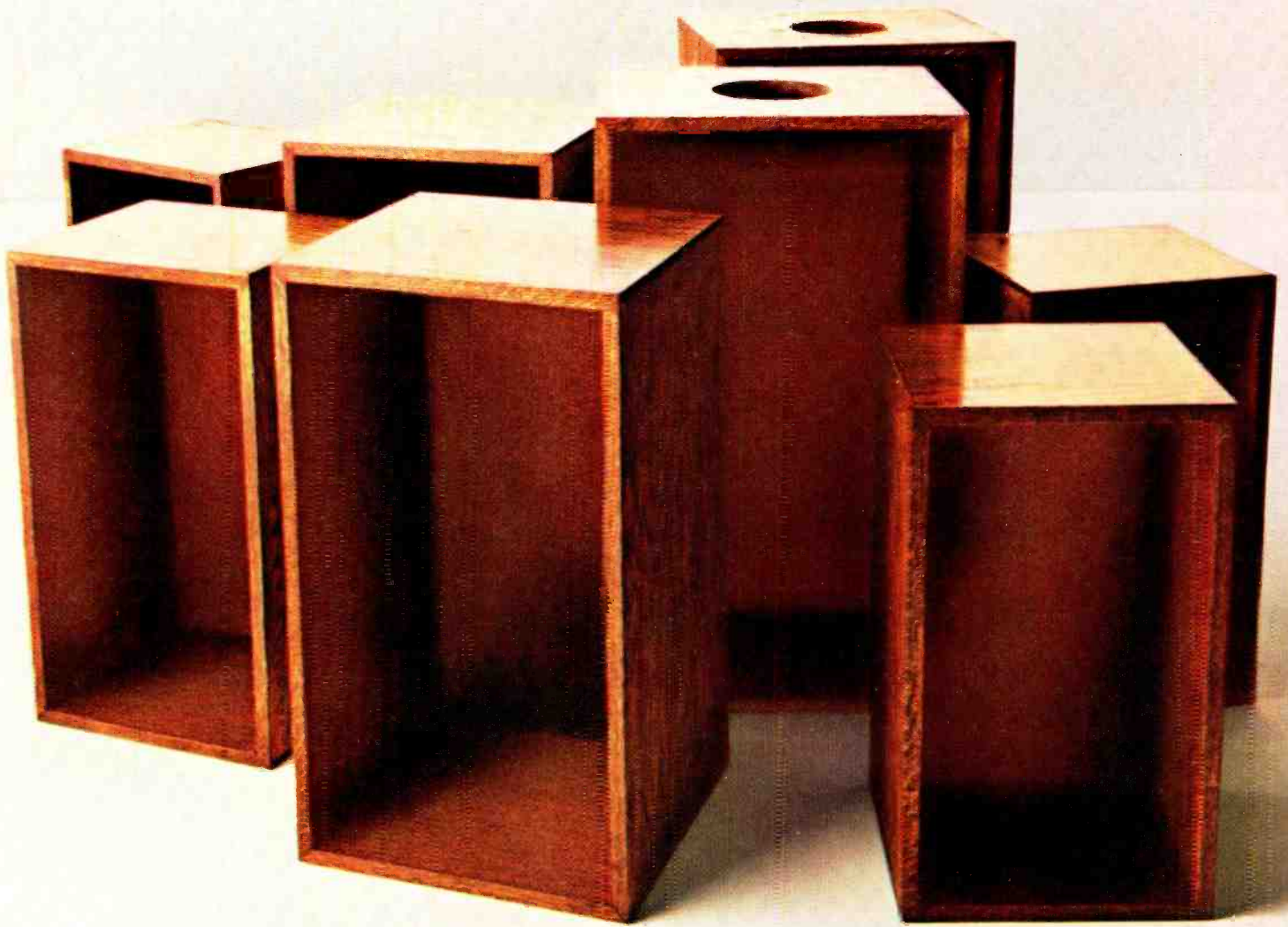


HPM 60

HPM 100

HPM 150

HPM 40



Most speaker companies try to impress you by describing the "wonderful" sound that comes out of their speakers.

At Pioneer, we think the most believable way to describe how good HPM speakers are is to tell you what went into them.

THE HPM SUPERTWEETER: SPEAKER TECHNOLOGY RISES TO NEW HIGHS.

In many speakers, you'll find that the upper end of the audio spectrum is reproduced by an ordinary tweeter.

In HPM speakers, you'll find that the high frequencies are reproduced by a unique *supertweeter*.

It works by using a single piece of High Polymer Molecular film, (hence the name HPM) that converts electrical impulses into sound waves without a magnet, voice coil, cone, or dome.

And because the HPM supertweeter doesn't need any of these mechanical parts, it can reproduce highs with an accuracy and definition that surpasses even the finest conventional tweeter.

As an added advantage, the HPM film is curved for maximum sound dispersion. So unlike other speakers, you don't have to plant yourself in front of an HPM speaker to enjoy all the sound it can produce.

MID-RANGE THAT ISN'T MUDDLED.

For years, speaker manufacturers have labored over mid-range driver cones that are light enough to give you quick response, yet rigid enough not to distort.

Pioneer solved this problem by creating special cones that handle more power, and combine lower mass with greater rigidity. So our HPM drivers provide you with cleaner, and crisper mid-range. Which means you'll hear music, and not distortion.

WOOFERS THAT TOP EVERY OTHER BOTTOM.

Conventional woofers are still made

with the same materials that were being used in 1945.

Every woofer in the HPM series, however, is made with a special carbon fiber blend that's allowed us to decrease the weight of the cone, yet increase the strength needed for clarity. So you'll hear the deepest notes exactly the way the musician recorded them.

And because every HPM woofer also has an oversized magnet and long throw voice coil, they can handle more power without distorting.

OTHER FEATURES YOU RARELY HEAR OF.

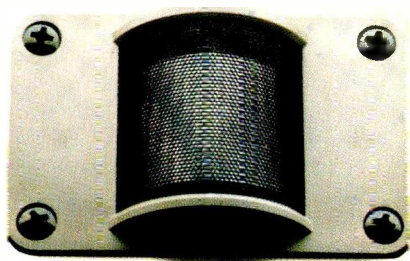
Every HPM speaker has cast aluminum frames, instead of the usual flimsy stamped out metal kind. So that even when you push our speakers to their limit, you only hear the music and never the frames. In fact, our competitors were so impressed, they started making what look like die cast frames, but aren't. HPM speaker cabinets are made of specially compressed board that has better acoustic properties than ordinary wood.

Their speakers have level controls that let you adjust the sound of the music to your living room. And these features are not just found in our most expensive HPM speaker, but in every speaker in the HPM series.

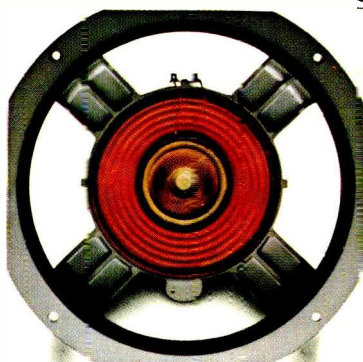
All of which begins to explain why, unlike speakers that sound great on only part of the music, HPM speakers sound great on all of it.

At this point, we suggest you take your favorite record into any Pioneer Dealer and audition a pair of HPM speakers in person.

If you think what went into them sounds impressive, wait till you hear what comes out of them.



The High Polymer Molecular Supertweeter. So incredible, we named a whole line of speakers after it.



You'll never hear a sound out of these die cast aluminum speaker frames.

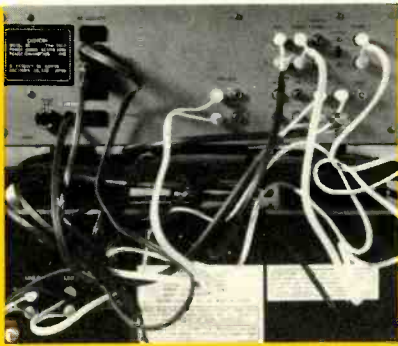


Level controls that let you adjust the sound to your listening area.

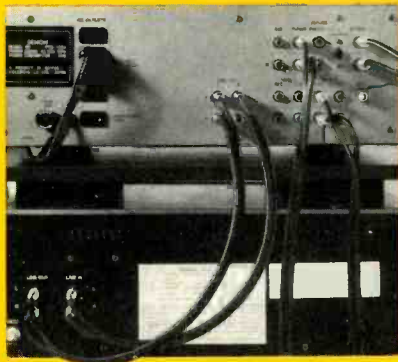
PIONEER
We bring it back alive.

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**WHAT COMES OUT
OF A SPEAKER IS ONLY
AS IMPRESSIVE AS
WHAT GOES INTO IT.**




YOUR RACK'S TANGLE HAS A CURE:



NEW HALF-METER GOLD-ENS™

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Columbia, Missouri 65201

Audio

"Successor to **RADIO**, Est. 1917"

Feature Article

A Basic Guide to
Coincident Microphones 40 Charles P. Repka

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About the Cover: The proper use of microphones, like the old-time spy, is usually surrounded by mystery and intrigue. To learn more about the use of stereo mikes, see the article by Charles Repka starting on page 40. Modelled by Ed Mannix. Photo by Photographic Illustrations Ltd., Phila.



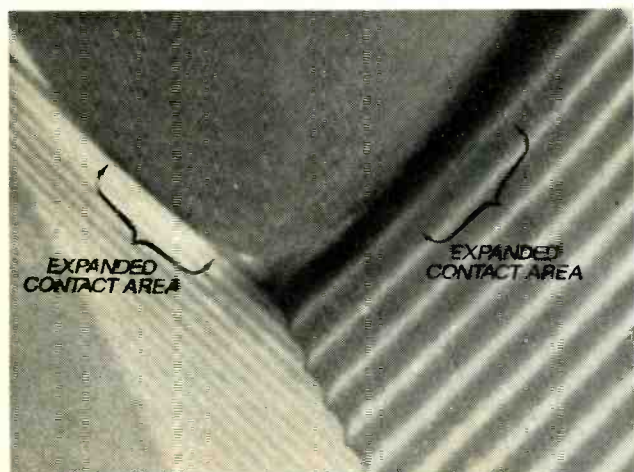
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PROFESSIONAL

**Nashville, the Center of Country Music,
is Stanton Country, too!**



Kitty Fickett checks out 45 rpm stamper, while adjusting one at 33 1/3 rpm.



Scanning Electron Beam Microscope photo of Stereohedron® stylus, 2000 times magnification; brackets point out wider contact area.

The Nashville Production Co., uses Stanton exclusively throughout its two Disc Cutting Studios. Naturally, they are mostly involved with Country Music, but they also get into Pop and Rock.

John Eberle, Studio Manager, states that they use the Stanton Calibrated 681A "for cutting system calibration, including level and frequency response" . . . and they use the Calibrated 681 Triple-E in their Disc Cutting operation . . . with plans to soon move up to the new Professional Calibration Standard, Stanton's 881S.

Each Stanton 681 series and 881S cartridge, is guaranteed to meet its specifications within exacting limits, and each one boasts the most meaningful warranty . . . an individually calibrated test result is packed with each unit.

Whether your usage involves recording, broadcasting, or home entertainment, your choice should be the choice of the Professionals . . . the Stanton Calibrated Cartridge.

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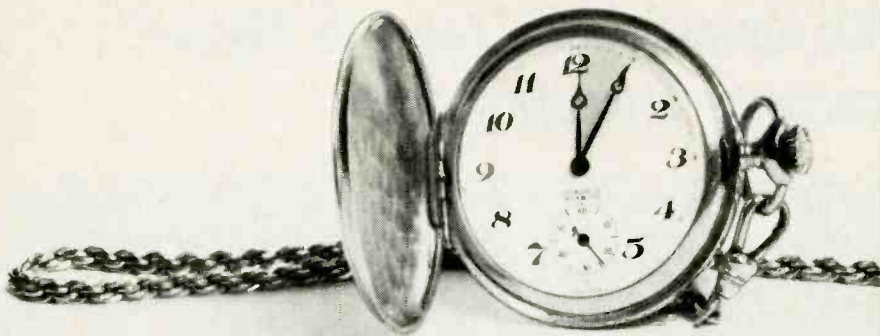
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the first 5 minutes don't count

Or even ten!

Sometimes it may take a little while before you know just how good a headphone really is.

Comfort, weight, cord convenience all are vital factors in headphone wearability.

With every minute of use, any manufacturing deficiencies in these areas grow into discomfort and inconvenience.

At Beyer we know these problems and all our headphones are designed to achieve the highest possible wearability factor (Hi-Fi News, September '76, page 143, Beyer DT440 ranked 1st out of six comparative tests for comfort).

Coupled with physical comfort comes the lack of aural fatigue. That bright overdone sound associated with the 'loudspeaker-on-the-ear' concept oversold by our competitors will often give you a bad headache in minutes. It takes time to appreciate good clean sound. And with time, good sound doesn't tire (Hi-Fi News, September '76, Subjective Headphone listening test, Beyer DT440 ranked 1st).

So visit your Beyer headphone dealer now and give yourself time to compare Beyer headphones against the competition.

**But remember—
the first
5 minutes
don't count!**



Beyer Dynamic

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No matter what system you own there's an Empire Phono Cartridge designed to attain optimum performance.

5

Detail, brilliance, depth.

This is the promise of each Empire Phono Cartridge and although there are many Empire models, each designed to meet specific turntable performance characteristics, every Empire cartridge contains the following features:

Features	Details	Benefits
Unique Fixed Unidirectional Three-Magnet Structure	Every Empire cartridge uses 3 high energy ferrite magnets in the cartridge body to provide a high level of unidirectional flux.	Higher and more linear output signal, immunity to bi-directional magnetic distortion, and improved hum and microphonic rejection.
Molded Four-Pole Magnetic Assembly	Every Empire cartridge employs a four-pole magnetic assembly that is precisely aligned and locked in place by a high pressure injection molding process... providing a uniform and orthogonal magnetic field.	Improved crosstalk and reduced distortion that is insensitive to tracking force.
Tubular moving Iron Design	By using a tubular high magnetic saturation iron armature we obtain an optimum ratio of output level to effective tip mass.	Improved tracking ability and widened frequency response.
Four Coil Hum Bucking Assembly Plus Electromagnetic Shielding	Using custom designed computer controlled machines, a precision drawn copper wire (thinner than human hair and longer than a football field) is wound onto a symmetrical 4 bobbin structure. By using 2 coils per channel a symmetrical electrical circuit is formed.	Improved rejection of hum and stray noise fields.
Aluminum Alloy Cantilever	The Empire computer designed tubular cantilever provides optimum coupling of the diamond tip to the moving magnetic system resulting in minimum effective stylus tip mass.	Superb low level tracking, reduced tracking distortion... plus enhanced wideband separation characteristics.
Precision Ground Oriented Diamond Tips	Empire diamonds are precision ground, polished and inspected in house, using sophisticated television cameras and powerful microscopes to ensure accurate angular orientation.	Reduced tracing phase distortion, together with reduced wear of both the record and the diamond tip.

For the full story on Empire cartridges we suggest you "test-listen" to one at your local Empire dealer, and for information on our full line of cartridges, write for our brochure "How to Get the Most Out of Your Records": **Empire Scientific Corp.**, Garden City, N.Y. 11530

EMPIRE

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**A tape offer
that sounds
as good as
the tape.**



**Buy 3
and get one free.**

6

A lot of tape companies can make you an offer that sounds like this.

But not tape that sounds like this.

Because our new Maxell UD cassette should be considered among the world's finest recording tape.

You see, Maxell cassettes are built to higher standards than necessary. They're designed to give you recordings free of noise, dropouts and trouble.

So buy three Maxell UD 90's, and get a UD 60. Free.

If you think our offer sounds great, wait till you hear our tape.

maxell 

*Available at participating Maxell dealers.
Offer expires December 22, 1978.

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Audioclinic

Joseph Giovanelli

Turntable Repair

In response to your answer on "Record Changer Repair" in the March, 1978, issue of *Audio* about slippage in an old automatic changer, I have been working as a professional with turntables and other audio gear for some six years now and would like to add something to your answer.

Instead of using alcohol on the idler wheel, use a common solvent, such as chloroethylene or "Chloro-Kleen" (a product of G.C. Electronics), made specifically for rubber drives. It removes most dirt and old, loose rubber particles from the driving surface of the idler wheel. It is very effective in restoring the "grabbing" surface of the wheel. It is also excellent for cleaning the inner rim of the platter and motor pulley, providing it is not made of plastic.

Using sandpaper on the idler surface sometimes works, however it usually produces an uneven surface which contributes to varying speed and increased rumble. If all that I have suggested doesn't do the trick, the only alternative (and sometimes the easiest) is to find a replacement idler wheel. EV and G.C. Walsco have excellent lines of replacement idler wheels for old and new equipment, which are available from local electronics parts distributors.

Glen Whatley
Denver, Colo.

Cable System Antennas

Q. In my area, cable TV is now available. Is it possible to use the cable as an antenna for my tuner? — Mike Neuman, Deer Park, N.Y.

A. The cable used for TV distribution in various parts of the country is not a long antenna, but rather shielded coaxial cable, and the signals which appear at your end of the cable are those intentionally supplied by the operator of the cable system. Many such systems do *not* supply the signals on the FM band. However, if your cable system does supply the signals

you wish to hear, they would be stronger than those picked up by your conventional antenna.

Before attempting any connections to the cable system, other than those originally provided for when the system was installed, check with the cable company as additions to a cable installation can result in radiation from the system which can interfere with the reception of TV and FM signals by those who are using regular antenna systems rather than being on cable.

Power Output

Q. How is it possible for an amplifier rated as low as 2.5 watts per channel to work with a magnetic phono cartridge? — Scott T. Baker, Winston-Salem, N.C.

A. In order for an amplifier to handle the tiny signal produced by a magnetic phono cartridge, the amplifier must possess sufficient voltage gain to bring the signal up to approximately the level of signal produced by a tuner, tape recorder, etc. Also, this amplifier must have the necessary equalization so that the cartridge will have a flat frequency response. Once these conditions have been met, the phono signal can be fed into the later stages of the amplifier which drive the speakers or headphones. Thus, the actual output, in this case 2.5 watts, isn't really relevant to whether the amp can do the job with the tiny signal from a magnetic cartridge.

Shielding Against A.c.

Q. I would like to know which metal would be best for shielding equipment against a.c. power lines and power supplies? — Michael D. Snyder, Pittsburgh, Pa.

Probably the best shielding against a.c. pickup is the use of bell foil cable.

(Continued on pg. 28)

If you have a problem or question on audio, write to Mr. Joseph Giovanelli, at AUDIO, 401 North Broad Street, Philadelphia, Pa. 19108. All letters are answered. Please enclose a stamped, self-addressed envelope.

AUDIO • November 1978

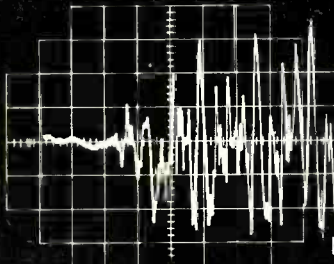
Technics Linear Phase SB-4500A. For people with an ear for waveform fidelity. And an eye for beautiful cabinetry.

If you keep up with the latest in hi-fi successes, you already know about Technics Linear Phase Speaker Systems. The Technics speaker systems with waveform fidelity: The ability to reproduce a musical waveform that's virtually a mirror image of the original. Now you can know Technics Linear Phase Speakers for something else: Beautiful simulated walnut wood cabinetry. Introducing the SB-4500A.

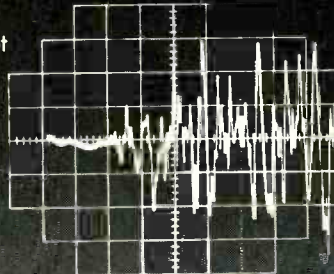
Like our other Linear Phase Speakers, the SB-4500A is capable of achieving not only a wide frequency response, but also flat amplitude and precise linearity.

And if seeing is believing, look at the waveforms. On top is the oscilloscope reading (the fingerprint) of a live piano waveform.

The other, the piano waveform as reproduced by the Technics Linear Phase



Live Piano Waveform.



Piano Waveform reproduced by SB-4500A.

SB-4500A. That's waveform fidelity you can see as well as hear. And that sounds better than good. That sounds live.

How did we do it? First by conducting exhaustive amplitude and phase studies in acoustically perfect chambers. Then by developing a unique new phase-controlled crossover network that not only compensates for the time delays caused by different frequencies, but simultaneously corrects any acoustic differences in the drivers. And finally by staggering each driver unit for the optimum acoustic position.

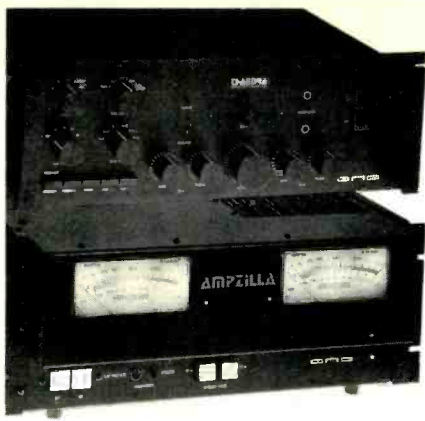
Technics Linear Phase SB-4500A. Your ears will love the way it sounds. Your eyes will love the way it looks.

Technics

Professional Series



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Two of a Kind

The Ampzilla IIa power amplifier and Thaedra II preamplifier were literally made for each other. In design, performance, and appearance they are complementary; fully-complementary, in fact.

Ampzilla IIa's features (such as its fully-complementary servo-controlled circuitry) and specs (200 Watts RMS per channel into 8 Ohms from 20 Hz to 20 kHz at less than 0.05% THD and 1M) are perfectly suited to Thaedra II's moving coil phono preamplifier (RIAA equalized) and servo-loop circuitry.

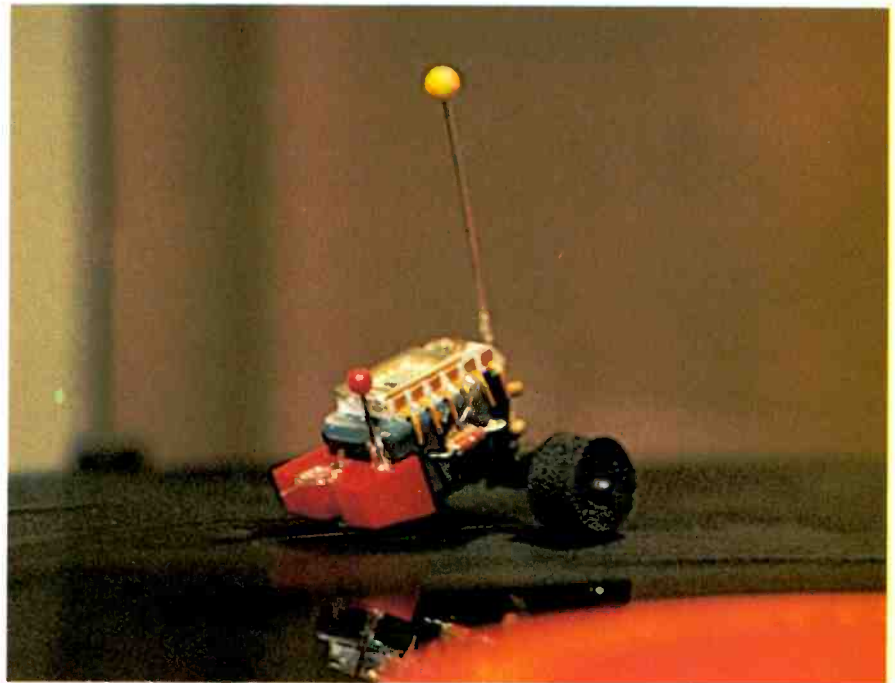
Of course, Ampzilla IIa and Thaedra II can function in separate environments. They just won't be able to provide all the sonic excitement that they can as a team.

Write GAS Company for literature containing complete features and specifications of all its products.

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THE GREAT AMERICAN SOUND CO., INC.
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Dear editor



Lirpa VDRS GT

Dear Editor:

After reading about the new Lirpa VDRS (Vehicular Disc Reproduction System) in your April, 1978, issue, I decided to build a GT version of the VDRS myself. Using a Tyco drivetrain and body by Pickering, this model can boast a higher "Album Per Battery" life (APB) using the same titanium-oxide wet cell power source than the earlier models. Also, it is equipped with G-60x $\frac{1}{8}$ " sponge rubber tires for maximum traction on even the dirtiest of records.

Enclosed you will find a snapshot of my VDRS-GT. The specs for my GT model are similar to the factory stock version except for frequency response (5 Hz to 50 kHz), pinwheel effect (reduced to -10, thanks to reduced weight), and output (12 watts per channel stereo, $7\frac{3}{4}$ watts mono). This unit works well with the standard Lirpa controller, and it will have to, since I haven't yet finished my own version.

I am currently working on a 78-rpm model and also on a 4-wheel drive model VDRS which will track even the most heavily warped records. Speaking for other readers of *Audio*, I wish Prof. I. Lirpa much success in all his endeavors.

John Huber
 Newtown, Penna.

Intercontinental Communication

Dear Sir:

This is an S.O.S. to audio buffs in the Canadian province of Quebec. I would like to contact a resident who can tape French radio broadcasts on either open reel or cassette, although I would prefer that it be on open reel in four-track stereo.

To anyone interested in helping me fulfill this request, please contact me first by mail before any taping from radio is undertaken. As I am not French speaking, please write to me in either German or English.

Let me thank all the Quebec readers who will help me.

Frank Healy
 Bei Knappe
 415 Krefeld
 Hulser Str. 129-131
 Germany

Mrs. Murphy's Mishap

Dear Kindly Editor:

One of the Gentle Readers, Mr. John Bane of Atlanta, Ga., has pointed out two mistakes in my recent article, *Audio*, August, pg. 47.

The constant in equation 19, 2.36×10^{-4} should be 2.36×10^4 , and the vent length in this example with a 7.6 cm diameter should be 14.0 cm (5.5 in.).

Continued on pg. 26

AUDIO • November 1978

A best seller. Versus the best.



Bose 301
\$218.00 per pair



Micro-Acoustics FRM-3
\$250.00 per pair

Tweeter	Bose 301 One, fixed.	Micro-Acoustics FRM-3 One, rotatable, rim-damped.
Tweeter mounting	Attached directly to baffle.	Isolated from baffle by damped suspension and separate compartment.
High-frequency dispersion control	Rotatable rectangular plate with control, mounted in front of fixed tweeter.	Rotatable Vari-Axis™ tweeter with five-position detented control.
Bass enclosure volume	929 cubic inches.	1210 cubic inches.
Bass loading	Single ducted port directly under tweeter.	Twin-ducted port positioned on opposite sides of woofer.
Cabinet panel thickness	1/2" throughout.	1" front panel; 3/4" sides and rear; 1/2" tweeter compartment.
Dimensions	17"W x 10 9/16"H x 9 5/16"D.	21 15/16"W x 12 5/8"H x 9 9/16"D.
Weight	15 1/2 lbs.	24 1/4 lbs.
Warranty	5 years (full).	10 years (full).
Mfr's. suggested list	\$218.00 per pair.	\$250.00 per pair.*



All side-by-side comparison photos are unretouched.

*Slightly higher West of Mississippi.

© 1978, Micro-Acoustics Corporation.

Complete FRM-3 specifications are available in Micro-Acoustics literature No. L-1113.

Compare these two speakers, and you'd probably expect the one on the left — with the lower price — to be the better seller.

You'd be right . . . *but is it the better value?*

Before you decide, it pays to consider how much more a little more money will buy:

Compare bass. The FRM-3 uses a twin-ducted enclosure with thicker cabinet panels and larger cubic volume, for rich, full bass.

Compare highs. The FRM-3's unique Vari-Axis™ control system, damped isolated tweeter suspension and rim-damped cone give lifelike highs.

Compare warranties. The FRM-3 is warranted *twice* as long.

The Micro-Acoustics FRM-3. When you compare, there's really no comparison.

Micro-Acoustics Corporation, 8 Westchester Plaza, Elmsford, N.Y. 10523, (914) 592-7627. In Canada, H. Roy Gray Ltd., Markham, Ont.

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Micro-Acoustics
Quality worth a 10-year warranty.™

Tape guide

Herman Burstein



12

It sounds like music

An incredibly solid 30 Hz low end gives you bass response not found in any other speaker of this size. This is clean bass. It isn't phony. There is no "hump" around 80 Hz to give the impression of bass when there really isn't any. What's on your source material is what you're going to hear — accurately.

There is no sacrifice at the high end either. Both front and rear-firing tweeters give you the uniform total acoustic power output that takes you into a "live-music" environment.

When you buy your next pair of speakers, do yourself a favor — audition the Interface:B's. If your criteria is musical accuracy, the Interface:B's are what you'll buy.



Electro-Voice®

a gulton company

500 Cecil Street
Buchanan, Michigan 49107

Interface:B™

Bias Adjustment

Q. I have read several times about adjusting the bias on a tape deck to the specific recording tape being used. I would like to know what the term bias means in this context and how one goes about adjusting the bias on the machine being used. — James Leone, Rochester, N.Y.

A. Bias is a high frequency current, usually in the range of 60 to 150 kHz which is fed to the record head along with the audio signal, or is sometimes fed to a separate (crossfield) head mounted opposite the record head. The purpose of bias is to reduce distortion and maximize the level of the signal recorded on the tape. All better tape machines contain a control, often internally, for either increasing or decreasing bias.

The usual procedure specified by the manufacturer is to record and play back a tone — typically specified as 500 Hz or 1 or 2 kHz — then adjust the bias of the tape until the output, as measured in playback, is at maximum. Some manufacturers advise a further increase in bias until output at the specified frequency drops ½ dB. For further information, you should consult the service manual put out by your deck's manufacturer.

Cassette Buzzing

Q. I have a pronounced buzzing or humming in the left channel of my cassette deck which occurs only in recording because prerecorded cassettes do not produce this noise. If the left channel control is turned down, the noise disappears. The noise doesn't appear to be a 60 Hz-hum as the pitch is too high. — F. Keuchmann, Maywood, Ill.

A. It may be that you are picking up a harmonic of the 60-Hz line frequency emanating from either the power transformer or the motor. You might check the leads to these components to see if they come very close to the

left channel record amplifier. Also, your problem might lie in a poor switch or jack contact, so clean these switches and jacks with a suitable cleaning fluid.

Since turning down the volume control eliminates the buzz, this indicates that the problem occurs prior to this control, hence you should also check the circuitry in the early stages of the record amplifier.

Response Perception

Q. Which is a better frequency response: 30-22,000 Hz, ±3 dB, or 50-16,000 Hz, ±3 dB? — Walter Mattox, Jr., Atlanta, Ga.

A. On paper, 30-22,000 Hz within 3 dB certainly looks better than 50-16,000 Hz. But to the human ear, except for rare cases, I doubt that the difference really matters. In order to extend response to 22k, a tape deck had to make sacrifices in terms of signal-to-noise ratio and/or distortion. In other words, in settling for slightly more limited response, the 50-16,000 Hz deck may give better all around performance.

Recording Hiss

Q. I seem to have a problem when recording. There is a hiss as loud as the music which occurs at all tape speeds. What is wrong? — Jerry Ubels, New West Minster, B.C., Canada.

A. It seems that you have either or both of the following problems: 1) Noisy components such as resistors or transistors in the record and/or playback amplifier, 2) A miscalibrated record-level indicator so that you are recording at too low a level, thereby accentuating the level of tape and ambient noise.
(Continued on pg. 16)

If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 401 North Broad Street Philadelphia, Pa. 19108. All letters are answered. Please enclose a stamped, self-addressed envelope.

The best tape decks in the world are only as good as this tape.

While there's a lot of controversy over who makes the world's best tape deck, there's very little over who makes the world's best tape. Maxell.

Because Maxell gives you the

widest frequency response, the highest signal-to-noise ratio and the lowest distortion of any tape you can buy. In fact, people who own the finest high-performance tape equipment use our

tape more than any other brand. So why buy one of the world's finest tape decks and get less than the world's best sound. When you can use Maxell and get everything you paid for.

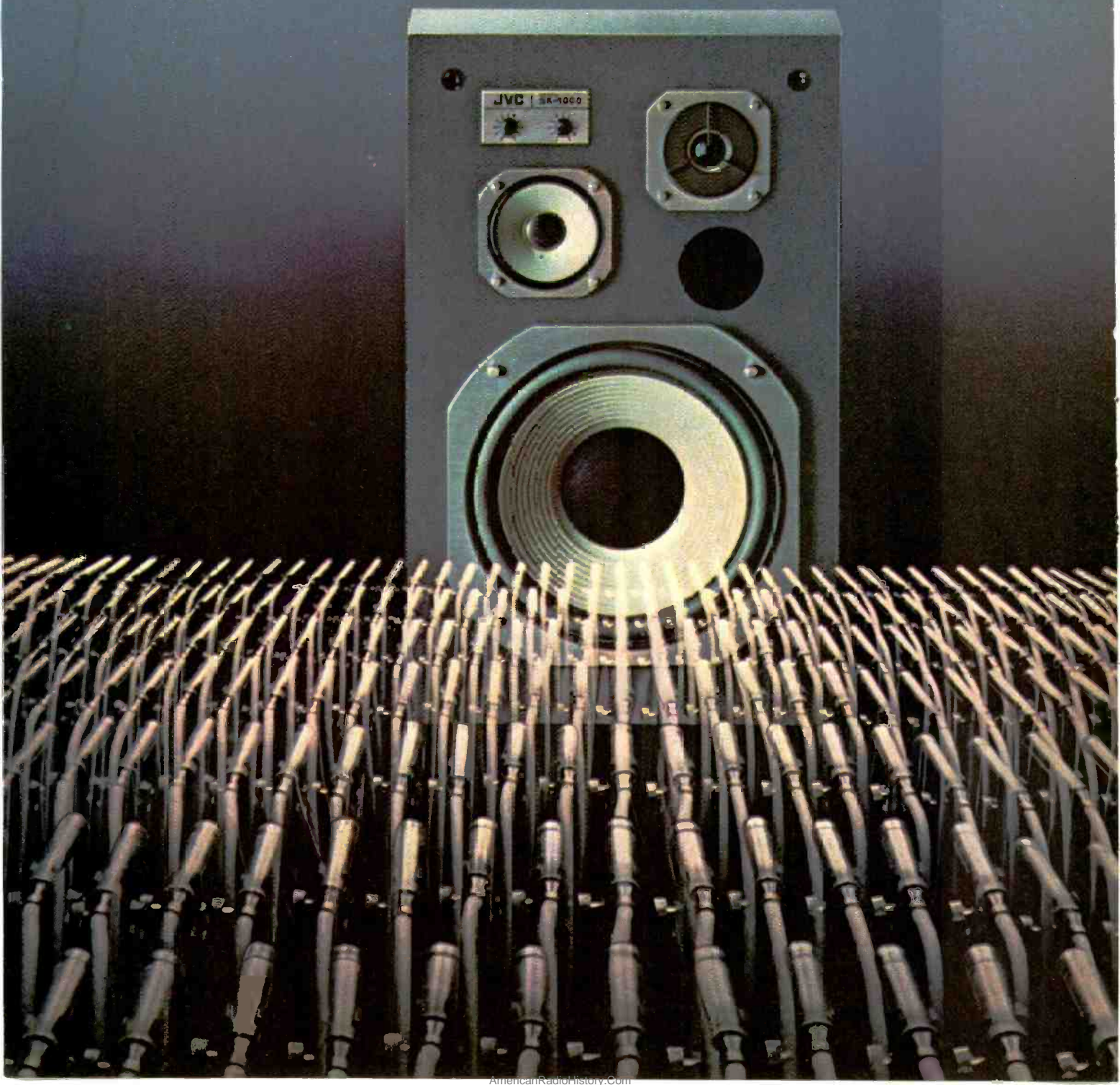


Maxell Corporation of America, 60 Oxford Drive, Moonachie, N.J. 07074.



Enter No. 32 on Reader Service Card

**When it comes to
speaker design, JVC goes
2969 times further.**



Traditionally, speakers are designed and tested by placing a special microphone in front of the speaker, and examining the sound it picks up on an oscilloscope. The oscilloscope pattern is then drawn or photographed for comparison purposes. And, by a tedious trial-and-error process, speaker design engineers try different speaker, crossover and enclosure combinations to express their sound philosophy.

But JVC has put an end to these archaic and time-consuming procedures.

By using a specially-constructed electro-mechanical transport device that creates a field of 2969 microphone positions; then feeding these sound impulses into a computer, then onto a laboratory video screen and onto motion picture film, JVC engineers can actually see what a speaker will sound like . . . before they get too far down the line in the design process.

This exclusive JVC development is called Phase Moire ("Mor-ay") Propagation Pattern Technology.

How the Phase Moire technology works

The motion picture film produced by the combination of nearly 3000 pickup points, the computer, and high-speed filming of the resulting patterns from the face of the video screen, actually shows how a speaker, crossover network or entire speaker system performs, rather like "sound in action."

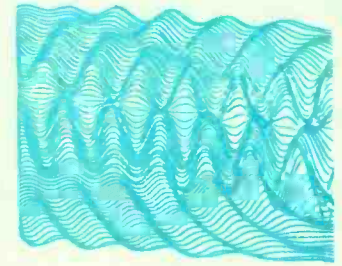
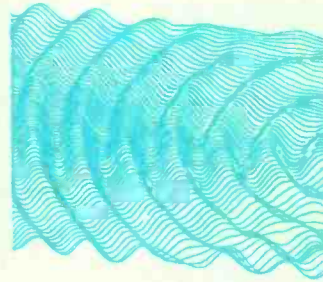
It all looks good, but it sounds even better

The SK-1000 is the careful result of Phase Moire Technology and human engineering. Capable of handling up to 170-watt peaks (85 watts RMS), this extraordinary-sounding,

unusually efficient speaker system delivers truly magnificent, rock-solid bass from its 12-inch free-edge woofer and heavy magnet structure. Vocals and midrange are unusually smooth, with a pleasing sense of presence, thanks to our specially-designed 5-inch midrange driver. Clear, crisp brilliant highs are produced with a 1-inch dome tweeter that disperses them evenly within the listening area.

A final note on technology

Once we discovered the technology needed to produce better-performing speaker



These two Phase Moire patterns represent the crossover frequency response of two similar multi-speaker systems. The left-hand pattern was produced by a JVC SK-1000. Its evenly-undulating shapes indicate a smooth transition from one speaker element to another. The turbulent, uneven pattern on the right is typical of a poorly-designed speaker/crossover combination.

components and systems, we put it to work to help us build a modestly-proportioned (and priced) speaker system that would come as close as possible to the highest levels of integrity in musical reproduction. We feel we've succeeded. But all the technology in the world can't fool two of the most sophisticated testing devices known: your ears. And all the words in the world can't really tell you what the SK-1000 really sounds like. So we suggest that you hear what we've been talking about at a JVC dealer.

JVC

- MID/TREBLE LEVEL CONTROLS**
Phase distortion and power loss are kept minimum.
- 1" DOME TWEETER**
Elastic hemispherical diaphragm permits wide-sound dispersion with low distortion.
- 5" CONE MIDRANGE**
Hard surfaced cone and aluminum alloy metal cap for midrange lucidity and tightness.
- 12" WOOFER**
Accepts unusually high power for real-life bass.



SK-1000



SK-700



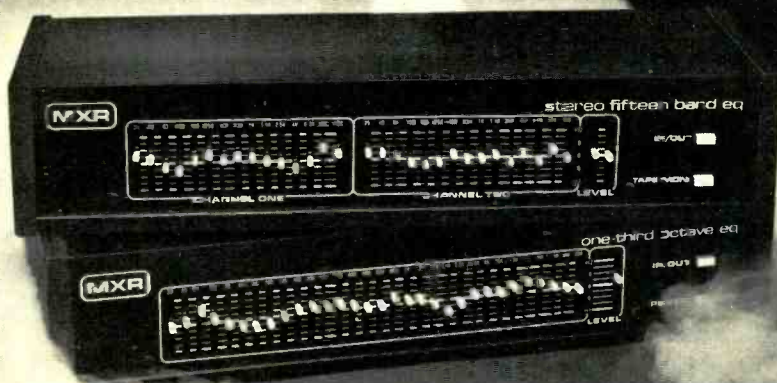
SK-500

JVC America Company, Division of US JVC Corp., 58-75 Queens Midtown Expressway, Maspeth, N.Y. 11378 (212) 476-8300
Canada: JVC Electronics of Canada, Ltd., Scarborough, Ont.

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Most components just provide recreation

MXR provides Creation



Create with MXR's two newest equalizers: the Stereo Fifteen Band Eq and the One-Third Octave Eq. Two great new eqs that not only put you in complete control of your acoustic environment but provide even more creative contour of your music as well.

The Stereo Fifteen Band Eq is an expanded version of our popular ten band Stereo Graphic Ec. With two channels each having fifteen bands spaced 2/3 of an octave apart, you have even more creative power for banding, shaping, enhancing the sound. No matter how fine your home component system is, problems such as poor room acoustics or program quality may occur. The Stereo Fifteen Band Eq gives you the control to create the exact sound you desire.

The One-Third Octave Eq goes even further in providing precision control over your system's sound. A single channel unit, its thirty-one frequency bands are spaced 1/3 of an octave apart to give you the most creative power available at any price.

Both units feature a range of -12 to +12 decibels on each band, high slew rate (7V/microsecond) and incredibly wide dynamic range (better than 100 dB). The eqs feature walnut side panels (rack mounting hardware also included) and are built with rugged, reliable MXR quality.

Have them perform at a fine audio dealer near you, or write MXR Innovations, Inc., 247 N. Goodman St., Rochester, N.Y. 14607.

In all of creation, MXR keeps providing

Also distributed in Canada by White Electric Development Corporation, Ontario.

MXR Consumer Products Group

Enter No. 29 on Reader Service Card

Tape Guide (Cont. from pg. 12)

plifier noise relative to the desired audio signal.

You can tell whether your problem is essentially in recording or playback by playing either a prerecorded tape or one made on another machine. If the hiss is much lower with such tape, then your problem lies in recording. If the hiss remains the same, then the difficulty is in the playback amplifier.

Tape Changes

Q. What does one have to do to one's tape recorder in order to use chromium dioxide tapes? — John Reeds, W. Lafayette, Ind.

A. To use chromium dioxide tapes in a tape deck set for conventional tape (ferric oxide), changes are needed in bias, treble equalization in the record amplifier, and in the amount of signal fed to the record head.

Specifically, these are about a 50 per cent increase in bias current, a reduction in the treble boost, and more current has to be supplied to the erase head, as the CrO₂ tape is more difficult to erase.

Distorted Recorder

Q. I wonder why the recordings on my tape deck come out distorted. I set the VU meter level so it doesn't go over the red distortion line — Buzz Hammond, Mt. Vernon, O.

A. Possibly the VU meter is miscalibrated so that it doesn't read 0 VU until the signal level is more than enough to cause tape distortion. Another possibility is that insufficient bias current is being fed to the record head... if the treble response seems overbright, this indicates that bias is too low. Another possibility is distortion in the recording and/or playback amplifiers. If tapes recorded on another machine sound clean in playback on yours then the problem is in recording rather than playback.

Question of Length

Q. Please indicate the pros and cons of tape lengths ranging from 1200 to 3600 feet on a seven-inch reel? — Walt Mattox, Jr., Atlanta, Ga.

A. It is generally not advisable to buy more than 1800 feet of tape on a seven-inch reel. Therefore, one should buy either the 1½-mil tape (1200 feet) or 1-mil tape (1800 feet). A thinner tape tends to raise problems with squeal and print-through.

AUDIO • November 1978



You know us best for our reputation in audio. In fact, it's audiophiles like you who have made TDK SA the best-selling High bias cassette in America today. But here's something you may not know: the same Super Avilyn engineering principle that revolutionized audio cassettes is in TDK's equally revolutionary new Super Avilyn video cassettes.

No wonder that TDK Super Avilyn is the first 4-hour capability video cassette to be quality approved by the people who know: video cassette recorder engineers. And even less wonder that Super Avilyn makes possible an image so stunning, you will feel as though you are sitting in the broadcast studio.

What's more, TDK's strict quality control works to give you low wear on delicate video heads, virtually non-existent oxide shedding, and no problems with tape stretching, even with repeated playback.

That's because TDK Super Avilyn video cassettes are an actual component of the system, not just an accessory. Our tape is housed in a precision, jam-resistant mechanism, for years of consistent high quality video reproduction. And TDK Super Avilyn VHS video cassettes are compatible with all VHS machines, both those with short-play (2-hour) capability and those with short and long-play (4-hour) options.

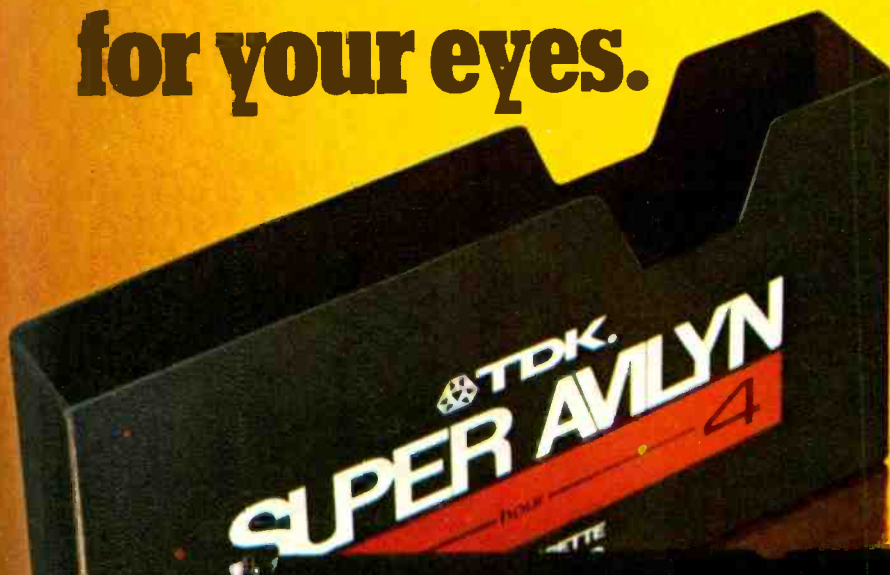
TDK Super Avilyn VHS video cassettes: model VA-T60, for one and two-hour recording; model VA-T120, for two and four hour recording. If you like things to look as good as you like them to sound, take a look.

TDK Electronics Corp., Garden City, NY 11530. In Canada: Superior Electronics Ind., Ltd.

 **TDK**[®]
The Machine for your Machine. [©]

Enter No. 50 on Reader Service Card

**What TDK
did for your ears,
it now does
for your eyes.**



Audio etc.

Edward Tatnall Canby

Sooner or later every aspiring audio buff, audiophile, hi-fi man, whatever, is likely to make an unsettling discovery concerning his audio software, the stuff he actually plays on his fancy equipment. Namely, that he has become the owner of a *library*, and he has to do something about it. Now for some of us this can be downright frightening. You mean — *file cards*? Maybe, though not necessarily, there are other ways. But any way you look at it, you are faced with some kind of action. Action or chaos.

A library is no more than a long-term holding action, a better way to get at what you want to keep around. You either have a library or you have a mess. And every time you come home with another recording, that mess gets a fraction messier. It's inexorable. And the more enthusiastic your hobbying, the sooner you'll get to the crunch. As I figure it, our present Editor should just about be entering that stage at his own place, as if he didn't have enough to do down at the office. So here comes Canby with soothing balm, words of wisdom and experience

— well, at least, plenty of the latter — in case you, too, are getting towards that inevitable crunch point. (Editor's Note: Mr. Canby, sir, I was at that stage before I became Editor! It's a prerequisite. — E.P.)

It pays to be philosophical in such cases; you are not the only one in history who has had to face the problem of collecting and organizing. It is a very human occupation and even some birds (real birds) do it. The magpie? They collect objects colored blue, bring them home and play with them, just like so many cassettes. Setting up your library, then, is a practical matter, but it can also be interesting and, of course, gratifying if it works as it ought

to. Especially since there are no official professional rules as yet (as there are in book library work) and so if you devise a system of organization that works well for your needs you can be full of pride.

Some of us are just naturally neat. Organizational problems never arise because they never get started. We always know where everything is. But that's almost inhuman. Most of us, as with check books and double-entry accounting, just do not like neatness via system, *any* system. That, alas, includes me. It is so much easier just to

record you want to play. You swear it was right on the couch. It isn't there any more. Where is it? As my mother used to say, years ago, "Oh, I put all those things in the so-and-so," the key phrase being *all those things*, a category of chaos no one but my mother could have invented. Like the magpie's blue objects. Anything was better than "all those things." Anything still is.

If you own no more than a couple dozen LPs and maybe a few cassettes, you can manage. But beware of accumulation. It's cumulative. Let's say (I

am trying to put myself into the shoes of a couple million readers), you have your records in a stylish cabinet with a front that closes — but it's already full and small heaps and piles are spilling out; it's easier, anyhow, than "losing" them inside the cabinet. And untidy little clusters of mixed cassettes sit here and there (like mine) for lack of any particular systematic way to keep them in good order. They're small and inconspicuous, after all, and mostly black. Just push them together, drop them into a box, and they look

very neat, for a while. You may also have assorted open reels of tape, in and out of their boxes, mostly with loose ends dangling and no labels, with half labels, or erased labels — unfinished business. All in all, this state of things has become a part of your living, and you are getting accustomed to it. Loose albums, empty record cases, while inner sleeves, and even naked LPs decorate most of the seats in your living room so no one can sit down any more. (Come look at my living room!) On the floor are the records you planned to play last night but didn't — they'll wait. Also the records from the night before last, like stale teacups left after a party. If all this ap-



reach for the record you want than to go look it up somewhere. Reach with one hand for one record, the other for the next, with the least amount of motional energy. And pile up the *recent acquisitions* right next to the turntable where you can look at them and choose to taste, right at hand, under your fingers, at arm's length. So easy! So comfortable. And no system at all. I'll bet 95 percent of home hi-fi music is played that way, for a while anyhow. It's the purest luxury.

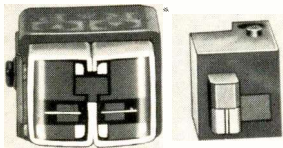
The danger point arrives when your software, as they said about Victorian children, can be seen but not heard. You can see it all right — it's everywhere. But you can't find the blasted

The Realistic SCT-30 tells it like it is:

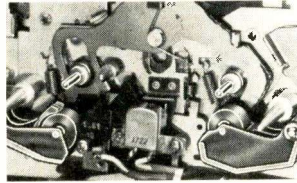
Why 3 heads are better than 2. Why 2 capstans are better than 1. Why double Dolby* is better than single.

3 Heads.

Two independent record and play heads eliminate the compromises of one combined r/p head, and the head assembly is integrated to eliminate azimuth error. The result: cleaner sound. The third head lets you monitor



your recording an instant after it's made, without interrupting the program. SCT-30 has 3 heads!



2 Capstans.

Dual capstans (instead of the usual 1) reduce wow and flutter to an inaudible 0.06% WRMS or less, and extend the audio frequency response. SCT-30 has dual capstans!

Double Dolby.

You know the single Dolby system cuts noise and adds dynamic range. But let's examine double Dolby. You get Dolby on both record and monitor so you know exactly what your tape will sound like.

You get a decoder for recording superb Dolby FM stereo. And you get simultaneous listening enjoyment of the decoded broadcast on receivers with tape monitoring. The Realistic SCT-30 has double Dolby! About \$380.



P.S. - Supertape® Gold.

To go with 3 heads, 2 capstans and double Dolby, you need a cassette tape that will enhance — not degrade — performance. That's why we design and manufac-

ture Supertape Gold in our own Fort Worth factory. Like SCT-30, it's a playmate you can believe in at a price you can afford.

Why Realistic®?

Because Radio Shack has delivered quality audio at sensible prices since 1921, its Realistic tape and recorder line can point to over 5,000,000 customers as living proof of these claims. Add after-sale service that isn't lip service. Add in-house engineering and manufacturing of much of the Realistic line. And add the convenience of neighborhood shopping where you get "sound talk" from a specialist. That's Realistic!

*TM Dolby Laboratories, Inc.



Radio Shack®
The nationwide supermarket of sound™.

Radio Shack is a Division of Tandy Corporation, Fort Worth, TX 76102. Over 7000 locations in nine countries.

B-I-C's FM ANTENNA GETS A GREAT RECEPTION.

In the fall of 1977, B-I-C introduced the Beam Box FM 10, the first electronically directable FM antenna. It sits conveniently near your receiver and requires no special installation. By simply adjusting its knobs you maximize the FM signal you want and minimize signals you don't want. At \$89.95, we thought it was quite a breakthrough. So have a lot of other people.

"I spent literally hundreds of dollars for FM antenna installations before I found the Beam Box. It really works. In fact, it works great." J.L.B., Alexandria, Virginia

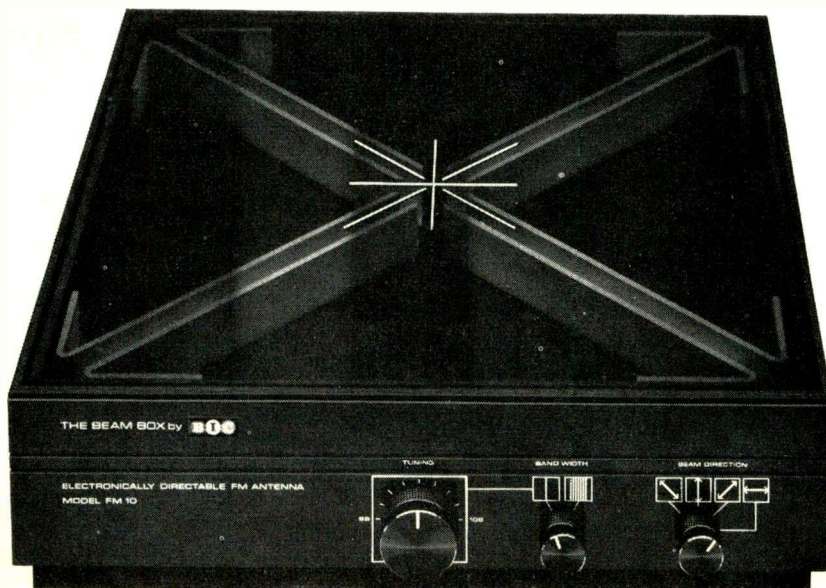
"The Beam Box is the greatest thing that has happened to my FM tuner. In several different locations I tried dipoles, rabbit ears, cable TV hook-ups, and stationary outdoor antennas with sad results. So sad, I never taped FM music. Upon incorporation of the B-I-C Beam Box in my system I detected an improvement that was unbelievable, specifically in cleanness of signal, stereo separation and station lock-on. Additionally I was able to pick up more stations. I am now making perfect FM recordings." A.G.M.D, Hill AFB, Utah

"Since buying and installing the Beam Box, my reception problems have been completely eliminated. I receive stations in Connecticut and Long Island with absolute fidelity, which I think is pretty outstanding since I live in New Jersey. I am finally confident that my 'prestige' tuner is performing as it was designed to." J.P., Edgewater, N.J.

"Great invention! Perfect reception. No multipath. This is a great advance. Works beautifully in a New York apartment." T.W., New York City

Now B-I-C introduces the new FM 8 at only \$49.95. It's a bit less fancy and therefore less expensive than the original Beam Box FM 10. Performance is virtually the same.

If you're unhappy with your FM reception and can't improve it with your present FM antenna, The Beam Box may be your answer.



Enter No. 7 on Reader Service Card

plies to you, then you are indeed heading for trouble. And accumulating more of it every day.

In this syndrome, it gradually becomes clear that the more recordings you put away — that is, figuratively sweep under the rug — the more there are lying around in messy display. You still use the hunt-for-it system, but with increasing frustration. Is it in that pile by the window, or in the stack I pushed under the piano? (Go look under my piano.) Or was that the one I loaned to my sister-in-law last month? Down on your hands and knees, man, and plough through pile after pile until you find the d—thing. Or don't, and conclude erroneously that somebody has walked off with it, the slob. Incipient paranoia. It's right there within 10 feet of you. But you can't find it.

Catastrophic Crunch

The ultimate crunch arrives one evening when you give a long groan, grab EVERYTHING and make a huge pile in the middle of the living room floor for drastic reassignment. A week later you have set up your library.

Other than via an almost prissy neatness from the very beginning, I know of only one other way to avoid this trouble. Go on the wagon.

Do not ever buy another recording, not an LP, 45 cassette, or open reel. Recordings anonymous! It helps to commune with someone else who has taken the pledge. After awhile, you get so you can, even in the pitch dark, reach into the same old pile of the same old records and come up with the exact item you want for its 150th playing . . . but this is a dream world. Because if you have a library you can do so much better; you can find the "oldies" and you can also buy the "newies." For that, it's worth the extra effort. I've been making extra efforts for decades, though I still haven't caught up. But then I'm a record reviewer. Even with paid help, my library remains perennially out of control. So I know whereof I speak.

What is a library? *Library* actually is not too appropriate for our sort of collecting, etymologically speaking, because in Latin *liber* means book (*livre* in French) and so a library is technically, by language, a "bookery." Curious that the french word *librairie* means bookstore, a collecting-together of books for sale. So does "gallery" in our own current art world; you come to browse and maybe to buy. But the much older and more exact meaning of library is minus the sales aspect and takes us back through organized book collections for two thousand years and more of human history, to the very beginnings of inscribed messages on clay

AUDIO • November 1978

Loudspeakers: Then And Now.

There was a time when it took a big speaker to get full, rich high fidelity sound.

It's not true anymore.

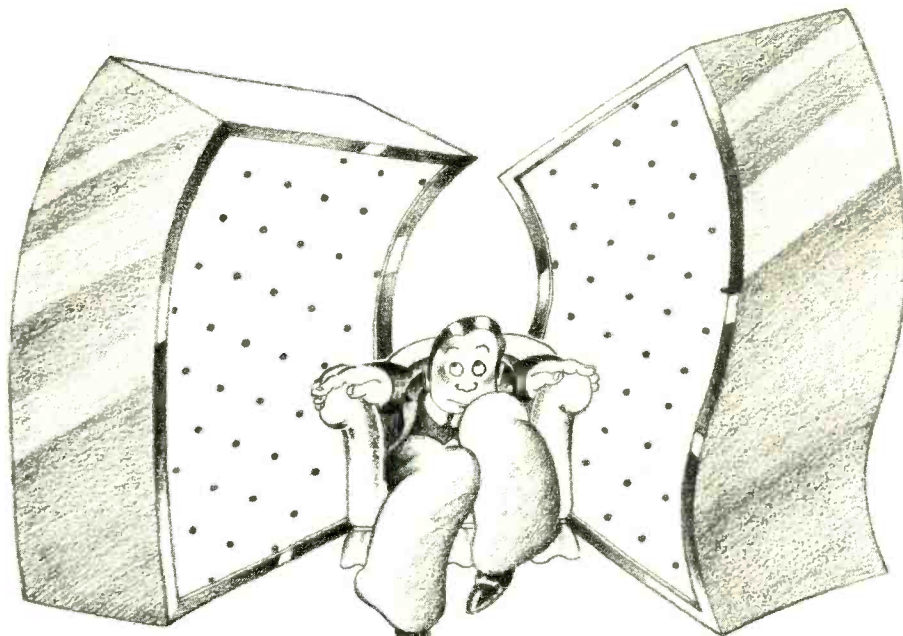
Now Visonik has developed a series of ultra-compact high fidelity loudspeakers that are heard but hardly seen.

This remarkable accomplishment is the DAVID® line of five speakers. Each is an ideal combination of maximum sound and minimum size.

To achieve the sound of a large, well-engineered speaker from a speaker the size of the DAVIDS® is no small accomplishment.

Visonik blends equal parts of technology, precision German engineering, and careful craftsmanship to arrive at this mini miracle.

The result is a speaker small enough to fit in the palm of your



the music that is incredible.

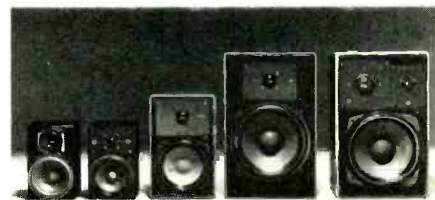
The smallest of the DAVIDS® are the two-way D-302 and D-502, perfectly made for easy placement within your home, or even in a car or van (in an MO version with mounting bracket).

While identical in size to the D-302, the two-way D-502 has more power handling capacity and deeper bass response. Commensurately fuller sound and greater power handling capacity are achieved with the D-602, D-702, and three-way D-803.

With the exception of the D-302, the DAVIDS® have an LED overload indicator to signal overload risk to the tweeters.

The D-602, 702, and 803 come in a choice of a walnut wood veneer cabinet for a touch of visual warmth, or the standard black finish cabinet.

Whatever DAVID® you choose, whether the tiny D-302 or its big



(but still relatively small) brother, the D-803, you can be sure you will own a loudspeaker whose size makes it possible to have the best sound wherever you want it.

See and hear today's concept in loudspeakers at your Visonik dealer. Write us or call this toll-free number for the name of your nearest dealer. (1) 800 423-2355, extension 606. In California, call (1) 800 232-2175, extension 606.



hand, with the sound of a speaker you could barely lift off the floor. And with dispersion and imaging of

VISONIK® HIFI

You'll hear more from us.™

Visonik of America, Inc./1177 65th Street/Oakland, CA 94608

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Enter No. 60 on Reader Service Card

See why TDK

It's the little things you can't see
that make a big difference in the way it sounds.

At first glance different brands of tape look pretty much alike. But if you look closely, you'll find there are many subtle differences. And it is these differences that make one tape stand out above all others.

Now you might not spend a lot of time looking closely at tape. But we have to—that's our business. At TDK we're committed to constantly improving our products. For years, our SA cassette has been the High bias reference standard for almost all quality cassette deck manufacturers. Yet we've incorporated improvement after improvement into SA's tape and mechanism since its introduction as the first non-chrome High bias cassette in 1975. These advances mean better quality sound for you. TDK makes this possible, by continuous attention to the little things you can't see.

The Particles

The lifeblood of recording tape is microscopic magnetic particles that can be arranged in patterns to store and reproduce sound. At best, they are as small as possible, uniform in size and shape; they are long and narrow (the greater the ratio of length to width, the better); and they are tightly, uniformly packed together, with no gaps or clumps.

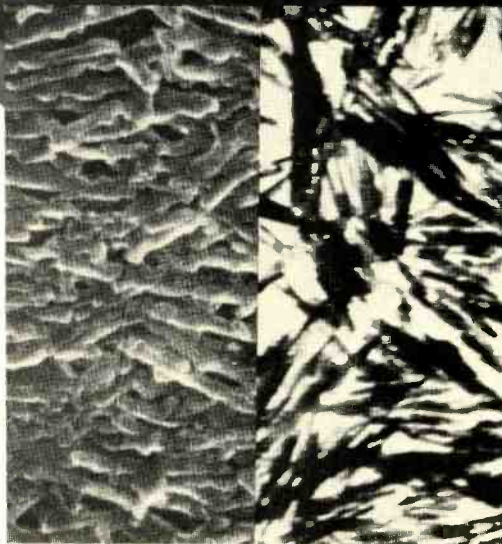
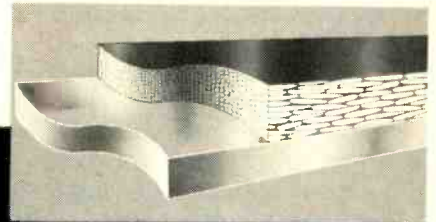
Over 40 years of experience in magnetic ferrite technology and 25 years in developing and manufacturing recording tape, bring the TDK SA and AD cassette particle formulations as close to these ideals as current technology will allow.

The TDK SA particle is a cobalt gamma ferric oxide compound made highly stable by our proprietary cobalt-ion adsorption process. The SA particle possesses one of the greatest length/width ratios of any particle used in audio cassette recording: an amazing 11:1. These little wonders are truly "state-of-the-art," and mean higher maximum output level (MOL), higher signal-to-noise and lower noise.

The particle in TDK AD is *pure gamma ferric oxide*; it has been developed specifically for use in Normal bias decks—in the home, car, in portables. With a length/width ratio of 10:1, the AD particle can deliver what most conventional cassettes lack: an extended, hot high end, to capture all the elusive highs in music, from classical crescendo to raging rock and roll. It is the logical successor to the world's first high fidelity cassette tape particle, TDK SD, introduced in 1968.

clumps nor gaps of oxide build-up. So we suspend our particles in a unique new binding, and we're fanatic about the way we do it. TDK engineers and craftsmen wear surgically clean robes and caps, and we vacuum the air to eliminate

Tape layers: coating (top); backing.



TDK SA tape surface (left) enlarged 30,000 times. TDK Super Avilyn particles (right) enlarged 20,000 times.

contaminating foreign matter and disruptive static charges. The high packing density that results means that the tape is prepared to handle high input level musical peaks gracefully, and without distortion.

The Base Film

We coat our oxides on broad rolls of supremely flexible, but nearly stretch-proof polyester film, to make sure

TDK cassettes don't tangle or introduce wow and flutter.

The Polishing

After each roll is coated, it goes through a polishing process called "calendering." Any oxide is removed,

The Coating

To best attach the particles to the film used for backing, it's necessary to coat that film evenly, with neither

sounds better.

and the surface is smoothed to reduce tape head wear and oxide shedding. Reduced friction across the tape heads means lower noise.

The Edge

If you look closely at the edges of TDK's tape, you'll find that they are uniformly straight and parallel to a tolerance of one micron. That's because we slit our tape by pulling it across an array of precisely-positioned, surgically-sharp knives. That means the tape movement is unimpeded; and mis-tracking that could result in garbled stereo is eliminated.

The Hub/Clamp Assembly

TDK has met a major challenge which has always faced cassette manufacturers:

anchoring the tape to the hub without causing mechanical problems. We use a unique double clamp system we pioneered. It practically eliminates wow and flutter, distortion, drop-outs and other problems related to poor winding. Some manufacturers use plastic pins jammed into notches on the edge of the hub. This system can lead to uneven winding, which causes the edges to feather, the tape to bulk unevenly, and occasionally, to snap at the anchor.

The Cleaning

Like most leader tape, ours is designed to protect the recording surface from stress, and to provide a firm anchor to the hub. Unlike most leader tape, TDK's cleans your recorder heads as it passes by.

The Splice

Our splices are firm, with leader and tape lined up exactly. Our splicing tape is specially designed not to bleed adhesive into the cassette mechanism, which could gum up the works.

© 1978 TDK Electronics Corp.

The Inspection

Before any of our tape is loaded into cassette shells, it must pass a series of inspections to



The TDK double clamp system.



The TDK high tolerance tape/leader splice.

see if it matches up to our own rigorous standards. If it doesn't pass, it's discarded. We never compromise on quality.

The Music and the Machine

We go to more trouble than most companies do, when we manufacture our cassettes. We see to all the little details, so you can hear more of your music. Our super precision cassette mechanism delivers the tape to your heads precisely, without introducing friction, wow and flutter and other problems in the process. And we back that mechanism, and the tape within it, with high fidelity's original full lifetime warranty*, a measure of the value we have placed in our cassettes, for over 10 years.

So next time you buy cassettes, look closely at TDK, and think of all the little things you can't see that make our cassettes just that much better. TDK Electronics Corp., Garden City, NY 11530. In Canada: Superior Electronics Ind., Ltd.

*In the unlikely event that any TDK audio cassette ever fails to perform due to a defect in materials or workmanship, simply return it to your local dealer or to TDK for a free replacement.



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tablets and, even earlier, collections of small clay tokens in various meaningful shapes, now discovered to antedate even writing itself. They, too had to be organized so you could find what you wanted and use it.

Nowadays, we have expanded the library idea to cover anything with a message on it, like a recording, which we want (a) to collect and preserve, (b) to organize and make accessible, and (c) to use. These are the three essentials of any library, public or private, and you can see nicely where you fit in. Libraries are now mostly public but there are and always have been private libraries, collections, of every imaginable size. My father had a distinguished library of books, some rare, many with personal dedications from the author, some first editions, numerous big "complete" sets, and up to 50 handsomely bound volumes. Shakespeare, Mark Twain, Jane Austen, H.G. Wells, O. Henry — I read through most of them as a kid, just browsing. This was decidedly a private library and so today is my own even larger library of sound recordings, and so is yours. Always the same three essentials, collect, make accessible, and use. But it is the middle one, accessibility, which is the important one.

Audio Accessibility

Maybe I'm using the wrong term here. Is it, instead, a private museum that you have in your assembled hi-fi software? The museum is a much newer institution than the library (basically 19th century), and it is different, though the two overlap in many ways. A museum is a collection too, semi-rearrangeable, primarily set up for show, organized to impress an eager audience. So is your hi-fi collection a private museum? I'd say so. You put on a (different) show each time you show off your fi. And you surely want to impress an eager audience, even if only an audience of one. As a "showable" collection yours is definitely museum-like.

Museums, too, are mostly large and public but there are a few private museums and quite a number of ex-private ones, like the Frick in New York and Mrs. Gardner's Museum in Boston, surely the zaniest museum you ever saw, if it still is as it used to be. Mrs. G. was wealthy, and she collected all right. She built herself a show-off place that must be seen to be believed, a vast Edwardian indoor botanical garden with pool, all iron and glass, where masses of flowers and shrubs and trees (often changed) mixed themselves up with a motley art display. Unique but, what with swim-

ming pool hi fi among the palm fronds (California) and loudspeakers in the trees (Florida?), we surely could do roughly the same.

Even without the hoopla, you can have your own little museum, provided you organize it with some sort of system. That's what I'm getting at. Or library, if you wish. Either way, it is better to get started before the crunch comes, if you clearly see that it is, indeed, coming. Take a look around you, as per the above. Yes, things are beginning to slide towards chaos? Are you wading already knee deep in piles of records, or even ankle deep?

Magpie Mimicry

File cards, I must say, are the final and most ambitious resort, also the most demanding, when all else has proved inadequate. I've had file cards for years, but I got to that stage 'way back, and out of the most dire necessity, having tried just about everything else in turn. I think I can make some useful suggestions, if only to get your mind going, but space is up for now and so I begin, reassuringly, with the most elementary suggestion of all. You've already put it into practice, unless you are color blind. Memorize your record jacket's front art. And then go look for what you want by shape and color. Especially, like the magpie, for color.

So you spread out your LP records luxuriantly, all over the place, just as already described, and you look for the right color. It's that bright red one with the blue picture in the middle. Or the mottled olive that looks like wallpaper. Even better, you can go for portrait identification. The glowering guy with the long curly hair. That leering grin on the pianist who has just had 50 color shots made of him (40 of which will appear on his other records) and he is getting hysterical under the camera's relentless gaze. Did you see the recent Columbia cover of the late Georg Szell holding up one hand in front of his face to hide it from the camera? That one broke me up. They'll use anything to get your attention today, even the misfires! So much the better. It's that much easier to find the record you want, among the dozens, the hundreds, the thousands that you own, in your own museum.

The trouble with this non-system, though, is that you will have to leave your records out and visible. Otherwise it won't work. So I predict that this stage in your collecting life will be short and snappy. "GEORGE, PUT THOSE RECORDS AWAY — don't you know the Smiths are coming for dinner?" That'll be the beginning of the end. A

Tandberg's New TD 20 A With The Exclusive ACTILINEAR Recording System

Tape recorders can no longer be looked upon as independent units in today's extremely sophisticated sound systems, but rather as components within a total system with performance capability as technically advanced as all other components of that system.

Drawing upon its unequalled 30 year tradition in magnetic recording technology, Tandberg has met this challenge by developing a completely new concept in tape recording known as ACTILINEAR Recording (Patent pending) for their new, advanced open reel and cassette machines.

In conventional recording systems, the summation of record & bias currents in the recording head is done through passive components, leading to inherent compromise solutions. The new ACTILINEAR Recording System is totally free of these compromises, as the passive components have been replaced with an active Transconductance amplifier developed by Tandberg. Just a couple of its many benefits are: up to 20 dB more headroom over any recording system currently available, and the ability to handle the new high coercivity tapes.

In fact, Tandberg's new ACTILINEAR Recording System, when used in conjunction with the soon-to-be-available metal particle tapes now under intense development in the U.S., Japan and Germany, offers performance parameters approaching those of experimental Pulse Code Modulation (PCM) technology yet is fully compatible for playback on all existing tape recorders. It is literally a machine for the future, with no obsolescence factor, as it can be used with any type of recording tape, available now or in years to come.

Tandberg engineers have mated this new recording system to a logic-controlled, four-motor, solenoidless tape transport of advanced design, which, like the ACTILINEAR concept, is totally unique on the market today.

Other superior features of the TD 20 A include: built-in Sel. Sync. • front panel bias adjustment • front panel 2-position microphone sensitivity switch • frequency-corrected, peak-reading VU meters, with new graphics designed for improved readability • four line inputs + master gain control • a "free" mode + Edit/Cue facilities for easier editing • LED mode indicators • separate power supplies for operational functions and audio functions • rack mount capability • optional wireless, PCM infrared remote control.

Visit your authorized Tandberg dealer for a demonstration of the new TD 20 A deck, and discover how tape recording will be done in the years to come. For your nearest dealer, write: Tandberg of America, Inc., Labriola Court, Armonk, N. Y. 10504.

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TANDBERG TD 20A

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It seems that Mrs. Murphy has moved her Fudge Shoppe & Speaker Works from Indiana to Kansas. Do you know of any way to induce her to move back to New York? I'm sure she would be happier with Larry Zide at *db Magazine*.

W.J.J. Hoge
Boy Wonder

"Live" Rock

Dear Sir:

In answer to Michael Kiley's letter in your September, 1978, issue of *Audio*, I can't understand how Mr. Kiley can

say that "live" rock performances aren't live. Granted, rock musicians use many different electronic devices, but if you take away the musicians what do you have? Nothing but a lot of electronic gear in one place. The musician is still the creator of the sound, *not* the equipment. Mr. Kiley doesn't have to like rock music, but denying its existence and the talent of rock musicians is going a little too far.

Bill Strateff
Akron, Ohio

(Editor's Note: "Not live" in Mr. Kiley's usage means non-acoustic. E.P.)

Audio-Visual Helpmate

Dear Sir:

Apropos to your column on VTRing in the July, 1978, issue of *Audio*, perhaps some of your readers can answer a pathetic cry for help from the far Pacific. A friend of mine in Manila is looking for opera and ballet recordings in the Betamax, V-matic, or VHS formats to add to his personal collection. He is hoping to find an enthusiast willing to correspond with him out in the "boondocks."

Those interested should write to: Jose Matti, No. 41 Alfonso XIII St., San Juan, Metro Manila, Philippines.

Any and all cooperation will be appreciated.

Odin Thanum
San Diego, Cal.

NAPCO's Mary Claffey Wins ABP Circulation Award

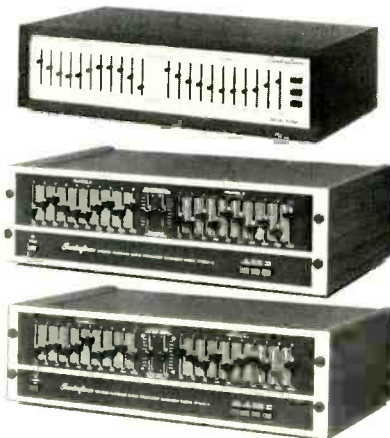


Mary Claffey, Vice President and Director of Circulation at North American Publishing Company, *Audio's* parent company, has received the 1978 American Business Press National Circulation Career Award in recognition for her contributions to circulation and publishing. In 1958, when North American had only one publication, she was the entire circulation department — as well as the bookkeeper, office manager, and telephone operator. Today she is responsible for administering a department of 64 people which provides a complete circulation operation for 25 publications and newsletters, as well as direct-mail activity. Under Ms. Claffey's direction, the circulation operation was converted to a computerized system which has saved the company a considerable amount of time and money. In 1972 she presented the postal authorities in Washington with an innovation in the handling of controlled circulation permits.

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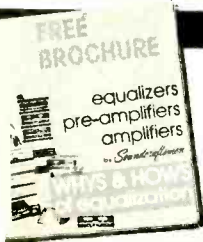
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YOU SHOULD EXPECT MORE FROM THE PHASE 4000 SERIES TWO.

Even if you're made out of money, you'd be hard pressed to buy more preamp.

The Phase 4000 Series Two goes way beyond the boundaries of conventional preamps. First, the 4000 processes and amplifies your music without introducing any significant noise or distortion. Then it actually compensates for losses in dynamic range and signal-to-noise ratios that occurred way back in the recording process!

To prevent overloads, studios "peak limit" the high-level attacks common in today's music. The 4000 Series Two has highly advanced circuits to read peak limiting, and immediately restore the dynamic range. The combined overall dynamic range is increased by 17.5dB. So when Charlie Watts hits a cymbal, it sounds like a cymbal!

The 4000 Series Two also spots low level gain riding, where the recording engineer adds volume to a low signal to overcome noise on the master tape. The

Downward Expander immediately expands the dynamics, so you hear the bass as the conductor called for it, not as the engineer delivered it.

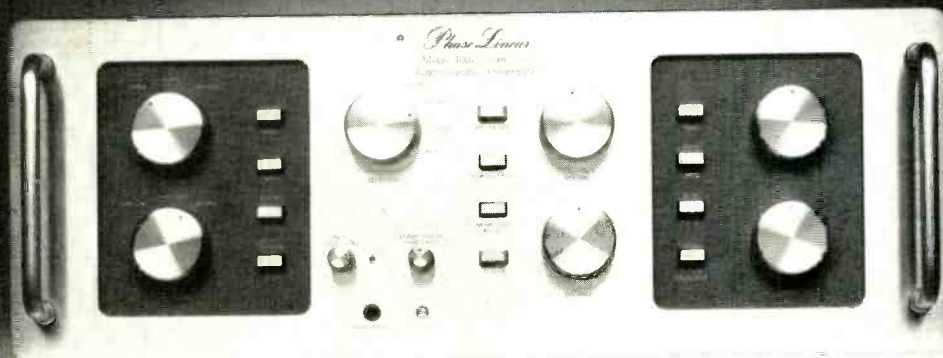
The 4000 Series Two second generation Autocorrelator reduces record hiss, tape hiss, and FM broadcast noise. Weighted overall noise reduction is -10dB from 20Hz to 20kHz. So your music comes clean, and the background is silent.

The 4000 has two new RIAA phono stages which eliminate low level switching and reduce hum and CB interference to a minimum.

Tape monitor and dubbing circuits allow copying between decks, while listening to a third program source. There's a separate direct coupled (OCL) Headphone Amplifier. An infrasonic filter eliminates audible effects caused by rumble. We could go on forever, but you get the point.

The Phase 4000 Series Two. It's waiting for you at your Phase Linear dealer.

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If you're one of those people that want facts instead of fluff then Fidelity Research is your kind of company. You see we're one of those old fashioned companies that would rather spend it's money on research and development than slick, glossy ads. So, we've developed some fact sheets on our moving coil cartridges, tonearms and related equipment. If you're serious about the optimum tonearm/cartridge combination then give us a call toll-free. We'll send you the facts. Nothing more. Nothing less.



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Audioclinic *Continued from pg. 6*

This cable works out well because it provides much better shielding than the spiral-wrapped cables we usually find. However, it has a higher capacitance per foot than other kinds of cable, which may be a consideration in such applications as phonograph installations.

Be sure to route all a.c. lines away from audio cables. Good shielded cables, as well as careful wire routing, may well cure any hum condition you have.

Amplifier Hiss

Q. I have a problem with my receiver. It produces an audible hissing sound when in either AUX, Tape Monitor, or the Phono mode. The hiss is present with the speakers, the cassette deck, the Dolby Noise Reduction, the turntable, everything except the FM position. When I took my receiver to a technician, he said that his speakers showed no sign of hiss at normal listening levels. He said that he could hear a hiss when headphones were used, but this was not uncommon with an integrated amplifier. He added that I shouldn't be able to hear hissing in my speakers unless I listened at high output levels. I understand that there will be noise in even the best of systems, but this is a very audible hiss.—
 Dale C. Allen, Roanoke, Va.

A. Probably your service shop used a speaker with less efficiency than your speakers, and this would eliminate the problem as far as he was concerned. Presumably the hiss of which you speak is present even when the volume is turned all the way down. This means that it occurs in the audio stages after the volume control. This hiss may be inherent in the design of the amplifier.

Your letter has a statement in it which puzzles me somewhat. You state that if you listen to FM, you do not hear this hiss. Perhaps there is some kind of gain reduction switched into the circuit, resulting in elimination of the hiss. Also you may have one of those circuits in which signal is introduced into a stage before the volume control and FM signals are the loudest, producing more voltage at the input of such stages. This means that, when listening to FM, the volume control must be lowered more than for listening to other program sources and this would prevent hiss from being audible. If this is the case, then the hiss is generated between the input to the high-level sources and the volume control.

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AUDIO • November 1978

Your choice between these new LUX turntables depends on how you feel about bearing arms.

Although these two turntables are being introduced simultaneously, the PD-272 (with integrated tonearm) was actually designed and produced first. Its operation is purely manual—no automatic assist whatever. So if you believe that any amount of automation implies compromise, the PD-272 should appeal to you.

The performance will certainly appeal to purists. The servo-controlled direct-drive brushless DC motor with its gapless pole design is totally free of the cogging (pulsing) that plagues many other direct-drive motors.

The straight, statically-balanced tonearm has several important design

features. For example, the vertical pivots extend through the arm rather than simply suspending it from the outside. This minimizes lateral play and assures that the stylus will always remain perpendicular to the record. Also, the arm's nested tube construction and internal damping deal very effectively with resonance.

Then for those audiophiles who like to go their separate ways, we produced the PD-270 (like the PD-272 but less tonearm) and the TA-1 (separate tonearm). With TA-1, you change cartridges by changing the entire tonearm tube. This system is much better than changing headshells since

it minimizes mass at the critical point of the tonearm. The TA-1 also has a built-in stabilizer below the arm base which damps out vibration.

This additional flexibility has its price. The PD-270 drive system is \$285; the TA-1 tonearm, \$125. The complete PD-272 is \$345. And for either tonearm, the new 115-C moving coil cartridge, \$195.)

As you can see, you do have to decide how likely you are to want interchangeable tonearms in the future. Think about it on your way to your LUX dealer. If it's still a problem when you get there, he'll help you bear up under it.

LUX Audio of America, Ltd.

160 Dupont Street, Plainview, New York 11803 • In Canada: White Electronics Development Corp., Ontario



PD-272. Effective tonearm length: 240mm. Tracking force calibrated 0-3 grams. Accepts cartridges from 4-11 grams. Anti-skating, viscous-damped cueing, adjustable height. Illuminated strobe, pitch variable $\pm 4\%$. Wow and flutter less than 0.03% (WRMS); rumble more than 60 dB. Same drive system specifications apply to PD-270. Both include removable dust cover.

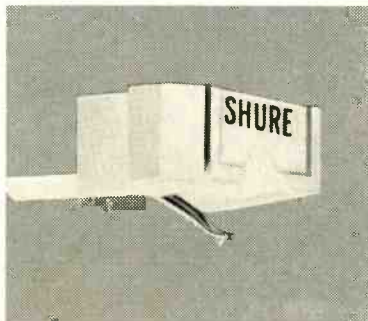
TA-1. Straight, tubular, static-balanced. Interchangeable tube. Stabilizer. Otherwise similar to tonearm of PD-272.



Needle in the hi-fi haystack

Even we were astounded at how difficult it is to find an adequate other-brand replacement stylus for a Shure cartridge. We recently purchased 241 random styli that were not manufactured by Shure, but were being sold as replacements for our cartridges. Only ONE of these 241 styli could pass the same basic production line performance tests that ALL genuine Shure styli must pass. But don't simply accept what we say here. Send for the documented test results we've compiled for you in data booklet # AL548. Insist on a genuine Shure stylus so that your cartridge will retain its original performance capability—and at the same time protect your records.

Shure Brothers Inc.
222 Hartrey Ave., Evanston, IL 60204
In Canada: A.C. Simmonds & Sons Limited



Manufacturers of high fidelity components, microphones, sound systems and related circuitry.

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Behind the scenes

Bert Whyte

In spite of the introduction of magnetic tape and subsequent open-reel, cassette, and 8-track prerecorded formats, the venerable phonograph record has remained the chief source of music for the audio consumer. Everytime an advance was made in the magnetic recording medium, the doom-sayers predicted the demise of the phonograph record. Subsequent technical shortcomings and economic considerations in prerecorded tapes kept the phonograph record flourishing. When stereo tape arrived on the audio scene in the early 1950s, it looked like this development would indeed mean the end of the phonograph disc. After all, how could stereophonic sound be recorded on a disc? Two sets of grooves on a disc were impractical for many reasons, and the notion of two signals contained in a single record groove was sheer fantasy. Right? Wrong. Had the doom-sayers delved deeply enough into the dusty archives of audio, they would have found that an unsung genius named Alan Blumlein had invented the single groove stereophonic disc in 1933! Perhaps if Blumlein had not met his untimely death in an aircraft accident in England during the Second World War, the stereophonic phonograph record would have become a commercial reality long before 1958. In any case, over the years the phonograph disc has repeatedly demonstrated its technical resiliency and longevity. Now, with the anticipation of digital disc recordings, a long road stretches ahead for the brainchild of Thomas Alva Edison and Emile Berliner.

All this preamble was in aid of the fact that if you have a phonograph record with grooves, you most assuredly have to have a phono pickup cartridge to trace the signals impressed in those record grooves.

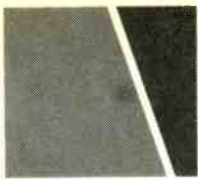
While it might seem perfectly obvious that the phono cartridge is the first element in the audio chain of reproduction and, as such, can have a profound effect on sound quality, the average audio consumer is usually more concerned with the nether end of the production chain, the loudspeaker. When a music lover no longer is dazzled by the delights of his first audio system and begins to listen more critically, usually the first upgrading of his

system is the acquisition of better quality loudspeakers. A bit later on, having become still more knowledgeable in the ways of audio, he opts for a better receiver or amplifier. Having advanced this far, he finally gets around to updating his phono cartridge. Our newly minted audiophile has followed a well-worn route in the improvement of his sound system. Yet it is obvious, that even if our audiophile acquires the very best speaker on the market and the *ne plus ultra* in amplifiers, the entire system is only as good as the phono cartridge at the beginning of this audio chain. I personally feel that, all things considered, upgrading a phono cartridge is the quickest, surest, and usually least expensive way to improve the quality of a system.

Cartridge Configurations

Over the years, the quest for higher quality pickup cartridges has produced some unusual and very exotic configurations of this component. But basically we have had relatively few principles involved in these designs. Early on, we had pickups with crystal and ceramic elements which produced sound by their piezoelectric effects. A big step forward in the evolution of phono cartridges was the introduction of magnetic pickups. These employed such designs as variable reluctance, moving magnet, moving iron, induced magnet, and moving coils to generate an audio signal. Whatever the design, they shared in common a relatively low output, necessitating the use of a preamplifier and in the case of moving-coil pickups, a pre-preamplifier. Needless to say, in the course of time some brands of magnetic cartridges have become pre-eminent and have dominated the field. In America such names as Shure and Pickering/Stanton come to mind. Between them they hold many of the basic patents for moving-magnet phono cartridges. Moving-coil cartridges have always been considered fairly esoteric items or, if you will, in the province of audio faddists. Ortofon was the principal supplier of moving-coil pickups until recent years, when all of sudden there was quite a proliferation of these pickups from Japan. Now, among fanatic audiophiles, moving-coil pickups have acquired a whole "mystique"

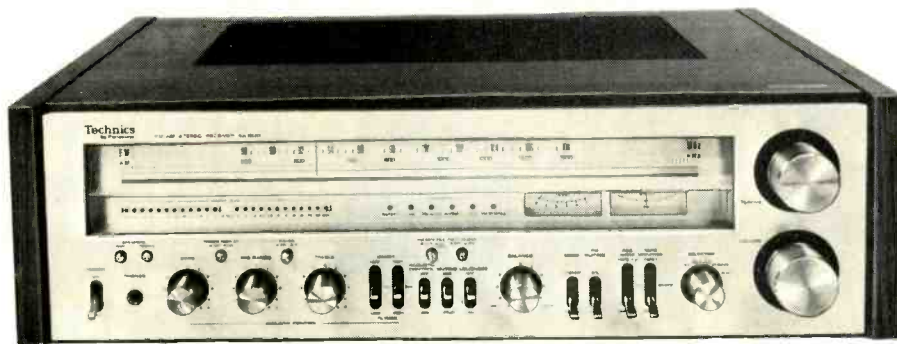
AUDIO • November 1978



**fact:
calling this a "brush"**



is like calling this a "radio"



**we call it a Dynamic Stabilizer
...critics call it a major innovation**

True, the device on the front of a V15 Type IV cartridge bears a superficial resemblance to a cleaning brush.

In reality, it is a complex, exquisitely engineered subassembly which performs several complex functions that measurably enhance the quality of record reproduction!

Each one of its 10,000 conductive carbon fibers is positively grounded to discharge ever-present static electricity from the surface of your records. This eliminates static clicks and pops, as well as the tracking distortion produced by the varying electrostatic attraction between the record surface and the tone arm.

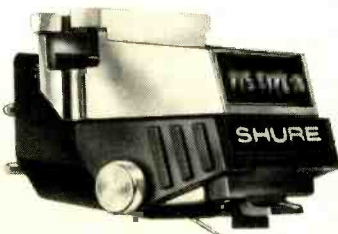
What's more, the Dynamic Stabilizer incorporates Shure-developed viscous damping that results in a uniquely efficient suspension system which maintains precise cartridge-to-record distance and uniform tracking

force—even on severely warped records. The stabilizer also acts as a shock absorber to cushion the stylus in case you accidentally drop the tone arm onto the record.

Finally, the tiny carbon fibers are so fine that 10 of them can fit *inside* a single groove to sweep free minute dust particles.

This integrated approach to pure sound reproduction extends throughout the design of the V15 Type IV. It sets a new standard of high trackability at ultra-low tracking forces—even on records that are warped, dusty, and charged with static.

If faithful reproduction of *all* your recordings is of paramount importance to you, we invite you to audition the V15 Type IV with the Dynamic Stabilizer. Or, write for the complete story (ask for AL569).



V15 Type IV...the stabilized cartridge



Shure Brothers Inc., 222 Hartrey Ave., Evanston, IL 60204, In Canada: A. C. Simmonds & Sons Limited
Manufacturers of high fidelity components, microphones, sound systems and related circuitry.

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and have become a cult item, much to the dismay and chagrin of the moving-magnet pickup manufacturers. I hasten to add that their dismay is not in loss of sales, because the moving-coil market is miniscule in comparison to the world market for the moving-magnet types. Rather, the distress of these manufacturers is in the claims made for the superiority of the moving-coil designs. They consider these claims to be far-fetched, unfounded, and unprovable. Companies like Shure and Pickering/Stanton maintain elaborate and costly research facilities staffed by

some very bright engineers, and they are ready at the drop of a stylus to refute the claims of the moving-coil camp. I should point out that Joe Grado holds a number of patents on moving-coil cartridges in this country, but does not manufacture this type of pickup. There are also beady-eyed cynics who remind us that some of the Shure and Pickering/Stanton patents run out in two years, and that there are container ships loaded with moving-magnet cartridges sitting in Japanese harbors ready to flood this country with that type of pickup.

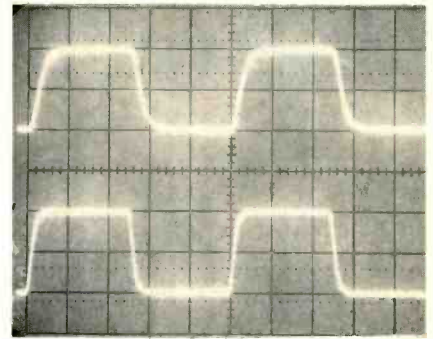


Fig. 1 — Response of MX-10 preamp to 1-MHz square wave. Output level is 4 V p-p. Horizontal scale is 0.2 μ S per division.

Moving-Coil Mania

What are some of the claims cited by the high-end audiophiles that make moving-coil pickups so desirable? They say that the lower moving mass of the MC pickup makes it easier to achieve lower stylus tip mass. Because the coils have few turns of wire in comparison to MM types of pickup, the inductance of moving-coil pickups is very low. The effect of this is to raise the resonance peak out of the audio range. Moving-coil pickups are regarded as having minimum hysteresis effects, and the flow of magnetic flux between poles is more balanced. MC aficionados say their pickups have higher definition, retain ambience and "air" around musical instruments, have lower and "tighter" bass response, give better stereo imaging and have more "musicality." Some audiophiles also feel that since records are cut with moving-coil cutting heads, playback with moving-coil pickups is a logical conclusion. This has been pretty thoroughly disproven, and even the hard core MC fanatics are acknowledging this to be so. The MM manufacturers can refute most of these claims with hard, cold figures to prove their point. They say that MC pickups cannot track as high a velocity signal as their MM units can. Furthermore, their pickups can track those velocities at much less stylus pressure. The MM people can prove a flatter frequency response, casting an accusing finger at the rising high end response of a number of MC pickups. They point out the generally higher cost of MC pickups and the fact that some sort of voltage step-up device is a necessity.

This last is indeed the case, and the device can take the form of an electronic pre-amplifier or a step-up transformer. Which brings me to the main thrust of this article. If, in spite of

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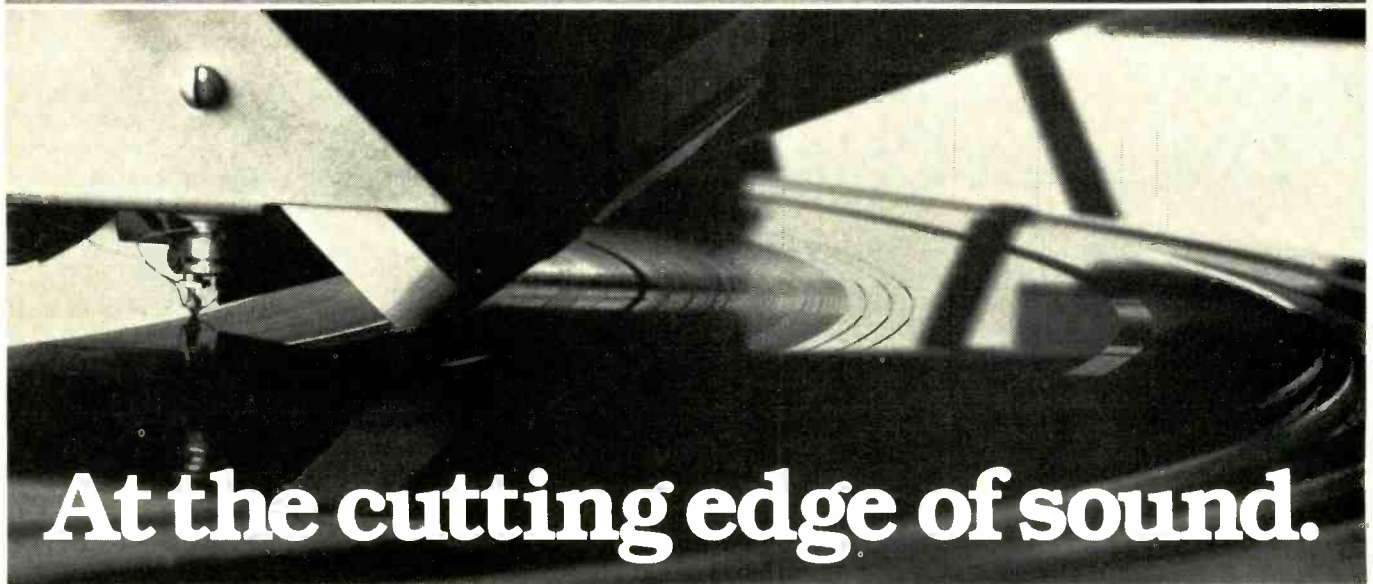
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the challenges of the MM manufacturers to the claims of MC pickups, you still have a preference for the MC type of pickup, it is indisputable that the quality of sound of the pickup is profoundly influenced by the quality of the step-up device. Most of the MC manufacturers make step-up transformers, along with some from independent manufacturers. The best of these appears to be the high-priced Verion transformer, which is very carefully shielded and has no hum. However, there are many MC adherents who state that transformers are subject

to hysteresis effects, core saturation, and that they degrade frequency and phase response.

I won't get into that dogfight, but there is no doubt that a great many MC faddists prefer pre-preamplifiers. There must be at least a round dozen of these units on the market, and the audiophile press is constantly testing them, looking for a sort of "Holy Grail" that will provide the necessary step-up voltage for their MC pickups with a minimum of signal degradation. I have tried a number of these devices with varying degrees of success. Re-

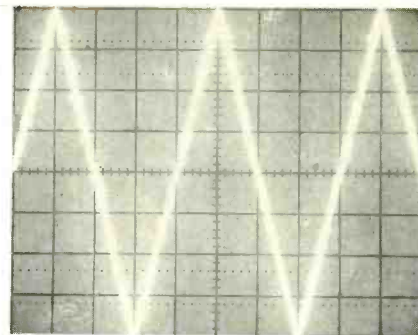


Fig. 2 — Response to 125-kHz triangle wave at 4 V p-p. Horizontal scale is 2 μ S per division.

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cently I was sent a prototype model of a pre-preamp, and the results have been nothing short of phenomenal. Every once in a while an item of audio equipment comes along that is so outstanding in quality and innovative design that it sets new standards. The Mark Levinson LNP-2 preamplifier of some years ago was such a product. In the same lofty category is Audio Standards Corp. Model MX-10 moving-coil pre-preamplifier. The guiding light behind this unit is John Dunlavy, an engineer with formidable qualifications, who holds some 34 patents in the fields of antenna design and wave-form theory. Many of the antennas on space vehicles orbiting the earth are of his design. Audio has been an abiding, if not over-riding addiction for most of his life, and the components he has designed reflect some very original thinking.

Pre-preamp "Specsmanship"

The MX-10 is larger and heavier than most such units on the market, and there is a very good reason for this. The unit is 6-in. high by 5 $\frac{1}{2}$ -in. wide by 10-in. deep and weighs in at a substantial 15 pounds. A walnut enclosure contains the pre-preamp and a power supply. Each is in a separate shielded module which is made of a 4-inch diameter, 3/16-in. steel pipe. The end caps are also steel, plated with 24K gold for maximum contact and minimum corrosion. The power transformer is toroidal, and there is separate power supply filtering for each channel. The power supply is highly regulated, maintaining 0.1 per cent over an input range of 105 to 130 V or 210 to 260 V. The MX-10 is an all FET design, using selected very high transconductance, planar junction FETs. There is no inverse feedback in the circuit, and the slew rate is a rather incredible 400 volts per microsecond. Those who feel



Wow & Flutter: 0.05% (7½ ips)
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Clearly, the A-6600 is not just a "convenience" machine for people who don't want to get up to flop reels. It's a professional-quality computer-designed tape recording and play back deck, which happens to also play both ways automatically. Truly, one-of-a kind.



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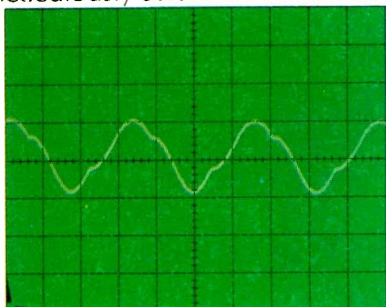
Because it provides a wide dynamic range.

When you combine the two, you have life-like sound that will satisfy even the most discriminating listener.

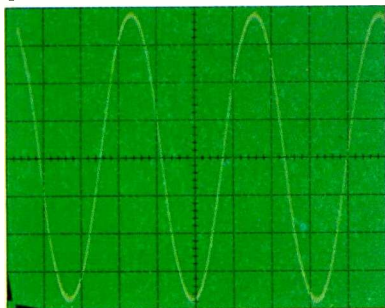
How did we do it?

The patented Venturi enclosure, which actually launched the high-efficiency era in speakers, has been significantly improved. The duct has been lengthened, retuned and acoustically damped. The result is a highly efficient, clean and tight response over an extended bass range.

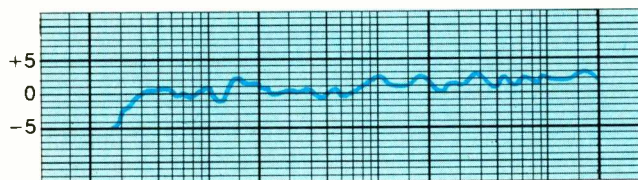
We improved the crossover network configuration through computer calculation, with circuitry and component values meticulously selected to avoid time



These oscilloscope photos show how the Venturi-coupled path multiplies and "cleans" the bass output. Above, a 25 Hz waveform taken directly in front of the woofer cone. Below, the same input measured at the Venturi duct is many times greater, and sinusoidal (nondistorted).



The new Venturi II design (right) both acts as an acoustic transformer, to multiply bass energy, and as a low pass filter to enhance the quality of the deep bass signal. Damping material (pink) acts to improve transient response. The response curve (below) shows how accuracy is maintained from treble peaks down through organ pedal notes.



outs because of unusual shapes or esoteric materials, which don't necessarily contribute to performance quality. But standouts because they combine design and componentry in such a manner as to maximize both linearity and efficiency—and therefore reproduce sound that the most discerning listener would want to hear.

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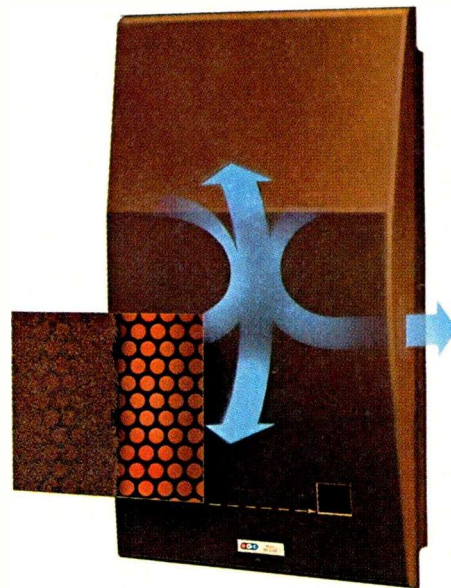
We created our "transonic" grille to avoid edge reflections and diffraction.

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The new "transonic" grille is acoustically transparent and allows sound to radiate in all directions. Molded design eliminates grille frame, thus avoiding unwanted deflection of widely dispersed sound.

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wide bandwidth is important should be happy with a frequency response whose -3 dB points are at 3 Hz and 10 megaHertz! The input impedance is 12 ohms, optimum for most MC pickups, and output impedance is 200 ohms. Gain in the unit is 26 dB, channel balance is ± 0.25 dB, and isolation between channels is greater than 95 dB (20 Hz-20 kHz). Dunlavy states the signal-to-noise ratio of his unit in a more accurate way than the usual spec employing various weighting factors, using equivalent input noise voltage, which is less than 0.6 nanovolts in a 1

Hz bandwidth referenced to the input, and equivalent input noise resistance, which is less than 25 ohms. This translates into a pre-preamp which is virtually noise and hum free.

To test transient intermodulation distortion in his pre-preamp, John uses the method of Ojala, Curl, and Leinonen reported in the April, 1977, *AES Journal*. Using a square wave of 3.18 kHz (output level 400 mV) and a sine wave signal of 15 kHz (output level 100 mV), TIM is less than 0.002 per cent, actually below the residual levels of almost all the measuring

instruments. Harmonic distortion and intermodulation distortion are less than 0.003 per cent for an output of 250 mV peak to peak, at any frequency from 5 Hz to 1 megaHertz. John offers an interesting new specification... "propagation time," which is the delay time between the input and the output, and in this MX-10 it is 35 nS. All these specs are very impressive, but the oscilloscope and spectrum analyzer photos are more so. How about a 1 megaHertz square wave at a hefty 4 volt peak to peak output, where the output trace is almost identical to the input trace! Or the linearity test using a 125-kHz triangular wave at 4 volts peak to peak, which shows the triangular wave as perfectly symmetrical. Most impressive of all is the spectrum analyzer photo of the Ojala/Curl TIM square-wave/sine-wave test, which shows almost total lack of distortion, the harmonic, IM, and TIM components being down more than 90 dB!

Obviously, the specifications of this MX-10 unit are an order of magnitude better than any unit I am familiar with, but as always, the most important question is... how does it sound? The best answer to this is that it has no sound. It's as if there was no pre-preamp at all between the moving-coil cartridge and the input of the preamplifier. I have tried the MX-10 with the Supex Super 900 plus, the Fidelity Research FR1 Mark 3F, the Ortofon MC20, the Denon 103S, and experimental moving-coil cartridges from JVC and Technics. The sound from all of these pickups was vastly improved over any previously heard through quite a number of step-up devices. Even if you are a dyed-in-the-wool moving-coil enthusiast, you won't believe how good a MC cartridge can sound with this unit. The combination of the MX-10 and the Supex was outstanding, affording utterly effortless, smooth, yet highly detailed sound, quite transparent and completely free of coloration. In short, if the moving-coil cartridge is your bag, in my opinion this MX-10 is the premier pre-preamp available today.

Speaking of availability, John Dunlavy tells me that his unit will ultimately be sold in selected high-end audio dealers, but at present can be obtained directly from his company... Audio Standards Corp., Post Office Drawer 2529, Las Cruces, New Mexico 88001. The price is \$299.95. Finally, as a teaser, John Dunlavy gave me a few details about his upcoming preamplifier, which apparently will be as advanced and innovative as his pre-preamp. But that for a later installment. 

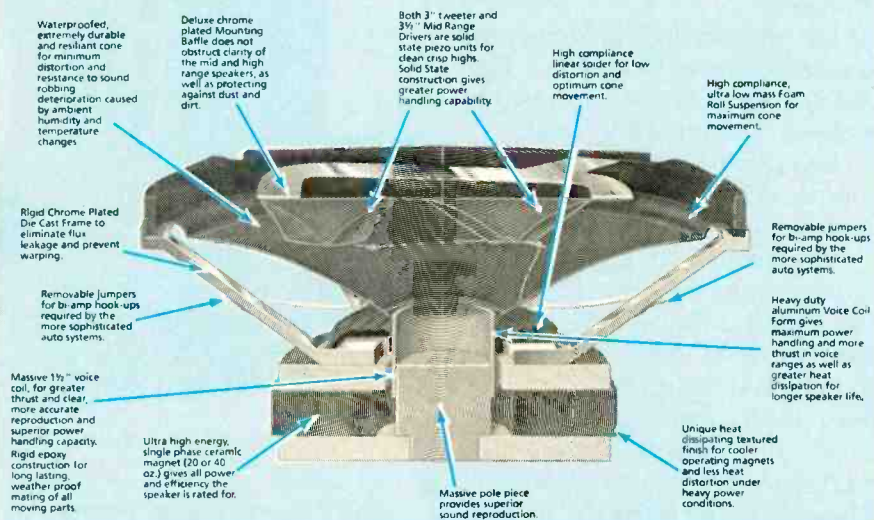


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	TRUSONIC	WELL KNOWN COMPETITOR			TRUSONIC	WELL KNOWN COMPETITOR	
Die Cast Frame	Yes	No	Cannot warp or bend due to heat or vibration.	Power *20 oz. 40 oz.	*40 RMS 80 Peak 80 RMS 120 Peak	~30 RMS 60 Peak not made	Heavier magnet structure materials coupled with an over hung voice coil increases linearity at high power levels and enhances the bass frequency reproduction thus minimizing distortion.
Chrome Plate	Yes	No	Chrome plating in conjunction with die cast construction prevents rust.	Response:	20 oz. 5" x 7" coax 40/25,000 Hz 20 oz. 6" x 9" 3-way 30/25,000 Hz 40 oz. 6" x 9" 3-way 25/25,000 Hz	50/15,000 Hz 40/20,000 Hz not made	The selection of totally solid state mid-range and tweeter elements produces superior sound in the 2,000 Hz range and beyond. Superior magnets and 50% larger voice coils provide greater low end performance.
Bi-Amp Capability	Yes	No	Permits hook up to the newer, more powerful dual output automotive systems being introduced.	Warranty	5 Years	1 Year	Superior construction and design insures years of flawless performance without material or sound deterioration.
Waterproof	Yes	No	Completely waterproof design is necessary for marine and outdoor use.	Price*	\$60.00	\$55.95	Great performance at a comparable price.
Voice Coil	1 1/2"	1"	50% larger voice coil handles greater power and reduces distortion.				
Utilized Magnet	Yes	No	Offers 1.6 times more energy than stacked magnets. This permits higher efficiency.				

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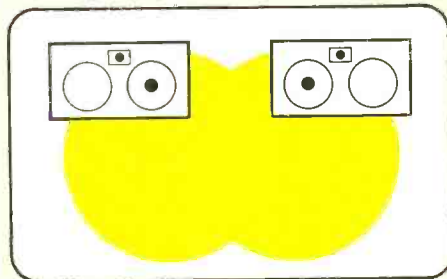
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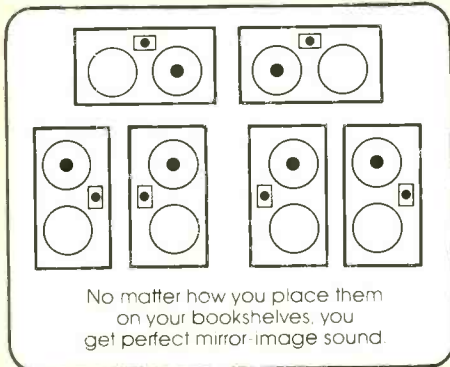
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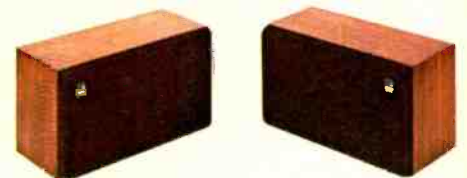


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By designing a left and a right channel configuration for the passive radiator, the woofer and the tweeter, Koss engineers



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A Guide To
**COINCIDENT
MIKES**

Charles P. Repka



Since the introduction of stereophonic recording, there have been three basic philosophies with respect to microphone placement. These are 1) multiple mikes, 2) spaced omni mikes (using two or three mikes), and 3) coincident stereo mikes. After the initial experimental period in stereo recording had passed, the coincident stereo mike was just about abandoned in the U.S. with most American recording engineers choosing some sort of multi-mike technique. In Europe, coincident microphones became the technique of choice for two major reasons: The conviction that it produced a more realistic stereo effect and, more importantly, that it produced a compatible signal easily converted to mono.

In recent years, however, there has been some degree of role reversal with a renewed interest in coincident mikes in the U.S. and the acceptance of the multi-mike techniques in Europe. (Look at the session photos found on the jackets of some of the more recent Philips and DGG recordings, and you will see a veritable forest of microphones.)

As a recording engineer, I've had to use all three techniques and sometimes a combination of them. For a professional engineer, each technique has its uses in the recording studio. However, for the amateur recordist, and in particular with recording a live event, coincident mikes have several major advantages.

How It Works

The basic coincident technique was developed in the 1930s (along with the first stereo recordings) by an English engineer Alan Blumlein. Blumlein used two figure-eight pattern ribbon mikes mounted so that their pattern lobes were at right angles (90°) to each other, as shown in Fig. 1. The stereo effect is produced, primarily, by the difference in amplitude generated in the two mikes by the sound source. A sound on the right generates a larger signal in mike B than in mike A. A sound directly in front produces an equal signal in both mikes and a sound on the left produces a larger signal in mike A than in mike B. The same process takes place with spaced omni mikes, but because of the spacing, there is also a time delay between the two signals. While this time delay causes no real problem when recorded on a tape machine, it does generate an "out-of-phase" signal (usually at low frequencies, but dependent upon the space between the mikes) that results in a large vertical modulation compo-

nent on a stereo disc which is difficult to cut, plate, and play back. It can also produce a loss in gain and unpleasant sound if the two channels are combined into a single mono signal. (This is of great concern to European broadcasters. Although most broadcasts are made in stereo, over 85 per cent of the receivers are still mono.) Since the coincident mike has both its transducers mounted on the same vertical axis (see Fig. 2), the arrival time is identical in both channels, thus reducing this problem to a large degree.

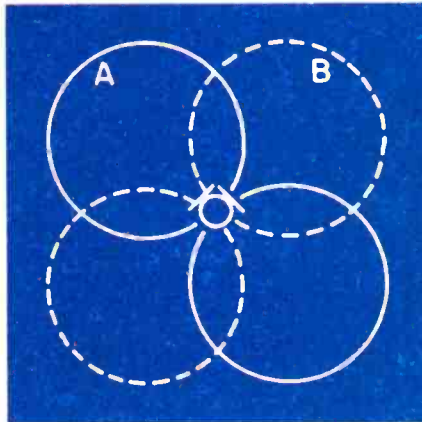


Fig. 1—The basic "Blumlein" pair of mikes.

At this point we should stop and consider that studies of the hearing process have shown the ear to use intensity, phase, and time delay to produce the spatial image. The fact that a coincident mike produces a realistic image means that a) the brain is very clever in constructing a stereo "illusion" from a minimum of information, b) we do not fully understand how the coincident mike really works, c) we do not fully understand how the hearing process works, or d) all of the above. I, personally, vote for d. (Editor's note: Me too)

Other Coincident Techniques

While Blumlein was limited to using figure-eight pattern microphones, modern coincident mikes can offer a choice of multiple patterns allowing the engineer to use the cardioid or hyper-cardioid patterns (see Fig. 3).

These patterns work as well as the figure-eight pattern microphones in producing a stereo image, but pick up less of the ambient hall sound.

These other patterns were used in the development of two variations on the basic coincident technique. These variations are the M-S technique and the O.R.T.F. technique. The M-S (mid-side) technique uses a forward-facing

cardioid mike and a side-facing figure-eight mike, as shown in Fig. 4. The mike outputs form a signal matrix with the cardioid mike supplying the sum L+R signal and the figure-eight mike supplying the difference or L-R signal. These two signals are then added and subtracted electrically (either before or after recording) to produce pure Left and Right signals. This sum and difference technique can be used to produce signals that are electrically equivalent to the various X-Y patterns normally used in coincident recording (see Fig. 7).

The advantage of this method is that the acoustic characteristics of the recordings can be controlled electrically without having to physically move the mike. The amount of separation can be varied from pure mono to pure stereo, or somewhere in between. It also allows the amount of hall sound to be increased or decreased without changing the amount of presence (distance from the performers).

As originally developed (also by Blumlein), the M-S matrix decoder was a pair of transformers with split secondaries connected as shown in Fig. 5. But for this circuit to work properly, the transformers have to be of high quality and closely matched with respect to frequency and phase response, something that is very hard (and expensive) to do in a transformer. These days, however, it is much easier to do the necessary additions and subtractions with electronics. A simple circuit has been devised by my friend Reg Williamson in England using two op-amps to replace the transformers. The basic schematic for this op-amp is shown in Fig. 6 with the construction details along with other circuit applications to be found in issue No. 1, 1977 of *The Audio Amateur*. (Back issues are available from *The Audio Amateur*, P.O. Box 176, Peterborough, NH 03458.)

The O.R.T.F. method uses two cardioid mikes facing *outward* with an angle of 110° between them (see Fig. 8). This method is said to approximate the effect obtained with dummyhead (*Kunstkopf*) recording and also produces excellent results when played back through loudspeakers. Because of the spacing between the transducers, the O.R.T.F. method does not have the time-coherence properties of pure Blumlein. The initials O.R.T.F. stand for *Office de Radiodiffusion Television Francais*, the French government radio network that developed this technique.

Probably the strongest virtue of the coincident mike technique is its sim-

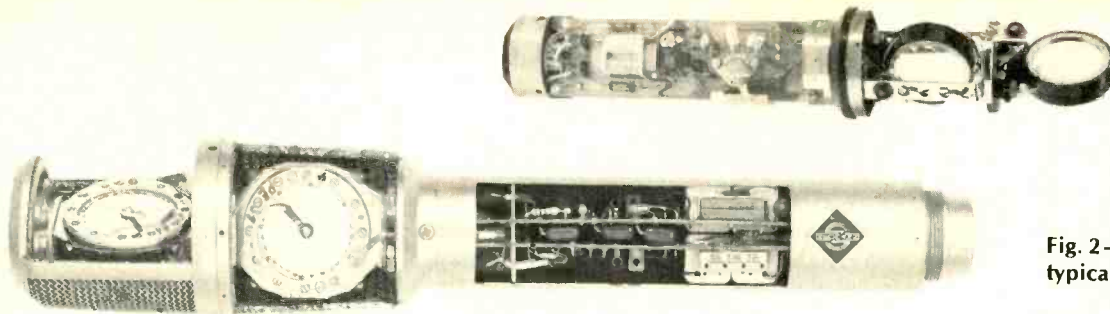


Fig. 2—Construction of two typical stereo mikes.

42 plicity under actual working conditions. One simply places the mike in a central location that gives a good balance between the musicians and the acoustics of the hall. It is this simplicity that makes coincident mikes a favorite of broadcast engineers recording (or transmitting) live symphonic concerts (I should say of European and especially BBC broadcast engineers, as we Americans have not yet seen the light). The trick is in finding the right spot, but this is always a problem no matter which technique is used. The stereo mike is somewhat easier to locate than spaced omnis (I always worry about the spacing; are the mikes too far apart or too close together?), and it is infinitely easier to use than the dozen or more mikes used in a typical multi-mike recording. Locating and balancing the levels from a large number of mikes takes a great deal of time and skill, and don't forget the logistics problem of setting up all those stands and mike cables. Of course, many of the balance problems can be delayed by using a multi-track tape machine (don't worry, we can fix it in the mix!), but that is not an option available to most amateur recordists.

Placement of a coincident mike is not all that difficult if one keeps in mind that musicians have usually solved their own balance problems, providing that they have had at least one rehearsal at the recording location. Thus, when recording a large orchestra, a good place to start is with the mike above and slightly behind the conductor's head. With a string

quartet or small chamber orchestra, choose a point equidistant from all players. With a solo instrument, slightly above and in front of the player is a good bet, but keyboard instruments, such as piano or harpsichord, can cause problems because of reflections off the lid. The amount of hall ambience can be controlled by the pattern shape on multi-pattern mikes as well as the distance from the musicians, with figure-eight mikes allowing the most ambience and cardioid mikes the least. I've given no exact placement distances because so much depends on the kind of sound you and the musicians want to hear, the acoustics of the hall, the exact instrumentation of the orchestra, and the pattern used on the mikes. What works in one hall with one set of musicians will not work in another hall (or even the same hall) with another group of musicians. You have to learn to use your ears and make adjustments for each situation.

Often, in a live concert situation, the locations where you are permitted to place a mike are limited to one or two places that produce minimum interference (visually) with the audience (or cameras in a televised event) but do not necessarily have the best sound. A recording session situation gives you more chances to experiment, but even then there is no guarantee for success if the musicians don't understand what you are trying to do. John Woram (well-known audio consultant and recording engineer) related to me how he was once asked to make a special demonstration recording using a

single stereo mike. The small group of professional musicians hired for the session were shocked to discover that they would have to control their own balances. If they wanted to hear more piano, the piano player would have to play louder; for less bass, the bass player would either have to play softer or move further away from the mike. They had never been recorded this way before and would not believe that the recording could be made with only one mike. After all, records are made by having a mike for every player and letting the engineer figure out the balances, aren't they?

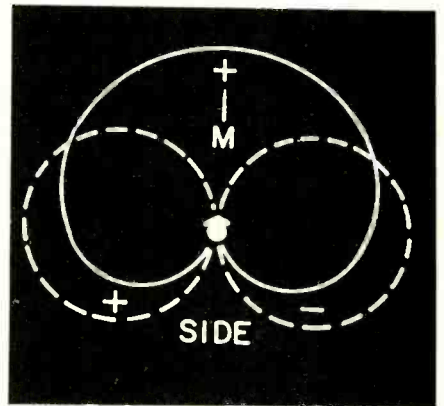


Fig. 4—The M-S (mid-side) mike pickup pattern.

Coincident mikes have one major weakness in that if the hall sounds bad or the musicians' sense of balance is poor, there is not too much the engineer can do about it. You simply cannot fix it in the mix! Good coincident mikes tend to be very truthful in what they hear. They cannot make a bad hall with mediocre musicians sound like anything but a bad hall with mediocre musicians. But, at the same time, it is this sense of reality that makes the coincident technique so attractive to many engineers.

Quadrasonic Coincident Mikes

There is still enough interest in quadrasonic recording for two manufacturers (AKG and Neuman) to develop their quadrasonic coincident mikes (four separate cardioid capsules mounted at 90° to each other), an English manufacturer (CALREC) to develop a tetrahedral "Sound Field" micro-

Fig. 3a—X-Y crossed cardioid pair of mikes.

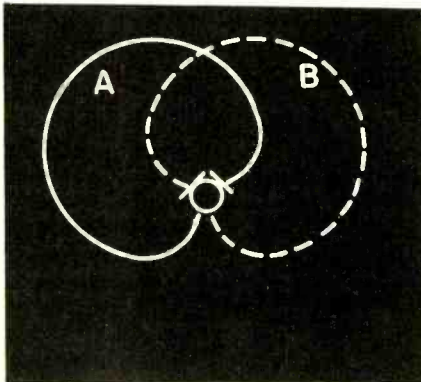
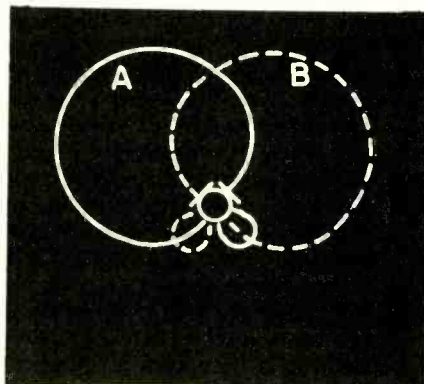
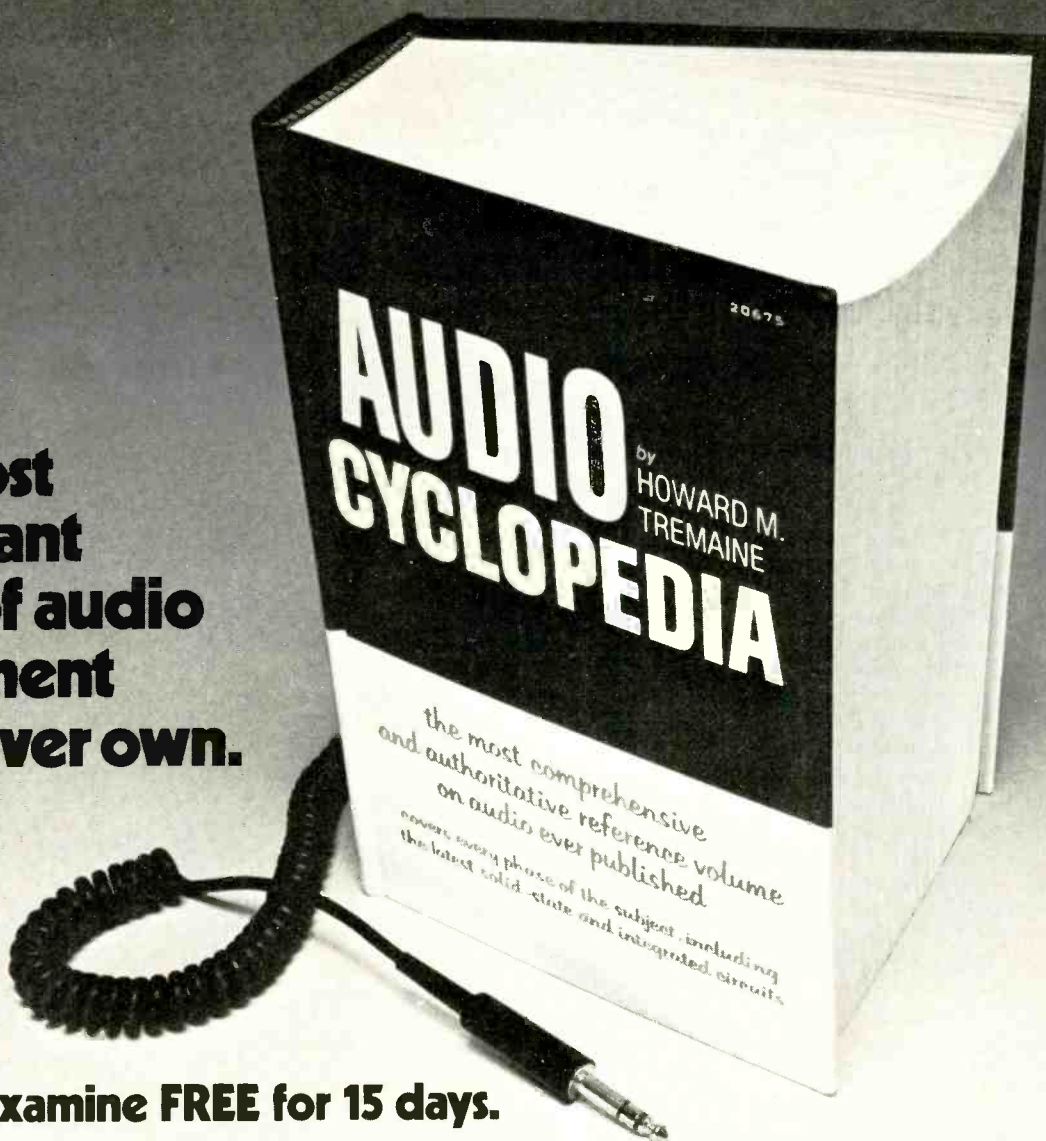


Fig. 3b—X-Y crossed hyper-cardioid pair of mikes.



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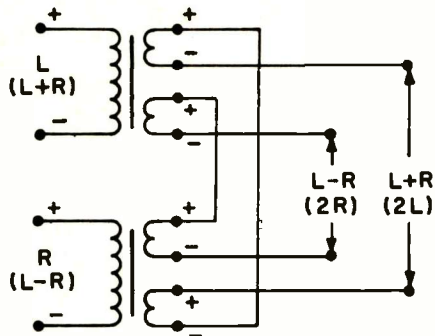


Fig. 5—The Blumlein sum and difference matrix technique using transformers.

phone, and for CBS to modify the QM-69 mike into the so-called Ghent microphone that produces a SQ-encoded signal. But it is not really necessary to use any of these mikes to record in quadrasonic because a true "Blumlein" figure-eight pair of mikes will produce an encoded quadrasonic signal if used in the proper manner.

A sound source located at the front or rear of the mike pair (0° and 180°) produce an electrically in-phase signal and sound sources located at the sides (90° and 270°) produce signals that are out of phase. Careful positioning of musicians around the mike and playback via the Hafler system can have spectacular results. Playback with other matrix systems will have a good quadrasonic effect, but will not

recreate the true location of the players. A Blumlein recording is a worthwhile experiment for anyone interested in quadrasonics.

Coincident Microphone Discography

The manner in which an engineer uses his microphones has been compared to that of an artist using various pigments and brush strokes in creating a painting. And just as a good artist chooses his paints and technique according to available light and subject matter, a good recording engineer selects his mikes and technique according to the acoustics and type of music being recorded. However, the renewed interest in coincident mike technique has created a cult who have declared it to be "the one true way of recording" and have produced endless reams of faulty mathematics as proof. This is the equivalent to saying that there is only one way to paint a picture. This level of silliness has reached such a level in the U.S. that a major producer of direct-disc recordings will no longer discuss publicly the details of his latest symphonic recordings, declaring that the information is a "trade secret," while, at the same time, letting it be known "unofficially" that the recordings were made using a single stereo mike.

To help the Gentle Reader arrive at some opinion on this matter, I have compiled a list of recordings which

demonstrate the capabilities of the three major mike techniques. While not being, by any means, a definitive list, it will allow the reader to become aware that sonically excellent recordings can be made irrespective of the mike technique employed.

Coincident Microphone Recordings

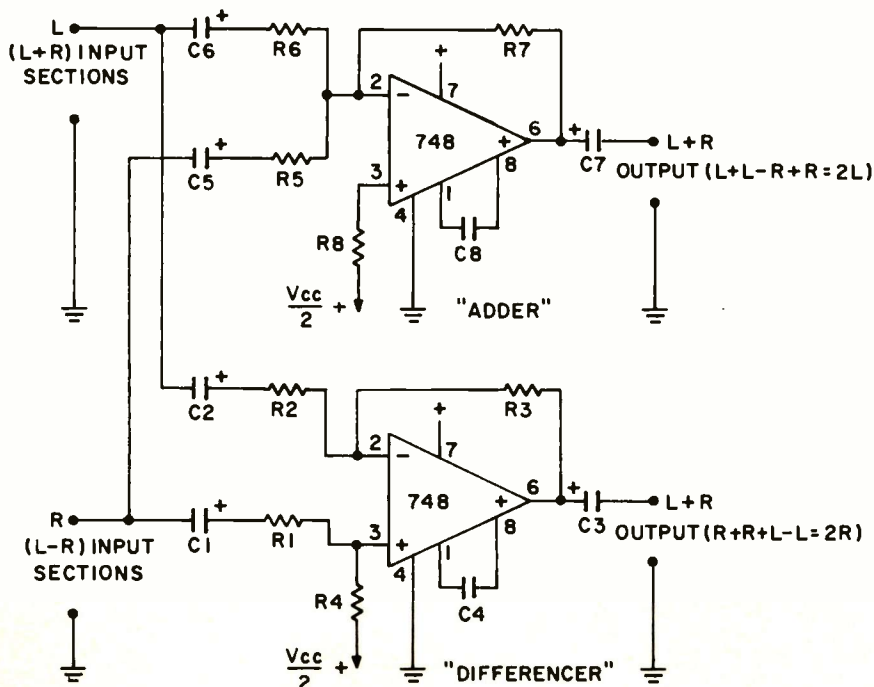
- Angel SFO-36034, Rimsky-Korsakov: **Scheherazade**, Chicago Symphony, Ozawa (cond.).
- Angel SFO-36035, Bartók; **Concerto for Orchestra**, Chicago Symphony, Ozawa (cond.).
- Angel SFO-36039, Stravinsky: **Petrouchka Suite & Firebird Suite**, Chicago Symphony, Giulini (cond.).
- Angel SFO-36040, Brahms: **Symphony #4**, Chicago Symphony, Giulini (cond.).
- Angel S-36047, Mahler: **Symphony #1**, Chicago Symphony, Giulini (cond.).
- Angel S-36048, Beethoven: **Symphony #7**, Chicago Symphony, Giulini (cond.).
- Angel S-36043, Dvořák: **Symphony #8**, Cleveland Orchestra, Szell (cond.).
- Angel SFO-36032, Brahms: **Double Concerto**, Rostropovich, Oistrakh, Cleveland Orchestra, Szell (cond.).
- Angel S-36093, **Classical Virtuoso Guitar**, Angel Romero.
- Angel S-36096, Bach: **Italian Concerto, French Overture**, Igor Kipnis, harpsichord.

All of the above recordings are the work of one recording engineer, Carson Taylor. During his long career at Angel, Carson insisted on using only one or two coincident mikes on his classical recordings. This list represents those recordings that Carson feels are some of his best works.

- Sheffield Lab-7, Wagner: **Orchestral Excerpts**, Los Angeles Philharmonic, Leinsdorf (cond.).
- Sheffield Lab-8, Prokofiev: **Romeo & Juliet Excerpts**, Los Angeles Philharmonic, Leinsdorf (cond.).
- Sheffield Lab-3, Harry James: **King James Version**.
- Sheffield Lab-6, Harry James: **Comin' from a Good Place.**

These Sheffield records are, of course, direct-to-disc recordings and have all the benefits attributed to that recording method, i.e. wide dynamic range, silent surfaces, and, in general, superior sound. The Los Angeles Philharmonic recordings are "rumored" to have been made with a single AKG C-24 stereo mike. I find the acoustics a bit too dry, but as a result the recordings are a model of clarity and definition. I also find the Prokofiev to have a much warmer sound than the Wagner, even though they were made in the

Fig. 6—Circuit for Williamson's M-S matrix decoder.



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same half a day apart. I don't know if this is due to a change in the mike position or pattern or is just due to a difference in the scoring.

The Harry James records are described in the liner notes as being made with a single C-24 mike (although one or two additional mikes can be seen in the session photos), and it does not sound at all like the typical direct-to-disc big band recording made in a dead studio. These records realistically recreate the sound of Harry and the band in a room of just the *right* size.

Fig. 7 — The equivalent X-Y and M-S patterns.

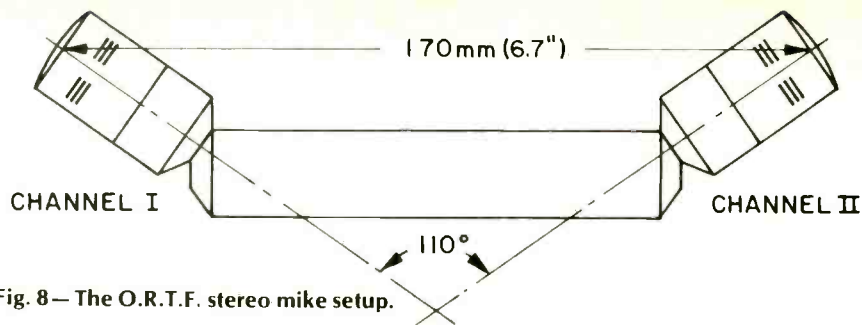
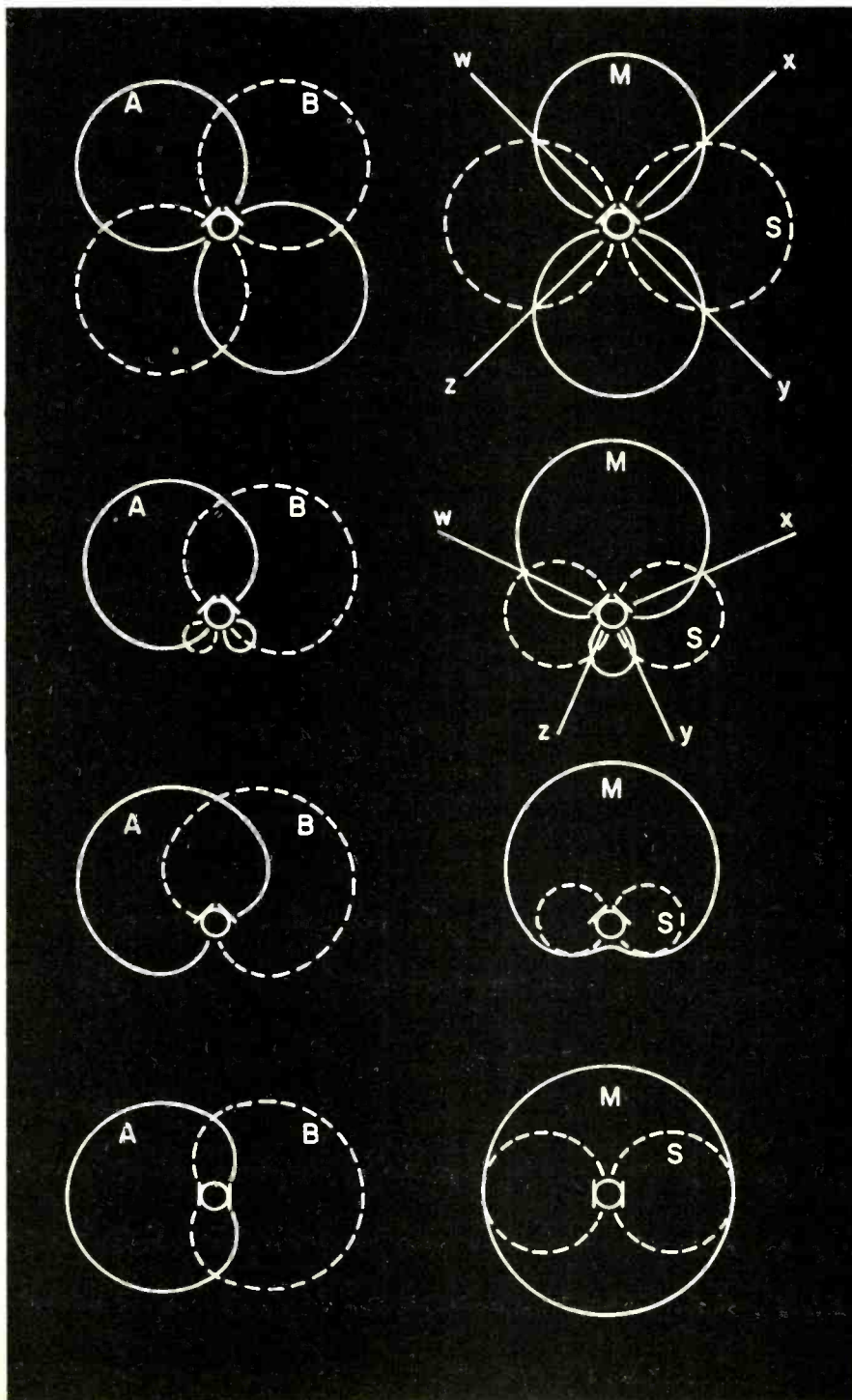


Fig. 8— The O.R.T.F. stereo mike setup.

Spaced Omni Mike Recordings

- Nonesuch H-71269, *Music of Edgard Varèse*, Contemporary Chamber Ensemble.
- Nonesuch H-71291, *Percussion Music*, N.J. Percussion Ensemble.

Nonesuch H-71284, Gershwin: *Piano Music*. Bolcom (pf).

Nonesuch H-71304, *After the Ball*, Morris & Bolcom.

Vox QSVBX-5133, Ravel: *Complete Orchestral Works*, Minnesota Symphony Orchestra.

Vox QCE-31098, Prokofiev: *Alexander Nevsky*, St. Louis Symphony & Chorus.

All of these recordings were produced and engineered by Marc Aubort and Joanna Nickrenz. Marc believes in using a basic omni pair of mikes along with an occasional spot mike to solve certain balance problems. This list contains only a few of the many recordings they have done over the years for Vox, Nonesuch, Vanguard, DGG, and others.

Mercury SRI-75003, Saint Saëns: *Symphony #3*, Detroit Symphony, Paray (cond.).

Mercury SRI-75028, *British Band Classics*, Eastman Wind Ensemble, Fennel (cond.).

Mercury SRI-75030, Prokofiev: *Love for Three Oranges, Scythian Suite*, London Symphony Orchestra, Dorati (cond.).

Mercury SRI-75057, Hindemith, Schoenberg, Stravinsky, Eastman Wind Ensemble, Fennel (cond.).

Mercury SRI-75058, Stravinsky: *Firebird*, London Symphony, Dorati (cond.).

All of the above are Philips Golden Import versions of the classic Mercury Living Presence recordings in the early 1960s. All these recordings were made by an engineering team led by Bob Fine who used only three spaced omni mikes. Even though some of the recordings are nearly 20 years old, they are still equal to anything being made today.

Multi-Mike Recordings

Columbia M-33523, Ravel: *Daphnis et Chloe*, New York Philharmonic, Boulez (cond.).

Columbia M2-33303, Schoenberg: *Gurre-Lieder*, B.B.C. Symphony & Chorus, Boulez (cond.).

DGG 2565 022/4, Schütz: *Psalms of David*, Regensburger Doomspatzen.

DGG 2530 619, Saint Saëns: *Symphony #3*, Chicago Symphony, Barenboim (cond.).

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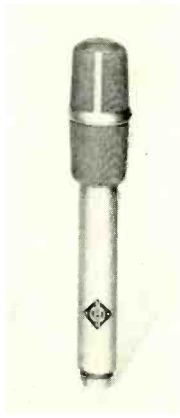
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Neuman SM-69



B&O BM-5

AKG C-422



DGG 2711 012, Bach: **St. Matthew Passion**, Berlin Philharmonic, Vienna Singverein, Von Karajan (cond.).

Both Columbia recordings used in excess of 25 mikes. The Ravel piece was recorded on eight tracks with Bud Graham as engineer, and the Schoenberg was recorded on 16 tracks with Bob Auger as engineer. The Saint Saëns recording is a bit unusual in that the orchestral part was recorded in Chicago (on eight tracks, I believe) and then sent to Europe where the organ was overdubbed in a cathedral in France. The Schütz recording uses a combination of stereo mikes and spot mikes; and the Bach recording, as well as any piece of music that calls for three choruses, two orchestras, and six soloists, simply cannot be recorded using two mikes.

Coincident Microphone Directory

AKG Model C-422 FET, variable pattern (X-Y or M-S), \$1600.00.

AKG Model C-34 FET, variable pattern (X-Y or M-S), \$1100.00.

AKG Model C-33 FET, X-Y cardioid pattern only, \$650.00.

AKG Model C-424 FET, quadrasonic coincident mike with four cardioid patterns, \$1700.00.

AKG Model C-24, variable pattern (X-Y or M-S), discontinued.

The C-24 is considered by many to be the classic stereo mike. Unfortunately the last 12 units of this model came off the production line in June, 1978, and were immediately shipped to waiting customers. AKG has replaced the C-24 with the C-422 FET which uses the same diaphragm capsules, but has a modern FET preamplifier circuitry instead of tubes. The C-33 and C-34 are based upon the popular 451 microphone series.

The Bang & Olufsen BM-5 has been discontinued for over five years now, but it can still be found, occasionally, in the "used equipment" lists. This is a true "Blumlein" stereo mike consisting of two figure-eight ribbon mikes in a single housing. An extremely mellow sounding mike, the output is very low (-80 dB) requiring the use of a low noise, high gain preamp. The original selling price was \$100.00, a real bargain.

Carson Taylor's favorite mikes are the Neuman Model SM-69 FET variable pattern (X-Y or M-S), \$2229.00 with the 48V phantom power supply, \$166.00 if required, and the Model QM-69 quadrasonic coincident mike with four cardioid patterns, including power supply, \$2303.00.

Schoeps mikes are not as well known in this country as AKG or Neu-

man, but they are well known in Europe for their high quality. They are the only manufacturer of O.R.T.F. stereo mike in a single housing. The O.R.T.F. method usually requires the use of two separate cardioid mikes properly oriented on a stereo bar.

The Schoeps Model CMTS-301 has three patterns (X-Y or M-S), \$1585.00 and \$216.00 for the power supply. The CMTS-501 also has three patterns (X-Y or M-S), and costs \$1535, plus \$216.00 for the power supply. The MSTC-44K is an O.R.T.F. stereo mike at \$950.00, and \$192.00 for the power supply. The Model MSTC-34U is an O.R.T.F. stereo mike at \$1000.00 and \$216.00 for the power supply.

The Studer SKS-501 mike has three patterns (X-Y or M-S) and sells for \$980.00, plus \$215.00 for the power supply and is manufactured for Studer by Schoeps.

The Sony ECM-99 has two cardioid-pattern capsules and sells for \$50.00, while the Sony Model ECM-990 with two cardioid-pattern capsules is \$100.00. Both of these are electret mikes with outward-facing cardioid capsules, but spaced much closer together than the O.R.T.F. type. Although these mikes are not as quiet or have as smooth a response as the other mikes on this list, their low price more than compensates for these shortcomings. I've used both mikes on many remote recordings with excellent results.

Although I've only listed stereo microphones, the coincident techniques I've discussed can be achieved using separate mikes of the appropriate pattern mounted so that their capsules are on the same vertical axis. Several companies make stereo mounting bars that can be used for X-Y and the O.R.T.F. methods, and there are also special adapters available for the M-S technique. The only restrictions on the mikes selected is that for best results they should both be made by the same manufacturer and be of the same transducer type, i.e. both be dynamic, condenser, or ribbon types. The same signal fed to both a condenser mike and a ribbon mike will result in signals 90° apart in phase. If these two mikes were used in a M-S technique, the results might be a little strange.

It is now possible to produce very high quality, low cost electret condenser mikes as the recent Equipment Profile by Jon Sank on the Nakamichi CM-700 mike system (*Audio*, September, 1978) has shown. All that remains to be done is for some manufacturer to produce a truly low cost, high quality coincident mike.

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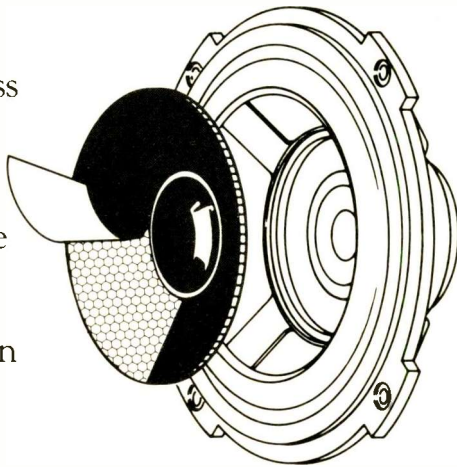
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products to permit fuller, more accurate use of these components.

As a result we introduce Directory II — as an experiment in letting the audio reader know what additional equipment is available to him in the categories of open-reel, cassette, and 8-track tapes; tape-care products; record-care products;

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EQUIPMENT

speaker stands; component racks; switching systems; noise reduction and filter systems; power indicators, and time-delay and ambience-generation systems.

We are aware that this list is not complete, and we would appreciate from readers the names of products and addresses of

manufacturers we may have missed, as well as comments on how we can improve this directory.

Of necessity it is impossible to list all the features for any product, and should the reader desire more information, we suggest that he write directly to the manufacturer.

MANUFACTURER	Brand	Principal Type of Use	Recommended Bias Level	Recommended Bias Level											List Price	Notes		
				C-60	C-45	C-90	C-120	Other	45 Min.	90 Min.	1200 ft.	1800 ft.	3600 ft.					
AMPEX	20/20+	Mastering		X														
					X													
						X												
							X											
AUDIO-MAGNETICS	High Performance	Home	Normal		X											2.19		
						X										3.49		
							X										4.49	
				X													2.49	
										X								2.59
								X						3.29				

Blank Tape

MANUFACTURER	Brand	Principal Type of Use	Material	Recommended Bias Level											List Price	Notes	
				C-80	C-45	C-90	C-120	Other	45 Min.	90 Min.	1200 ft.	1800 ft.	3600 ft.				
BASF	Performance Series Cassettes	Portables	Ferric		X										2.29		
						X									3.59		
							X										4.99
				X													2.49
	Performance 8-Track		Ferric							X						2.89	
											X					3.49	
								X†									
	Performance Reel-to-Reel		Ferric										X		7.49		
													X		15.99		
								X†									9.99
	Studio Series Cassettes		Ferric				X								4.49		
								X							5.99		
					X												2.99
	Studio 8-Track		Ferric							X					3.29		
											X				3.99		
								X†									3.59
	Studio Reel-to-Reel		Ferric										X		9.99		
													X		19.99		
								X†									14.99
	Professional I		Ferric				X								4.79		
					X												3.29
	Professional II		Chrome				X								4.99		
					X												3.49
	Professional III		FeCr				X								4.99		
X															3.49		
Professional Reel-to-Reel		Ferric										X		14.99			
												X		29.99			
Chromium Dioxide		Chrome				X								2.99			
							X							4.99			
				X												2.99	
CAPITOL	The Music Tape	General			X										1.99		
						X									3.69		
							X								4.39		
				X											2.49		
										X					2.49		
									X†						2.79		
											X				2.99		
									X†						3.19		
Continued							X†					3.79	†120 min. 8-track.				

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MANUFACTURER	Brand	Principal Type of Use	Recommended Bias Level	Recommended Bias Level											List Price	Notes				
				C-50	C-45	C-90	C-120	Other	45 Min.	90 Min.	1200 ft.	1800 ft.	3600 ft.							
Capitol												X			5.79	†2500 ft.				
													X		6.99					
								X†							17.29					
														X	19.98					
		Capitol I	General			X										.89				
					X										.99					
						X									1.49					
							X									1.99				
		8T-45								X						1.79				
		8T-80						X†								1.99	†60 min.			
		Capitol I									X					2.29	†600 ft. †900 ft.			
								X†								2.69				
							X†								2.89					
													X		3.99					
CERTRON	High Energy					X									2.39					
							X								2.79					
				X											1.89					
	Low Noise																			
												X				1.89				
Chrome		Chrome				X														
				X																
COLUMBIA MAGNETICS	Columbia	General	Normal					X†									† C-40			
						X														
							X													
				X																
										X†										† 8-track, 40(min.)
										X†										† 8-track, 50 min.
										X†										† 8-track, 80 min.
						X†										† 8-track, 100 min.				
DENON (AMERICAN AUDIOPORT)	Denon	Music	Normal		X											3.50				
				X											4.00					
						X										5.60				
	Denon	Music	FeCr			X										4.50				
					X											5.00				
							X											7.00		
FUJI	FX-I		Normal					X†								3.25	† C-46			
				X												3.75				
						X												5.10		
	FX-II		Chrome						X†								3.48	† C-46		
					X												4.01			
							X												5.46	
	FL		Normal		X											2.50				
							X											3.60		
	Continued							X								5.00				

Blank Tape

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MANUFACTURER	Brand	Principal Type of Use	Recommended Bias Level	Recommended Bias Level											List Price	Notes
				C-60	C-45	C-90	C-120	Other	45 Min.	90 Min.	1200 ft.	1800 ft.	3600 ft.			
FUJI (continued)	8 Track									X					3.20	
														X		
	FB-151													X	8.50	
													X		11.00	
	FG													X	36.00	
												X		5.95		
												X		7.95		
													X	22.50		
	FM							X†						5.00	† 900 ft.	
	FB-101													X	5.65	
											X		6.45			
							X†							24.00	† 2400 ft.	
LAFAYETTE	Criterion XHE	General	Normal			X									3.29	
							X								3.99	
				X											2.29	
									X						2.99	
												X			3.79	
													X		5.99	
														X	7.29	
MEMOREX	MRX3	General	Normal						X†						2.29	†C-30
					X									2.49		
						X								3.99		
							X							5.39		
					X									2.69		
	Memorex Chrome Dioxide			CrO ₂	X										3.19	
						X								2.99		
							X								4.69	
	8-Track	General								X					2.99	
											X			3.59		
										X†					3.19	
	Quantum			Normal									X		8.59	
													X		22.49	
Memorex Open Reel	General		Normal									X		5.49		
											X		6.59			
							X†							8.99		†2400 ft.
MAXELL	LN	Low Noise	Normal		X									2.30		
					X								2.55			
						X							3.90			
							X						5.20			
	UD-XL I	Studio Master		Normal			X							6.95		
					X								5.00			
	UD-XL II	Studio Master		High			X							6.95		
X												5.00				
Continued				X									5.00			

MANUFACTURER	Brand	Principal Type of Use	Recommended Bias Level	Recommended Bias Level											List Price	Notes	
				C-60	C-45	C-90	C-120	Other	45 Min.	90 Min.	1200 ft.	1800 ft.	3600 ft.				
MAXELL	UD		Normal		X											3.50	
				X											3.80		
						X										5.70	
							X									7.50	
									X							4.99	
										X						6.19	
	LN			Normal					X†							3.79	†46 min. 8-track
									X†						4.19	†60 min. 8-track.	
										X					4.69		
	LN35-180											X		25.75			
	LN25-120							X†						14.00	†2400 ft.		
	LN18-180												X	19.40			
	LN50-60										X			8.25			
	LN50-120							X†						22.50	†2500 ft.		
	LN35-90											X		9.50			
	UD50-60	Master	Normal								X			9.40			
	UD50-120	Master	Normal					X†						26.00	†2500 ft.		
	UD35-90	Master	Normal									X		10.95			
UD35-180	Master	Normal										X	29.50				
UD-XL50-60B	Studio Master	Normal								X			11.50				
UD-XL50-120B	Studio Master	Normal					X†						31.50	†2500 ft.			
UD-XL35-90B	Studio Master	Normal									X		13.25				
UD-XL35-180B	Studio Master	Normal										X	35.95				
NAKAMICHI	SX	Master	High			X									7.20	Cobalt-diffused gamma ferric oxide.	
				X										5.50			
	EX-II	Master	Normal			X									7.00	Cobalt-encapsulated gamma ferric oxide.	
				X										5.20			
	EX	Master	Normal			X										5.80	Pure gamma ferric oxide.
X													4.50				
RADIO SHACK	Supertape Gold				X										2.59		
						X								3.09			
							X							3.99			
				X										2.99			
	Supertape Chrome		Chrome	X											2.99		
						X								3.99			
SDS	HE		Normal	X											3.49		
						X								4.99			
							X							5.99			

Blank Tape

MANUFACTURER	Brand	Principal Type of Use	Recommended Bias Level	C-80 C-45 C-90 C-120 Other 45 Min. 90 Min. 1200 ft. 1800 ft. 3600 ft.											List Price	Notes			
				C-80	C-45	C-90	C-120	Other	45 Min.	90 Min.	1200 ft.	1800 ft.	3600 ft.						
SONY	Low Noise	Speech	Normal						X†							1.79	†C-30		
				X														1.99	
						X													2.99
							X												3.99
	Hi Fidelity	Music	Normal		X												2.69		
				X													2.99		
						X													3.99
	Chrome	Music	Chrome	X													3.79		
						X											5.09		
	Ferrl Chrome	Music	FeCr		X												4.29		
				X													4.79		
	Elcast	Music	Normal			X											5.89		
				X													7.95		
	Elcast	Music	FeCr			X											10.55		
X																10.55			
SUPERSCOPE	HF	Normal							X†								†C-62 †C-92 †C-122		
									X†										
									X†										
	SHF-62	Normal								X†							†C-62 †C-92 †C-122		
										X†									
										X†									
	CrO ₂	Chrome								X†							†C-62 †C-92		
										X†									
	8-TR	Normal									X								
												X							
	TDK	SA	Mastering	Chrome			X											5.29 3.69	
					X														
		AD	Mastering	Normal		X												2.69 4.19 5.69	
							X												
							X												
D		General	Normal							X†							1.59 1.79 2.79 3.49		
					X														
						X													
							X												
M		General	Normal							X†							1.99 4.99		
				X		X													
8 Track		Mastering	Normal								X						3.69 4.79		
											X								
8 Track		General	Normal									X					2.99 3.69		
											X								
Continued											X								

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MANUFACTURER	Brand	Principal Type of Use	Recommended Bias Level												List Price	Notes			
				C-80	C-45	C-90	C-120	Other	45 Min.	90 Min.	1200 ft.	1800 ft.	3600 ft.						
TDK	Audua LB	Mastering	High/Normal									X		10.49					
													X	28.49					
	Audua L	Mastering	High/Normal								X			6.79	Plastic reel. Metal reel.				
											X		8.49						
												X	19.99						
												X	23.99						
	S	General	Normal								X			6.29	Plastic reel. Metal reel.				
												X	6.99						
												X	16.99						
												X	20.99						
	3M COMPANY	Master I	Audiophile	Normal		X									3.29				
							X								4.69				
X														3.59					
Master II		Audiophile	High		X									3.89	Cobalt-modified ferric oxide.				
						X								5.29					
				X										4.19					
Master III		Audiophile	Ferri-chrome		X									3.89					
						X								5.29					
				X										4.19					
Dynarange		Music	Normal		X									2.39					
						X								3.89					
				X										2.79					
							X							5.35					
Highlander		Music & Voice	Normal		X									1.49					
				X										1.69					
						X								2.49					
							X							3.79					
Metafine †					X									†Fine metal-particle tape, requires special electronics, heads, etc.					
Master		Audiophile								X				3.99					
													X				4.69		
Dynarange		Music								X				2.99					
													X				3.69		
Master		Audiophile											X	9.95					
																		X	25.99
																X†		12.95	†2400 ft.
																		5.49	
Dynarange	Music									X			7.19	On either 5-in. or 7-in. reel.					
															X	14.29			
																10.89	†2400 ft.		
													X†			3.59	†600 ft.		
																4.19	†900 ft.		
													X†						

Record Care Products



Adcom Discostat is a counter-balanced arm to reduce static buildup by conducting these charges to ground. Price: \$19.95.

Adcom Discoclean is a simple arm with soft fibers and a plush pad to remove loose dust from the record while it's playing. Price: \$9.95.

Adcom Discosweep has thousands of conductive fibers to sweep dust from records and reduce static electricity. Price: \$12.95.

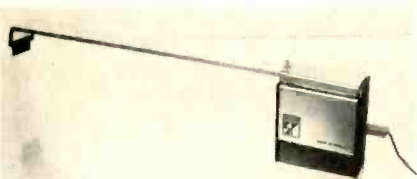
Audio Works AW-200 Record Cleaner is designed to be used dry for light dust removal or with the AW-100 cleaning solution for best cleaning and static removal. Price: \$3.95.

Audio Works AW-100 Cleaning solution contains anti-static agents, wetting agents to reduce viscosity, cleaning agents, and germicides to inhibit mold and bacteria growth. Price: \$3.50.

Audio Works AW-300 Record Cleaner is made from walnut hardwood for light dust removal or in conjunction with AW-100 cleaning solution for best cleaning and static reduction. Price: \$6.95.

Audio Works AW-400 Stylus Cleaner uses a dense cleaning material drawn over a metal form to provide a smooth surface that won't tangle with the stylus cantilever. Price: \$3.95.

Ball Sound Guard Total Record Care System contains both cleaner and preservative to clean off oily fingerprints and protect the record with a dust resistant, patented lubricant. Price: \$15.00.



The Decca Record Cleaner is the arm-type dry cleaner with 20,000 conductive carbon-fiber bristles and a ground wire to amplifier for a complete static drain path. Price: \$16.95.

The Decca Record Brush has one million conductive carbon-fiber bristles to dry-clean records and remove static. Price: \$16.95.

The Decca Microbe is a three-way record cleaning accessory with three fiber assemblies, each containing 10,000 ultra-fine bristles, and mounts on a bracket between the cartridge and the headshell, adding less than one gram of mass. Price: \$9.95.

Discwasher D3 is a fluid to remove the long term micro-dust not removed with "dry cleaning" while reducing the static charges contained on the record surfaces. Price: \$2.25 for 1 oz., \$9.60 for 6 oz., and \$16.00 for 16 oz.

Discwasher Disctracker is a tonearm/cartridge damper for cushioning the phono cartridge against record warps and mistracking. Price: \$29.95.

Discwasher D-Stat II is a soft turntable mat for reducing electrostatic charges on the turntable and eliminate bothersome pops of static discharge. Price: \$8.50.

Discwasher Zerostat is an anti-static piezoelectric pistol to neutralize static charges on the surface of the disc. Price: \$20.00.



Discwasher Discorganizer is a milled walnut tray with dustcover that holds the Discwasher brand of record accessories. Price: \$12.50.

Discwasher SC-1 Stylus Cleaner has a brush with nylon bristles mounted at a specific density to remove the waxy deposits from the stylus, with inspection via a magnifying mirror opposite the brush. Price: \$7.00.

The Discwasher System has an angled microfiber brush which picks up, rather than lines up, record dust. The walnut handle stores a bottle of D3 fluid, which will clean fingerprints from records and has buffers for record additives. Price: \$15.00.

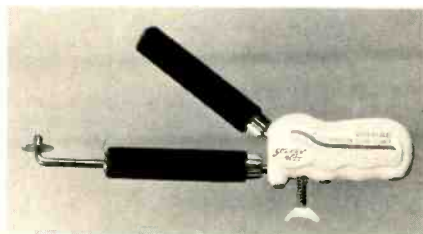
Discwasher DiscKit is a milled walnut tray filled with the Discwasher brush, D-3 fluid, SC-1 stylus cleaner, and Zerostat. Price: \$50.00.

GC Electronics Total Concept Kit No. 30-8500 for the cleaning and proper maintenance of records contains: "Record Basic" for removing old lubricants, "Record Plus" lubricant, cleaning tools, and a book on record care. Price: \$20.00.

GC Electronics Liquid Stylus Brush removes hardened deposits, as well as dust and lint, from the phono stylus. The siphon tube keeps the soft fiber brush moist with cleaning fluid. Price: \$2.55.

GC Electronics Stylus Tracking Force Gauge is a balance-weight gauge with a bubble-level indicator to accurately measure tracking force at the stylus tip. The 0-3 gram scale is divided into 1/10 gm divisions. Price: \$9.95.

GC Electronics Angled Stylus Brush is designed to flick away dust, dirt, and lint particles with no damage to the stylus. Price: \$2.55.



The Golden Hit Record Cleaner clamps the record securely between velvet cleaning rollers, cleaning both sides at once with little chance for fingerprints to contaminate the grooves. Price: \$12.95.

GRT Record Care Maintenance Kit includes "Sound Cleaner," stylus mirror, record-cleaning solution, and a stylus cleaner. Price: \$15.95.



GRT "Dustbuster" is a record cleaner with a velvet pad and spray. Price: \$3.95.

Hammond Audio-Kare Quietone is an anti-static record preservative and lubricant designed to protect against

static buildup on a disc for up to eight weeks while providing a thin protective lubricant to limit wear. Price: \$3.95.

Nakamichi Model FG-100 Stylus Force Gauge is a precision gauge to facilitate accurate tonearm adjustment. Price: \$25.00.

Neosonic Lencomatic Model LM-1 Record Cleaner dissipates the electrostatic charge from the record through the cleaning brush and turntable spindle. Price: \$19.95.

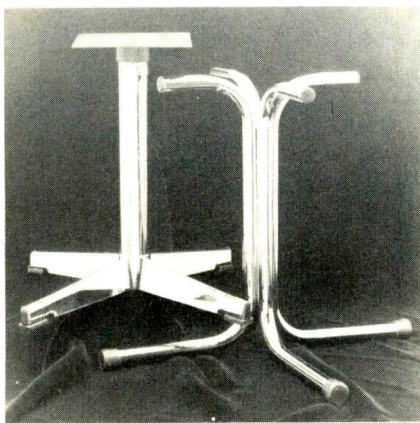
Neosonic Lencoclean Model LC-1 a record cleaning system removes dust, electrostatic charges, surface noise, and resulting distortion. Price: \$24.95.

Transcriber Disc Shield Record Protection System is a dry lubricant that protects the record surface from wear by reducing friction between the stylus and the record surface. Price: \$7.99.



Transcriber Sound Saver Classic I record care system incorporates a fluid retention system that allows cleaning records without leaving a residue. Price: \$15.00.

Speaker Stands



Acoustique 3A/Curb loudspeaker stands are 13-in. high, come with either a matte black or chrome finish, and will fit any speaker. Price: \$49.00 to \$65.00 per pair.

Armstrong J-2 speaker stands help bass definition by raising the speakers 12-in. above the floor and are made of spun steel, coated with black nylon. Price: \$60.00 pair.

Mastercraft Audio MS-127 is a universal stand for most mini speakers featuring one long hardwood post (concealed wire provision) and bases available in either black hardboard or wood veneer. Price: \$50.00 pair.

Mastercraft Audio Model MS-111 is a short angled stand for most mini speakers with one hardwood post (concealed wire provision) and bases in either black hardboard or wood veneer. Price: \$40.00 pair.

Mastercraft Audio Model SD-308 is a speaker stand for the Dahlquist DQ-10 with three hardwood posts (concealed wire provision) and bases available in either black hardboard or wood veneer. Price: \$60.00 pair.

Mastercraft Audio Model US-203 is a universal angled stand for most conventional speakers with two hardwood posts and bases available in either black hardboard or wood veneer. Price: \$40.00 pair.

Mastercraft Audio Model R-1 is an angled clear lucite stand for most rectangular speakers with a rear lip and pads for protection. Price: \$45.00 pair.



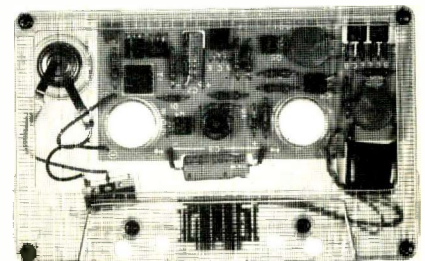
Mastercraft Audio Model RT-2 is a universal, angled, clear lucite stand for most speakers with a rear lip and pads for speaker protection. Price: \$49.00 pair.

Mastercraft Audio Model SU-208 is a universal stand for most conventional rectangular speakers with two hard-

TDK's new one-second, no-headache demagnetizer.

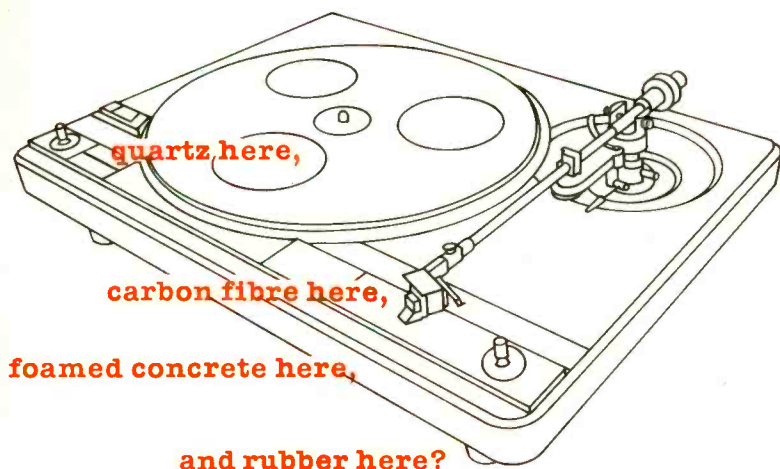


You don't need time or technical expertise to operate TDK's exclusive instant head demagnetizer. Just pop it into your deck and push "Play" to restore musical performance lost through inevitable head magnetization. Other demagnetizers can be less effective, take more time, or actually magnetize your heads and are more difficult to use. Because our HD-01's miniature battery powers sophisticated circuitry built into a standard cassette shell, it solves all of these problems. You will hear the performance improvement in your home, portable or auto system. TDK Electronics Corp., Garden City, NY 11530.



TDK
The Machine for your Machine.®

What do you get when you put



ADC THE FIRST LOW-MASS, TURNTABLE.

ADC is in the business of building breakthroughs.

First, we brought you the innovation of the low mass cartridge. Then the remarkable computerized Accutrac® turntables. Next, the State-of-the-Art Low Mass tonearms.

And now, our engineers have combined the latest advancements of tonearm technology and turntable construction to reduce mass and resonance to new lows.

Result: new benchmarks of high performance.

Finally, the integration of a carbon fibre design tonearm. The famous LMF Carbon Fibre tonearm was the model for the tonearm found on the ADC 1700DD.

In fact, until now you had to make a separate investment in an ADC tonearm to achieve this level of performance.

A level of performance never before available on an integrated turntable.

The mass is lowered by the development of a tapered profile. It is statically balanced with a lead-filled decoupled counterweight, and the headshell is molded carbon fibre, long known for its low mass to high tensile strength ratio.

Furthermore, the headshell is connected to the arm with gold plated computer terminal pins. And the main bearing cradle is made of sintered aluminum. The pivot system utilizes micron polished instrument bearings which are hand picked and matched perfectly to both the inner and outer races, for virtually frictionless movement.

The viscous cueing is a gentle 4mm/sec., and the tempered spring anti-skate adjustment is infinitely variable to 3.5 grams.

The design, the materials and the details interact to provide incomparable performance for a tonearm on an integrated turntable system.

In fact, the tonearm alone is worth the price of an ADC 1700DD.

Finally, resonance conquered.

The technical know-how that conquered the problems of the tonearm mass, also conquered the problems of turntable resonance.

The ADC 1700DD reduces resonance to levels so negligible they are virtually nonexistent.

The achievement lies in the innovative construction formula for the turntable base that incorporates the latest advancements from European engineers.

The base is constructed with two dissimilar materials that are resonance-cancelling. First, the outer frame of the base is molded, and then a composition of foamed concrete is injected to absorb and neutralize resonance and feedback.

Enter No. 9 on Reader Service Card

LOW RESONANCE

Beyond even this foamed concrete anti-resonance breakthrough, the base is isolated by energy absorbing, resonance-tuned, rubber suspension feet.

This is as close as technology has ever come to defying the physical laws of resonance.

The motor in the ADC 1700DD is also present standard of excellence: Direct Drive Quartz Phase-Locked Loop. The quartz is used in the reference oscillator of the motor.

An electronic phase comparator constantly monitors any variance in the speed, making instantaneous corrections. Even when out of the Quartz-Locked mode, the optical scanning system keeps drift at below 0.2%.

In fact, to check the speed at a glance, we've engineered the 1700DD with a pulsed LED strobe display for your convenience.

Low-mass. Low-resonance. High performance.

What is the result of all these breakthroughs? Pure pleasure.

The pleasure of enjoying your favorite music with less distortion and coloration than you may have ever experienced before. Now you can truly appreciate the integrity of the original recording.

Our engineers have reduced record wear and music distortion to a point where rumble is -70dB Din B, and Wow and flutter less than .03% WRMS.

In the history of audio technology, significant breakthroughs have been made over the past four years with the development of Quartz Lock Direct Drive, carbon fibre tonearms, foamed concrete anti-resonance construction. And now, ADC is the first to bring them all together in the 1700DD. We invite you to a demonstration of this and the other remarkable ADC turntables at your nearest franchised ADC dealer.

Or, if you'd like, write for further information to: ADC Professional Products, a division of BSR Consumer Products Group, Route 303, Blauvelt, N.Y. 10913.

Low-mass. Low-resonance.
We think you'll be highly interested.

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*Accutrac is a registered trademark of Accutrac Ltd.



Q • How close can hi-fi get to an authentic musical experience?

A • Slip on new Audio-Technica Stereophones and hear for yourself.

If you want to find out how good the new Audio-Technica Stereophones really are, don't just compare them with other headphones. Put them up against the very finest *speaker* systems. But don't just listen to the equipment. Listen to the *music*. And be ready for a surprise!

Judged on the basis of flatness of response, freedom from distortion, transient response, sensitivity, and independence from room acoustics, these new dynamic and electret condenser models are perceptibly better sounding than speaker systems costing hundreds of dollars more.

And if you think that great performance can only come from heavy, bulky stereophones, get ready for another surprise. Our heaviest model is less than 7½ ozs. and our lightest is an incredible 4¾ ounces light. Comfort that lasts an entire opera if you wish.

For all the facts, send for our catalog. But for the revealing truth about stereophone performance, listen and compare at your nearby Audio-Technica showroom. It will be a great *musical* experience.

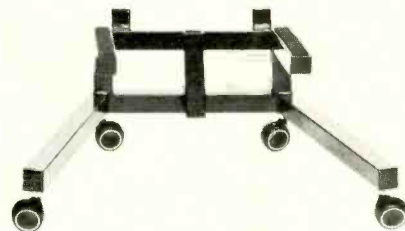


Model ATH-7
Our finest Electret Condenser with LED peak level indicators
\$149.95

Model ATH-1
The moving coil dynamic stereo-
phone that weighs just 4¾ oz.
\$29.95

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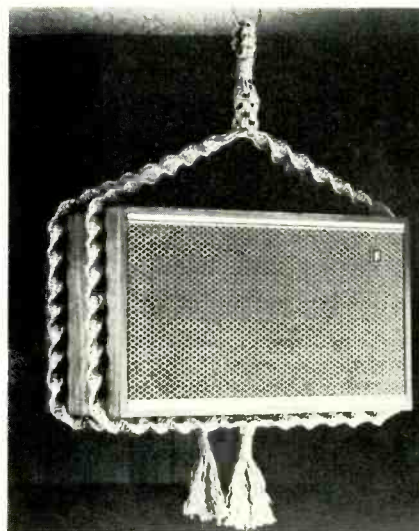
wood posts (concealed wire provision) and bases in either black hardboard or wood veneer. Price: \$45.00 pair.



The Osawa Universal Vari-Tilt is capable of holding most speaker systems and raising them off the floor to cut bass boominess. The stands can also be tilted to an angle for optimum sound dispersion. Equipped with low-friction casters, the metal unit is coated with black nylon to complement the components. Price: \$74.95.

The Osawa AVF Universal Wall Bracket is a device for mounting bookshelf speakers onto walls. Measuring 9x14 inches, the brackets mount onto wall studs and will hold speakers weighing up to 30 lbs. Price: \$39.95.

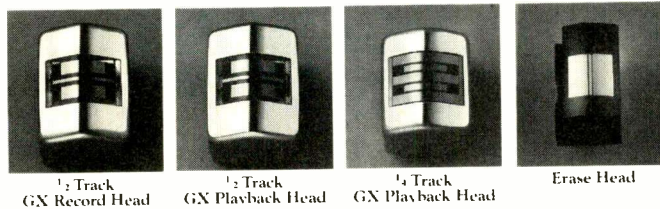
The Osawa Mark IV AC Speaker Stand raises the speaker 10 in. off the floor and tilts it slightly backwards to eliminate the "boomy" bass response that occurs when sound waves are coupled to the floor. Finished in a black-nylon protective coating, the unit is equipped with swivel casters. Price: \$49.95.



Sandborg macramé hangers are available in both jute and herculon with two basic ties, twist or square knot. Designed for both medium and large sized rectangular speakers, in addition to the Bose 901 series, the prices range from \$20.00 to \$36.00.

IT TOOK THE BEST HEADS IN THE INDUSTRY TO MAKE AKAI'S NEWEST PROFESSIONAL DECK.

For years, AKAI's patented glass and crystal (GX) heads have been making recorded history. Not only for unsurpassed sound quality, but for unequalled wearability as well. Guaranteed, in fact, for 150,000 hours; the equivalent of playing 24 hours a day for almost 17½ years. Now AKAI puts its heads together



in one dynamite machine: the PRO-1000. The four head, 2-track mastering

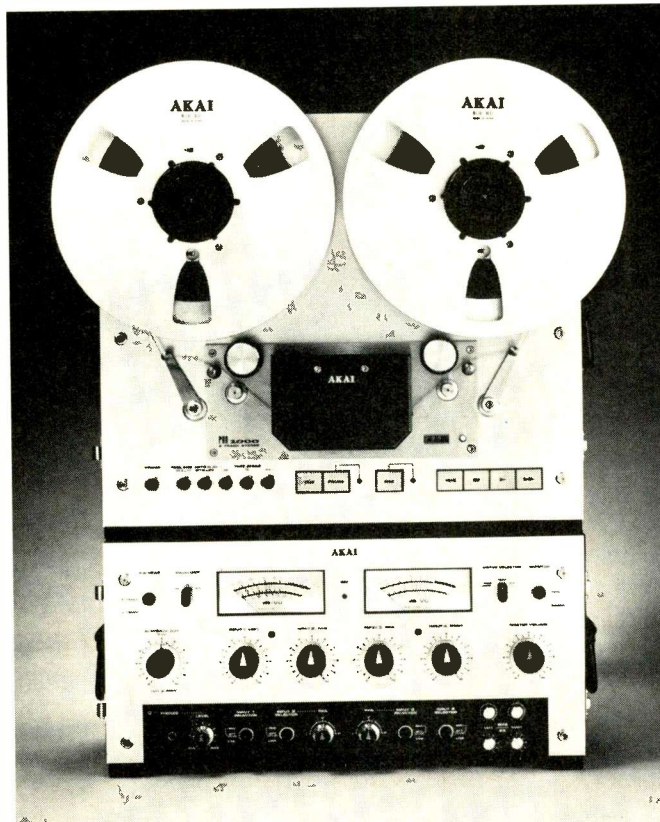
machine that's as much at home on location as it is in the studio.

See the PRO-1000 at your AKAI dealer or write us for information.

But do it soon. Because it's already turning the heads of a lot of people.

Features:

- 3 Motors 3 Speeds
- 4 Heads ½ Track Record/Play and ¼ Track Play 10½" Reel Capacity
- Large Illuminated 40 dB meters: read Peak, VU, and Bias Four In/Two Out Mixer, built-in Panpots
- 20 dB Microphone input attenuators Variable EQ and Bias controls Special inputs for outboard noise reduction units, i.e. "DOLBY,"* "DBX:" Double Capstan, Closed Loop Drive System
- Remote Control operation (optional RC-17 and RC-18)
- Feather touch, full logic solenoid control system
- NAB playback standards
- Fade-in and fade-out controls Separate sections for tape transport and tape amplifier with heavy duty carrying handles on both sections Pre-set clutches on all input level controls.



Specifications:

- Wow and Flutter** 15 IPS: 0.025% WRMS, 7½ IPS: 0.04% WRMS, 3¾ IPS: 0.08% WRMS **Frequency Response** 15 IPS @ "0" VU: 50-20 kHz ± 1 dB, 7½ IPS @ "0" VU: 40-24 kHz ± 3 dB, 3¾ IPS @ "0" VU: 60-12 kHz ± 3 dB **Overall Distortion** Not more than 1% @ 1 kHz @ "0" VU for all speeds **Signal to Noise Ratio** 62 dB **Heads** (4), ½ Track GX Record, ½ Track GX Playback, ¼ Track GX Playback, Full Track Erase **Motors** (3), (1) AC Servo Capstan Drive Motor, oil circulating, center pole generated (CPG). (2) Eddy Current Motors, for fast forward and rewind, oil circulating **Inputs** Microphone (4), Line (4) **Outputs** Line (4), Mixer (2), Headphone (1).

*TM of Dolby Labs., Inc.

AKAI

AKAI America, Ltd., 2139 E. Del Amo Blvd., P.O. Box 6010, Compton, CA 90224

The Audio Critic stands alone.

Of all the publications that review audio equipment by brand name, only The Audio Critic can make every one of the following statements:

- We're totally uninfluenced by advertisers, since we accept neither manufacturers' nor dealers' advertising.
- We not only agonize over subjective listening comparisons but also try to correlate what we hear with fine-tuned objective tests in a truly well-equipped *in-house* laboratory.
- Our test reports are relatively nontechnical but informed by a belief in physics and mathematics, not by pop-tech cults or the untutored folklore of audio-store cowboys. (As a result, serious technologists speak of us with respect rather than the sad smile they reserve for the "undergrounds.")
- We published our first five issues within a span of just over 14½ months.

• Each of these issues reviewed in depth an average of 35 specific items.

The subscription cost of six consecutive issues (indexed as one volume) is \$28, by first-class mail only. (No Canadian dollars, please!) For overseas airmail, add \$5. No single copies are sold for any reason whatsoever, but the unused portion of canceled subscriptions is refundable on request.

A good "starter" issue is Volume 1, Number 6, which should be off the press by the time you read this. It's a special reference issue that updates all our previous findings and also brings you many first-time reviews. Or you may want to start with Volume 1, Number 4, which includes the now internationally famous cartridge/arm alignment instructions (further elucidated in Number 6). Of course, we're willing to start you with any issue you specify, except that Volume 1, Numbers 1, 2 and 3 are now somewhat dated and just about out of print.

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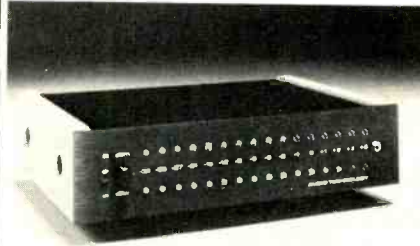
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The Audio Critic

Power Indicators

Audio Innovations Model LED-2C is a dual channel display system to monitor amplifier output power over a 57-dB dynamic range. Price: \$165.00.



Audio Technology Model 510 peak responding LED display combines the functions of a peak-power indicator and a peak line level monitor into one versatile instrument. Price: \$129.95.

Lectrotech Model PPI-400 peak power indicator monitors amplifier output preventing clipping distortion

and loudspeaker damage due to overload. Price: \$130.00.

Sansui Model MA-7 meter amplifier is a rack-mountable monitor system with two meters calibrated in VU and watts and a stereo amplifier and pair of monitor speakers. Price: \$330.00.



The Uni-Sync Model PMS-1 professional metering system measures line level as well as power output and is fully adjustable up to 200 watts. Price: \$149.00.

Time Delay Systems

The ADS Model 10 is a digital time-delay system with both analog and digital technology, combined with built-in amplification and matching loudspeakers for optimized ambience reproduction. Price: \$999.50.



Advent SoundSpace Control is designed to recreate the size and ambience of live listening environments in the home listening room. Price: \$595.00.

Audio Pulse Model 2 digital time-delay system adds the delayed and reverberant signals absent from conventional stereo sound to recreate the feeling of a live performance. Price: \$539.00.

Bozak 902 time delay system has an analog time delay unit, an integrated 35 W amp, and two matched speakers for continuously variable delay and reverberation control. Price: \$975.00.

Eventide Model 2830 Omnipressor is a combined compressor-expander, noise gate, and limiter that allows for such effects as dynamic reversal. Price: \$615.00.

Eventide Model 1745M digital delay line has up to five independently adjustable outputs with a maximum delay of 320 mS and optional pitch change and remote modules. Price: \$4100.00 for the basic two output unit.

Eventide Model S1066 special effects device allows up to 32 individual effects to be stored in the read-only memory (ROM) and a digital delay line with up to 400 mS delay. Price: \$1675.00.

Sansui Model RA-700 reverberation amplifier has continuously adjustable reverb time with visual indication and can add echo effects during either recording or playback. Price: \$190.00.

Sound Concepts Model SD550 ambience restoration system is designed to be used with a second stereo amplifier and two additional speakers to recreate the ambience lost during the recording process. Price: \$675.00.

An ant in trouble screams for help. BASF's New Professional Series Cassettes can prove it.



Sensitive Sound.

Using an anechoic chamber, the finest sound equipment available, and the most sensitive tape ever made, we were able to record the sound of a desert ant in distress ... a call that sounds amazingly like a fire alarm.

More sensitivity for more music.

It is a startling demonstration of the sensitivity of our New Professional Series Cassettes. You get more headroom, greater dynamic range, a better signal-to-noise ratio and unheard-of sensitivity. And that's why you hear music the way you have never heard it before on cassette.

Sounds of other worlds.

Visit your BASF dealer soon and ask him about the New Professional Series, including Professional I, our new ferric formulation, Professional II, our new second generation chrome formulation, and Professional III, our new ferrichrome formulation that is ideal for auto cassette players.

If you would like to discover the sounds of an ant in distress, an eye winking, a butterfly in flight, and other never-before-recorded sounds, send \$3.50 to BASF OTHER WORLDS, Box 18367, Boston, Mass. 02118.

We will send you a \$4.99 Professional II C-90 cassette with these sounds. This offer will be available while supplies last. Please allow 4 weeks for delivery.



BASF

Sensitive Sound. From The People Who Invented Magnetic Tape.

B-I-C INTRODUCES NEW TURNTABLES



Four years ago, B-I-C invented the belt-driven record changer. In two years, it was the most popular turntable in America.

Success achieved so quickly is not easy to repeat. But in all modesty, we're about to do it again.

Consider:

1. Nine totally new B-I-C turntables. One is a single play manual, four are single play fully automatics and four are record changers.

2. V.I.A. It stands for Variable

Isolation Adjustment, the first turntable suspension that can be user-adjusted to dampen acoustic feedback and room vibration frequencies in nearly every listening environment. It's a B-I-C exclusive and all the new B-I-C turntables have it.

3. Triple-isolated chassis. On all B-I-C models, platter and tone arm are mounted on a sub-chassis, isolated between base and top plate by optimized isomer shock mounts.

Coupled with V.I.A., this system intercepts more extraneous vibration frequencies than any we know of.

4. The controlled-mass straight tone arm was computer designed for low mass, strength, and minimal tracking error. Sapphire bearings reduce friction to insignificance.

5. Stroboscopic variable pitch control is standard on the five lower-priced models.

6. Micro-processor digital drive is the most accurate drive system to be had

9 REMARKABLE



at any price. A digital computer continuously monitors platter speed and corrects variations by means of an AC servo system. Pitch can be varied by 3% up or down and locked in. It's standard on the four top B-I-C models as well as a vacuum fluorescent digital display that reads out measured platter speed to .03% accuracy and updates itself every two records, and a digital stop watch for timing selections to tape. This is another

micro-processor display function. A carbon fibre tone arm is standard on two B-I-C models, optional on four others. A micro-processor non-contacting velocity trip system initiates end-of-record cycle without moving parts. Standard on B-I-C's two top models, it's part of a two-motor drive system. \$99.95 to \$319.95. Anyone will find a B-I-C turntable with the right features at the right price.

There's more to tell, but only our catalogue has room. We'll happily send you a free copy.

Seven of B-I-C's new turntables are the world's best for the money. Two are the world's best, period.

Before you even consider another turntable, see your B-I-C dealer or write: B-I-C/AVNET, Westbury, New York 11590.



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BGW COMPONENTS: The "Art-of-The-States"

Foreign components dominate the consumer hi-fi marketplace. But when you walk into a pro-recording studio and take a look through the double-glass window, it's mainly American gear you see. And, when it comes to the amplifiers that drive the monitors and musicians' headphones, that usually means BGW.

The matching Model 210 Power Amplifier and the Model 103 Pre-amplifier share this professional heritage. Both have performance and features that define the standards of component audio. Write us or contact your franchised BGW dealer for full technical and feature information.

Get Behind the BGW "Art-of-The-States"™ Components. The pros already have.

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Recorder Care Products



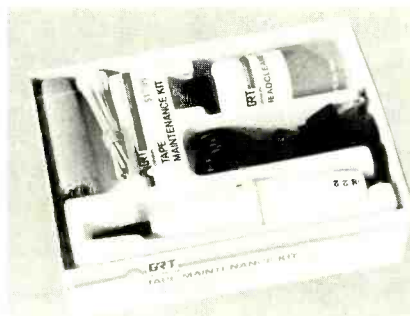
Aspen Tape Head Cleaner Kit consists of a CO₂ cannister, six chemically treated wipers, and an extension nozzle to clean and protect cassette, 8-track, and reel-to-reel tape recorder heads. Price: \$2.39.

Aspen Wipe Heads come 25 to a package and chemically clean and protect all metallic surfaces contacting the tape. Price: 79¢.

Aspen Decktester is an 8-track test tape for checking the tape speed, speaker placement, speaker rattle, phasing, wow and flutter, and head alignment. An instruction booklet is included. Price: \$6.95.

Aspen Plastic Wax removes fine scratches from plastic, resists dust and dirt, future scratches, fingerprints, and smudges on wood, glass, formica, vinyl, and plexiglas surfaces. Price: \$4.59 for 16-oz. squeeze bottle.

GRT Tape Demagnetizer & Cleaner are separate 8-track cartridges and cassettes to demagnetize and clean tape recorder heads. Price: \$4.95.



GRT Tape Maintenance Kit includes an electric head demagnetizer, head-cleaner solution, cleaning cloth, cotton swabs, and a booklet on record and tape care. Price: \$17.95.

Maxell Tape Recorder Care Kit contains probes, accessory tips, cleaning tabs, cleaning solution, and an instruction booklet. Price: \$8.95.



Nakamichi Model DM-10 Head Demagnetizer features a vinyl-clad tip and is specially designed for cassette decks. Price: \$20.00.

Nortronics Swabs are available as either six-in. cotton or cellular foam swabs to safely clean magnetic heads and guides.

Nortronics Tape Head Cleaner is formulated to safely remove impacted dirt and oxide deposits from tape heads and rollers while leaving no residue.

Nortronics Head Cleaner features a non-abrasive belt to safely remove accumulated oxide and dirt from magnetic heads.

Nortronics Demagnetizers are designed to completely demagnetize recorder heads, guides, and other metallic parts without any possibility of creating permanent magnetism.

Nortronics Professional Splicing Blocks help the splicer to make clean, smooth cuts with no damage to reproduction quality, while eliminating the usual cut-and-trim work.

TDK HC-01 is a head-cleaning kit for deck maintenance containing a non-toxic aerosol cleaning agent, brush, inspection mirror, and cleaning probes. Price: \$7.99.



TDK HC-01 is a head cleaner cassette which operates automatically. Price: \$1.49.

TDK TA-01 is a level-adjust test tape to ensure channel balance when recording or playing back. Price: \$13.00.

TDK HD-01 is a cassette head demagnetizer, battery operated, for demagnetizing recorder heads. Price: \$21.99.

HITACHI

The New Leader In Audio Technology



...introduces the world's most powerful 50 watt receiver.

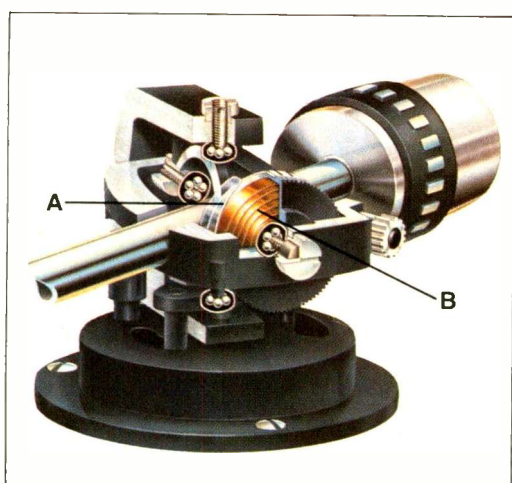
The new Hitachi SR 804 stereo receiver has the revolutionary Class G amp that instantly doubles its rated power from 50 to 100 watts to prevent clipping distortion during those demanding musical peaks (note the clipped and unclipped waves in the symbolic graph above). The SR 804 is conservatively rated at 50 watts RMS, 20-20,000 Hz into 8 ohms with only 0.1% THD.

Class G is just one example of Hitachi's leadership in audio technology. Power MOS/FET amplifiers, R&P 3-head system cassette decks, Uni-torque turntable motors, and gathered-edge metal cone speakers are just some of the others. There's a lot more. Ask your Hitachi dealer.



HITACHI
When a company cares,
it shows.

We'll match the tonearm on against the tonearm on their



We'd like to be very clear about what we have in mind. By "their" we mean everyone else's. And, our lowest-priced turntable is the new CS1237.

The CS1237's tonearm is mounted in a four-point gyrosopic gimbal—widely acknowledged as the finest suspension system available. The tonearm is centered, balanced and pivoted exactly where the vertical and horizontal axes intersect. (A)

From pivot to tonearm head, the shape is a straight line, the shortest distance between those two important points. (Curved tonearms may look sexier, but at the cost of extra mass, less rigidity and lateral imbalance—none of which is consistent with good engineering practice.)

Tracking force is applied by a flat-wound spring coiled around the vertical pivot (B), and this force is maintained equally on each groove wall whether or not the turntable is level. The tonearm's perfect balance is maintained throughout play.

By contrast, tonearms which apply tracking force by shifting the counterweight forward are actually unbalanced during play and prone to mistracking. For example, on warped records the stylus tends to dig in on the uphill side of the warp and to lose contact on the way down.

Vertical-bearing friction in the CS1237 tonearm is astonishingly low—less than 8 milligrams. It can track as low as 0.25 gram—which means it will allow *any* cartridge to operate at its own optimum tracking force.

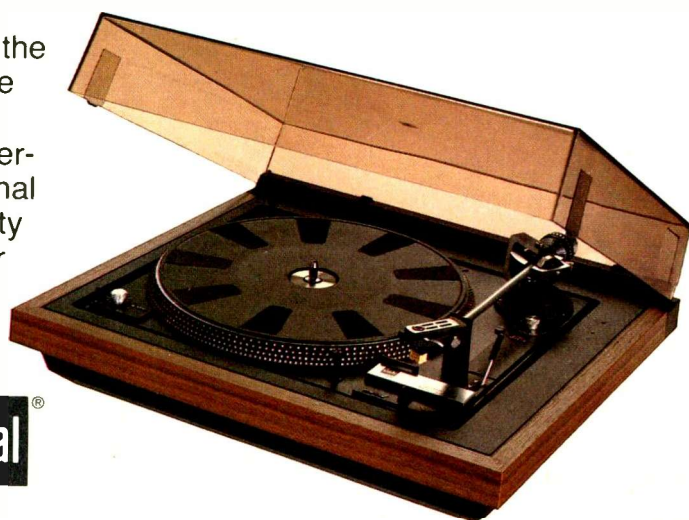
There's still more. The counterweight is carefully damped to attenuate tonearm resonances. Anti-skating is separately calibrated for all stylus types. Cueing is damped in both directions to prevent bounce. And because the CS1237 can play up to six records in sequence, the stylus angle can be set for optimum vertical tracking in either single-play or multiple-play.

To find any other tonearm that seriously matches the CS1237's, you have two choices.

You can consider one of the more exotic separates. But you'll find they cost as much as the entire CS1237. (Price: less than \$180, complete with base and cover.)

Or you might compare it with one of the higher-priced Dual turntables. You'll find a few additional refinements, but no difference in design integrity or manufacturing quality. Which is why no other turntable quite matches a Dual.

Any Dual.



For the life of your records

Dual[®]

United Audio, 120 So. Columbus Ave., Mt. Vernon, NY 10553

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**our lowest-priced turntable
highest-priced turntable.**



Take a close look at a better record cleaner. Audio-Technica AT6002



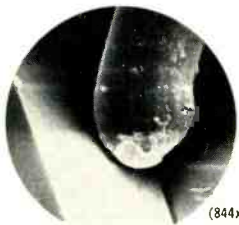
(84x enlargement)

This is an A-T scanning electron microscope photo of the dirt that must be removed if your records are to sound clean. It's dirt that is falling on your records even as you listen.



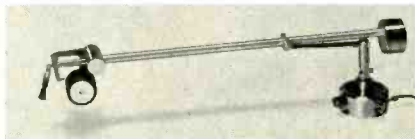
(169x enlargement)

Our unique carbon fiber brush sweeps each groove literally hundreds of times as the record plays, just *before* the stylus touches the groove. The carbon fiber brush helps conduct static charges away, making groove cleaning easier. And the incredibly small 6 micron diameter reaches deep into the groove for the smallest particles.



(844x enlargement)

Immediately behind the brush, our velvet pad captures and holds dust particles as you play. And moisture released from an inner reservoir helps to dissolve stubborn deposits to prevent static build-up.



This 4-way attack on dirt (brush, pad, liquid, and conductive path to ground) is uniquely effective. For proof, clean a record with any other system. Then "play" it with the AT6002. You'll find dirt removed by the AT6002 that was left behind by other cleaners. Try it today. Just \$12.95 at all Audio-Technica dealers.



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Noise-Reduction & Filter Systems



KLH/Burwen Model DNF 1201A dynamic noise filter filters hiss from turntables, tape decks, and tuners with provisions for three levels of noise reduction. Price: \$299.00.

Ace Audio Model 4000 subsonic filter is a sharp cutoff, low frequency filter to prevent woofers from being driven below their passband by high-powered signals. Price: \$89.50 wired, \$59.25 kit.



Allison Electronic Subwoofer is an audio bandpass filter and bass equalizer that can extend the response of Allison speaker systems flat to 20 Hz. Price: \$250.00



The dbx Model 128 incorporates an expander and the dbx II tape noise reduction system in the same unit which allows tape copies to be made with more dynamics and less noise than the original.

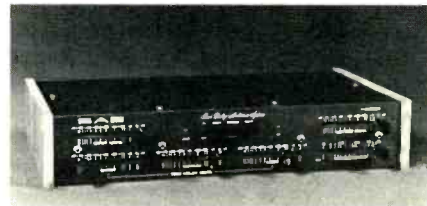
The dbx Model 3BX is a three-band dynamic range expander capable of increasing the dynamics of records, tapes, and radio broadcasts up to 50 per cent, while reducing interference noise.

The dbx Model 122 is a two-channel switchable dbx II tape noise reduction system which will reduce tape noise by 30 dB and improve recording headroom by 10 dB.

KLH/Burwen Model TNE 7000 transient noise eliminator removes the clicks and pops from records without introducing noise from the switching action. Price: \$379.00.

The MXR Componder is a noise-reduction device which compresses the dynamic range of signals being recorded and expands them upon playback allowing quiet passages to be heard while reproducing musical peaks without distortion. Price: \$129.95.

SAE Model 5000 impulse noise-reduction system is specifically designed to reduce the impulse noise (clicks and pops) present in phonograph records and other program sources. Price: \$225.00.



SAE Model 4100 time-delay ambience system with three variable delays allows it to create any kind of desired spatial environment for home listening. Price: \$500.00.

Source Model VRE Compressor/Expander unit has flexible, playback-only dynamic range enhancement featuring 8-dB upwards or 14-dB upwards-downwards expansion, threshold control, an indicator LED, normal and fast attack and release, and preserves reverberation. Price: \$175.00.



The Source Noise Suppressor is a "one-way," four-band system, with no pumping or trailing effects, and fixed filters at 3 & 7 kHz; effective with tapes, FM, and old and new discs. Price: \$295.00.

NOW THERE ARE THREE TRIAXIALS® FROM THE PEOPLE WHO INVENTED THE 3-WAY SPEAKER.

The 6" x 9" Jensen Triax®... the first ever.

This is the speaker that revolutionized car stereo sound. It features a separate woofer for the low tones, a tweeter for the highs, and a mid-range for the middle tones... just like the better home stereo speakers.

The 5¼" Triax for front seat 3-way sound.

Another Jensen innovation. The 5¼" woofer mounts low in the front door for distortion-free bass. While a separate unit mounts high on the door, delivering sharp, clear high and middle tones from an individual tweeter and midrange.

A new 4" x 10" Triaxial for newer midsize cars.

It's specially designed to bring

3-way high fidelity to the narrower rear decks of the new midsize cars.

And a whole line of other quality speakers.

Jensen also offers a full line of coaxial 2-way speakers, dual cone speakers and surface mount speakers. All with the quality and great sound Jensen is famous for. And with a size and price to fit every car and wallet.



® "Triax" and "Triaxial" are registered trademarks identifying the 3-way car stereo speakers of Jensen Sound Laboratories, Division of Pemcor, Inc.

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SOUND LABORATORIES
Division of Pemcor, Inc.
Schiller Park, Illinois 60176

TWICE THE SPEED! TWICE THE PERFORMANCE!



B-I-C INTRODUCES THE TWO SPEED CASSETTE DECK

1 7/8 ips for compatibility: 3 3/4 ips for extraordinary performance.

Recording engineers recognize that the way to obtain more professional results is to increase the speed at which tape is moved past the heads.

Until now, all conventional cassette decks have recorded and played back at 1 7/8 inches per second only. The new B-I-C tape decks do this... superbly. When used at 1 7/8 ips, they exceed virtually every existing performance spec. At 3 3/4 ips, they establish new standards.

This faster tape speed results in dramatic improvements in frequency response, dynamic range, signal-to-noise, and wow and flutter. It also provides much quicker rewind and fast forward times automatically at either speed.

As an example, consider the model T-3's 3 3/4 ips specs.

Performance unheard of in any other cassette deck. Guaranteed frequency response of at least 25-22,000 Hz \pm 3 dB, wow and flutter less than 0.35% WRMS. Total harmonic distort on below 1.5%. Signal-to-noise ratio better than 67 dB (A-weighted).

To achieve these new performance standards we used a fresh approach to the electronics. The result—a group of new circuitry concepts which we have named “Broadband Electronics.” These circuitry concepts lower residual noise and distortion. They enhance frequency response and stereo imaging. And—most important, these improvements are audible at either speed on all B-I-C tape decks.

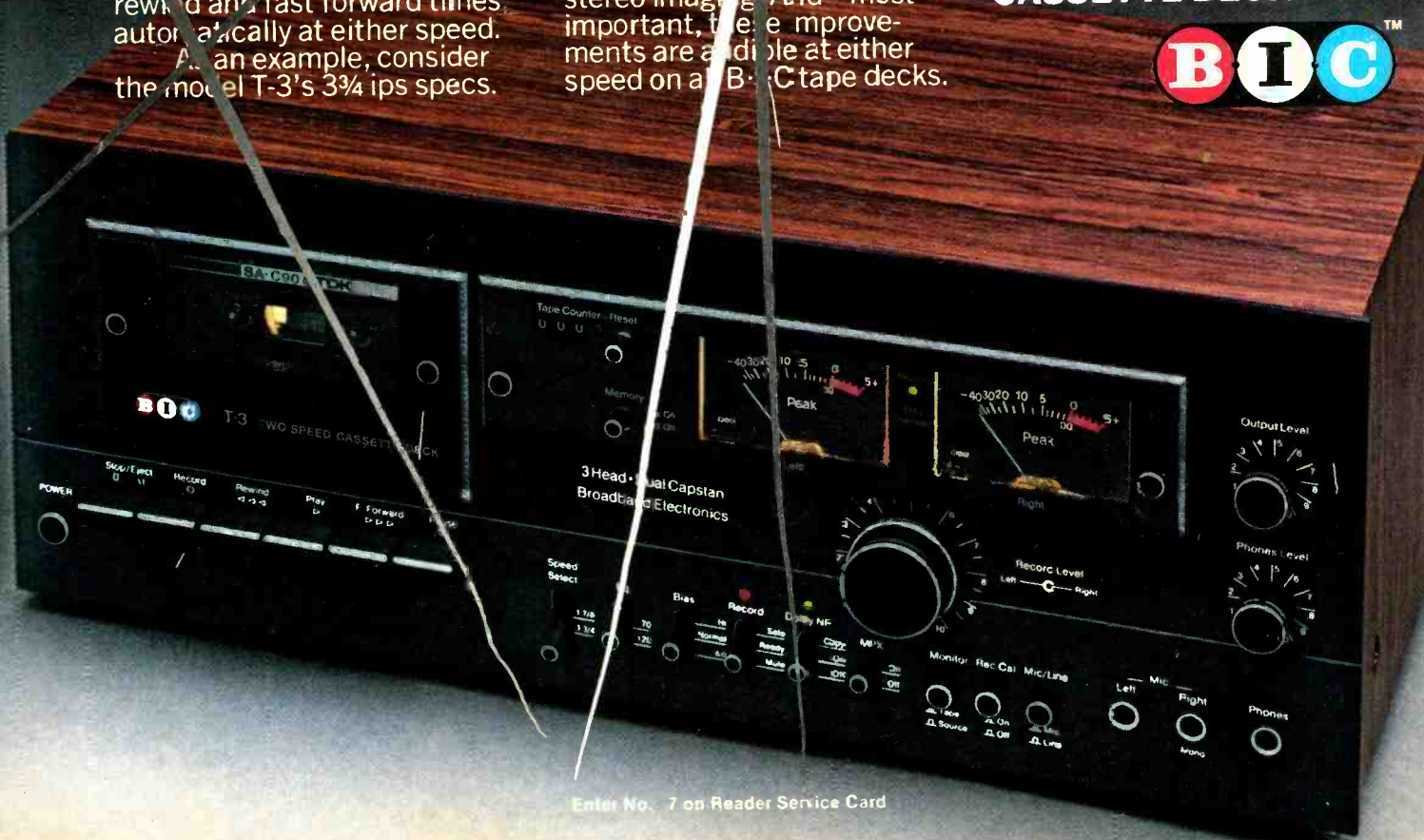
The result is sound that is cleaner and more detailed than you have ever heard from cassette tape.

There are three B-I-C cassette decks, from the “no frills” Model T-1 at under \$300, to the 3-head, dual capstan T-3... all at prices you'd expect to pay for an ordinary one speed machine.

For a free 24-page brochure, see your B-I-C dealer or write B-I-C Avnet, Westbury, N.Y. 11590.

**Twice the speed.
Twice the versatility.
Twice the performance.**

**THE NEW B-I-C
TWO-SPEED
CASSETTE DECK.**



Enter No. 7 on Reader Service Card

SONUS SERIES II.

**THE BEST
KEEPS GETTING
BETTER.**



The original Sonus cartridge established a new standard in high definition phonograph reproduction. Yet we believe there is even further room for improvement in this often-overlooked area of high fidelity. So we have taken the original Sonus cartridges and refined their designs, taking full advantage of the latest in materials and techniques. Sonus Series II cartridges are the result of these new design developments.

The new Sonus Gold consists of three models with identical bodies and stylus assemblies, differing only in the form of their diamond tips. The new Sonus Silver comes in two stylus types, and shares all the qualities of their more costly counterparts, yet still can offer a dramatic improvement in sound reproduction overall. Both series employ a transducer system characterized by reproduction of exceptional accuracy, clarity and definition. For full details and a recommendation of which model is correct for your particular system, we suggest a visit to the Sonus dealer nearest you, or write us.

SONIC RESEARCH, INC., Sugar Hollow Rd.
Danbury, Conn. 06810

SONUS

High Definition Phono Cartridges

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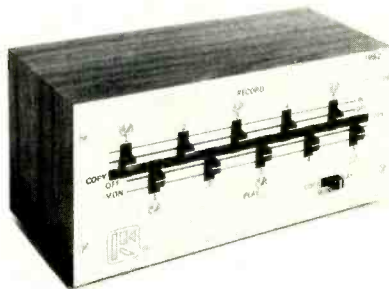
Switching Systems



Avid Equal Level Comparator features programmed A-B comparison of up to six receiver/amplifiers and 12 pairs of loudspeakers with defeatable, automatic level compensation for varying loudspeaker sensitivities. Has built-in sine-wave oscillator and pink-noise generator. Price: \$1100.00.

Crosspoint Model Seven series is a group of expandable computerized comparators to control speakers, amplifiers, or tape decks, alone or in system. Price: \$650.00. Model 21 for up to 20 units, \$1700.00, and Model 22 for 16 units, \$4000.00.

GC Electronics Speaker Selector Switch No. 30-5004 permits operation of up to five pairs of speakers in any combination with impedance automatically balanced to protect the amplifier and a maximum of 55 W rms per channel. Price: \$34.00.



Russound TMS-2 allows up to five tape recorders or other line level sources to be used in any combination while preventing overloads when multiple recorders are used in parallel. Price: \$69.95.

Russound Model TMS-1 Tape Recorder Selector Switch allows up to three tape recorders to be used at once in any combination of functions, and the internal network prevents overload. Price: \$39.95.

Russound SWB-2 Speaker-Amplifier Selector Switch is used to connect up to three sets of speakers to any ampli-

fier and play any or all simultaneously while maintaining proper load impedance. Price: \$29.95.

SAE Model 4200 speaker switching system has facilities for up to three pairs of speakers or headphones. One of the headphone jacks provides high level output for use with E.S. headphones.

Sony Model SB-5335 System Selector functions ideally in an audio showroom or a home component center allowing multiple connections and instant system selection.

Superex Model TSB-3 is a switching console to enable the user to duplicate source material on up to three tape decks with all modes of operation color coded for easy identification. Price: \$50.00.

Switchcraft Model TC-2000P1 stereo tape deck comparator makes A-B comparisons of tape deck recording and playback performance for up to 12 units. Price: \$675.00.

Switchcraft Model 640R stereo selector system demonstrates up to 1728 combinations of stereo hi-fi program sources in audio salons and demonstration rooms. Price: \$850.00.

Switchcraft Models 640B and 640C studio sound control centers allow up to 1728 combinations of stereo components, while the 640C extends the combinations to 10,648. Price: \$684.25 each.

Switchcraft Model 641P1 stereo control center provides switching of mono-stereo speakers for homes, offices, and clubs with negligible loss. Price: \$104.50.



The Wallace Audio-Minder will automatically turn-off your stereo system whenever sound stops coming, although the variable delay, from 30 sec. to 20 min., allows you to change records and tape. The electronic timer, from five min. to two hrs., allows continuous programming but will shut the system off at a specific time. Four unswitched a.c. outlets handle up to 1200 W. Price: \$79.95.

The evolution of the revolution.

The new Bose® 901® Series IV Direct/Reflecting® speaker.

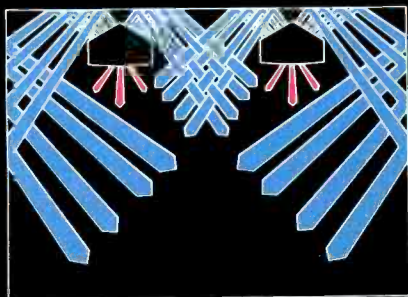
When Bose introduced the original 901® speaker, high-fidelity critics around the world hailed its revolutionary approach to sound reproduction.

"Bose has, in a single giant step, produced one of the finest speaker systems ever made."
(USA)

"The orchestra is there in front and the atmosphere of the concert hall all around."
(Belgium)

"Bose contains more technical innovations than any other speaker of the past 20 years."
(Austria)

"...sets new standards for loud-speaker music reproduction."
(France)



Now the 901® has evolved. Again. Introducing the Bose 901 Series IV Direct/Reflecting® speaker system. With new equalizer controls that consider your room as part of the speaker design. And a new answer to the problem of choosing an amplifier.

It is a known fact that moving a speaker just a few feet in a room will alter its performance. And that the variances in a speaker's performance from one living room to the next can be vast. This is a problem all speakers have regardless of design. Except one.

A new approach to the study of listening room acoustics and an ambitious survey of many actual listening rooms has resulted in new equalizer controls for the Bose 901 IV. These controls allow you to simultaneously adjust several bands of frequencies in a precise manner to match the per-

formance of the 901 IV to your room. In a way that cannot be duplicated even with an expensive graphic equalizer.

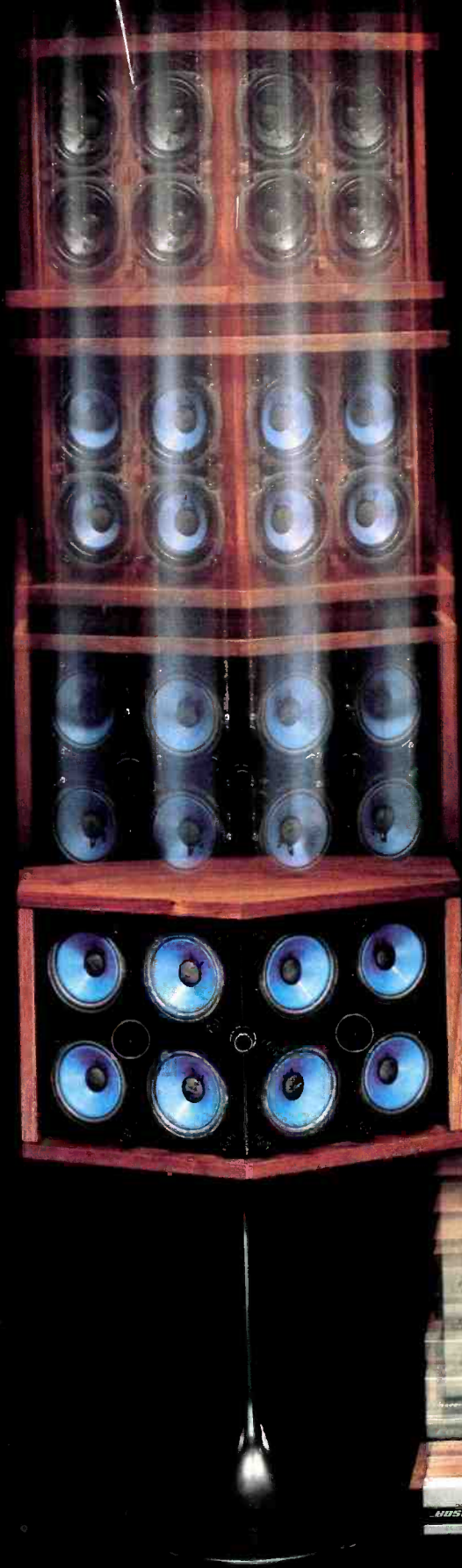
As a result, the 901 Series IV speakers perform as well in the living room as in the demonstration room. Were our engineers to design a speaker specifically for your living room, you would not get better sound than you do when you properly adjust the equalizer controls on the Bose 901 Series IV.

And the 901 IV provides a simple answer to the problem of choosing the power rating of your amplifier or receiver. Choose any amplifier you wish. The 901 IV provides surprisingly loud sound with as little as 10 watts per channel. Yet it is durable enough for us to remove all power limitations on the 901 IV. There is no power limit. Period.*

With these new improvements, the Bose 901 IV gives you a flexibility no other speaker can. You can place the 901 IV in almost any room and get the life-like, spacious sound for which the 901 IV

Direct/Reflecting® speaker is famous. And you can match it to virtually any amplifier.

We think that once you hear the new Bose 901 IV Direct/Reflecting® speaker, you'll agree. The revolution has evolved.



*There is a power limit in commercial applications. For information, contact Bose Customer Service.

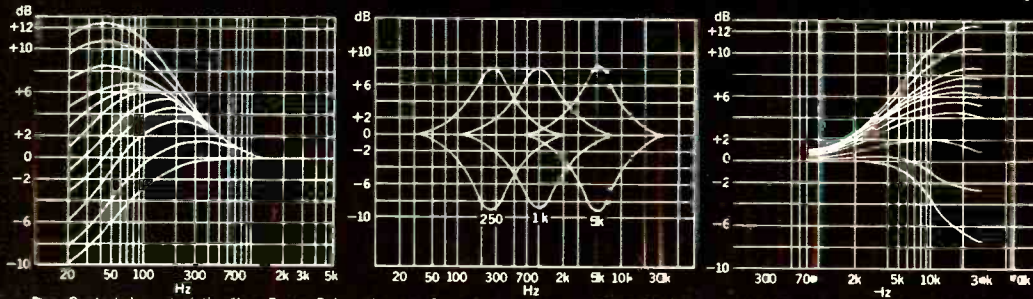
BOSE®

Power. With distortion so low it's more than inaudible, it's barely measurable. That isn't news. It's Technics.

Stereo Receivers	Min. RMS Power Per Channel into 8 Ohms from 20Hz-20kHz	Total Harmonic Distortion at Rated Power (Max.)	FM Sensitivity Stereo-50dB*	Phono S/N (10mV IFF A)
SA-1000	330 watts	0.03%	36.2 dBf	97dB
SA-800	125 watts	0.04%	36.2 dBf	95dB
SA-700	100 watts	0.04%	36.2 dBf	95dB
SA-600	70 watts	0.04%	37.2 dBf	95dB
SA-500	55 watts	0.04%	37.2 dBf	95dB

* IFF 75 standard

Look at the chart. That's Technics, too. Surprisingly good performance that comes as no surprise.



Bass Control characteristics (Low Boost: On) Midrange Control characteristics (variable range) Treble Control characteristics (High Boost: On)

Still, you expect the unexpected from Technics and with Acoustic Control that's just what you get. With

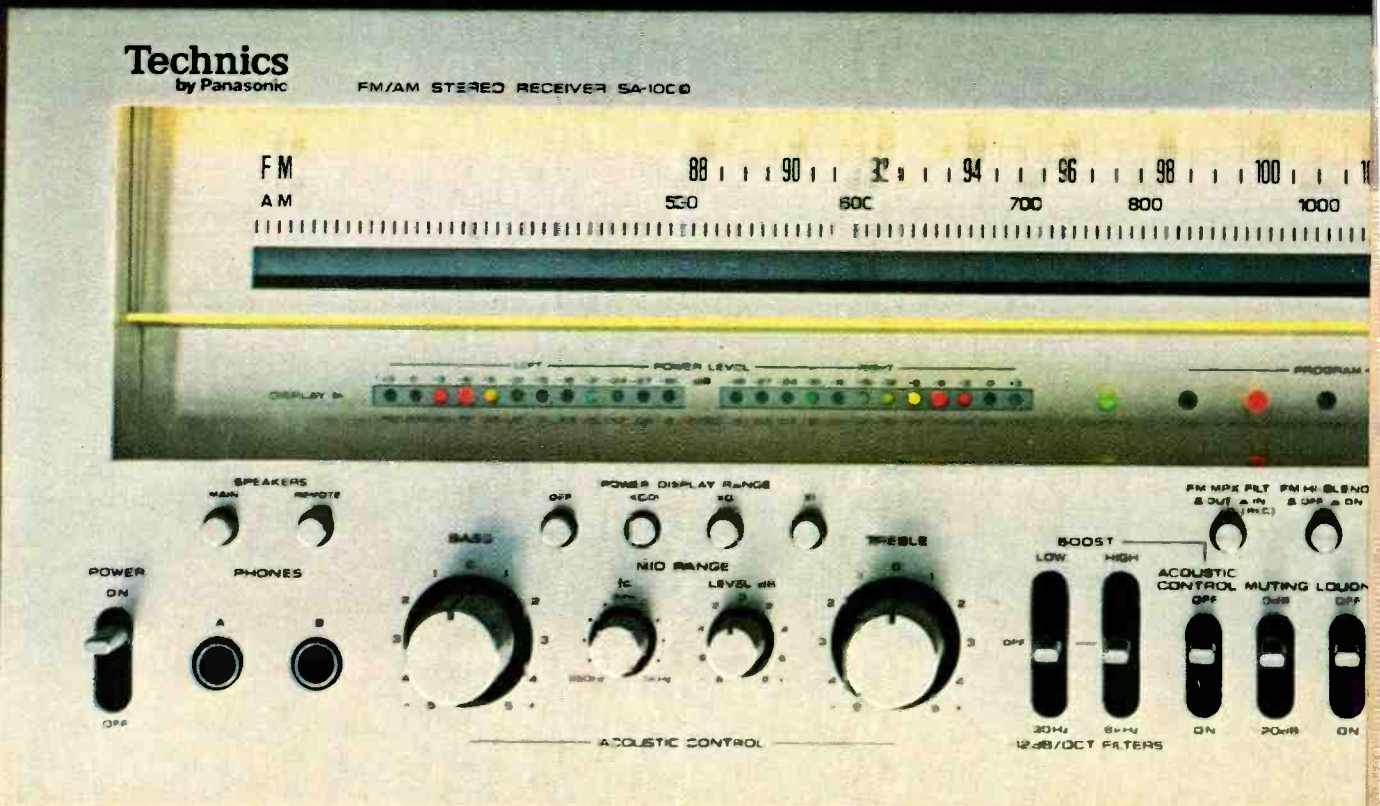
the low-boost switch and the bass control, you can accentuate drums and bass instruments with a minimum of boominess. Or use the treble high-boost switch to bring out the brilliance in both vocals and instrumentals by boosting the frequencies starting at 2 kHz, all the way up to 30 kHz.

You can also decrease the bass response starting at 100 Hz, or attenuate high-frequency response, thereby suppressing hiss and other noise. And with the SA-1000 shown below, there's a midrange control with a variable center frequency adjustment. So you can isolate any frequency between 250 Hz and 5 kHz. Then boost or attenuate it, according to your needs.

Still, you don't have to buy our most powerful receiver to get our most sophisticated circuitry. Because every

Technics receiver has direct coupling, conservatively rated power supply capacitors, current mirror loading

Big power with little distortion from Technics isn't news. Acoustic Control is.



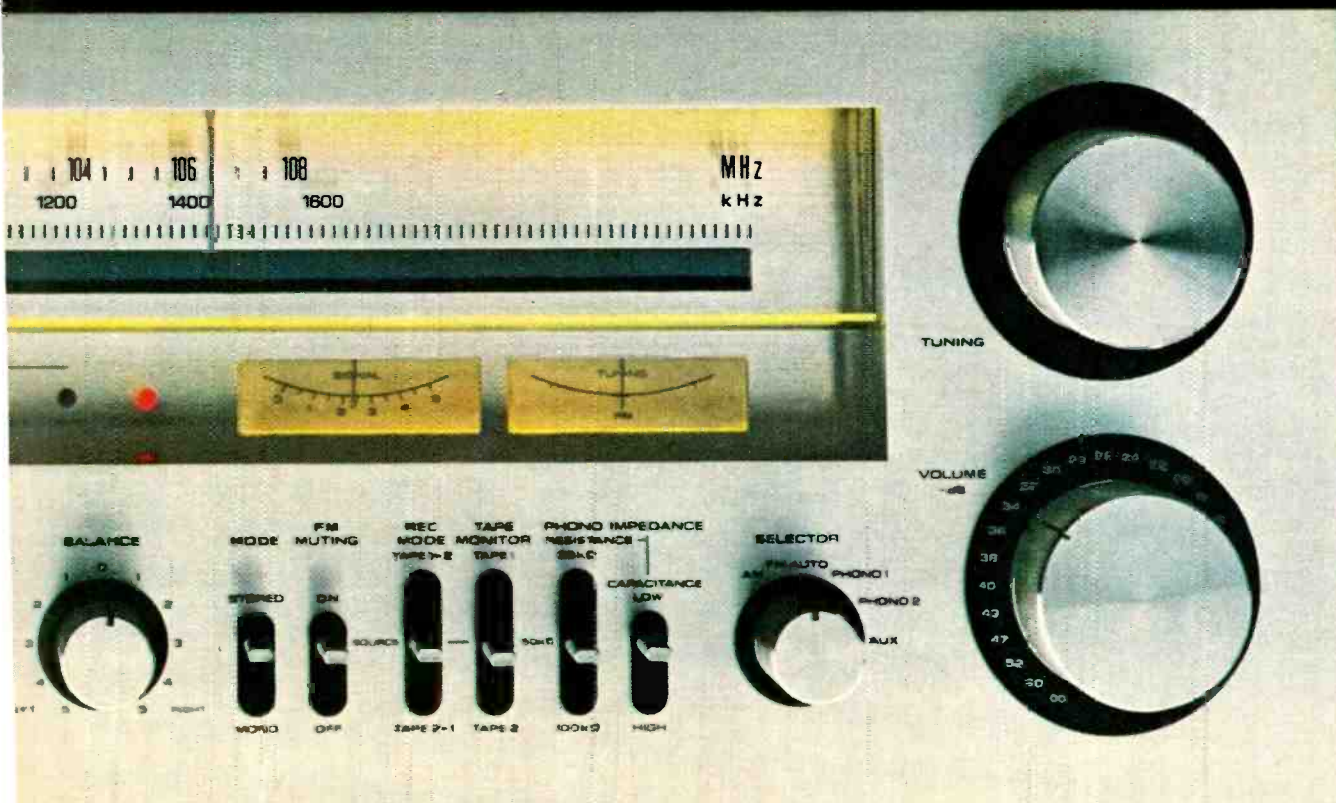
and single-packaged matched-pair dual transistors. They all add up to one thing: An amplifier that's clean and stable even under the most demanding dynamic conditions.

All your records will love the phono equalizer section in every Technics receiver. Because they all boast super-quiet S/N ratios, an extremely wide frequency response and an overload-resistant phono pre-amp.

For outstanding performance on FM, even from an overcrowded band or a marginal signal, every Technics receiver has Phase Locked Loop IC's, flat-group delay filters and a frequency response that's both flat and wide. And with LED power level indicators, your eyes can see what your ears will hear. Because Technics separated each channel's indicators into individual power levels—from as low as 0.3 watt to as high as 700 watts. And what's more, at the flick of a range switch, the indicators will read up to 100 times the actual power generated. With far greater accuracy than conventional mechanical meters.

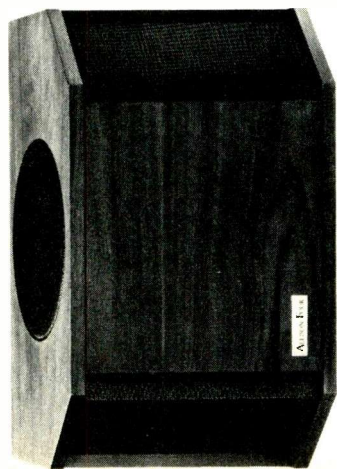
Technics new receivers. Big power with little distortion as well as outstanding performance isn't news from Technics. Giving you more ways to control it, is.

Technics



Enter No. 56 on Reader Service Card

ALLISON: FOUR



\$195*

“Within its frequency range the Allison: Four produced one of the flattest, smoothest frequency responses we have ever measured from a loud speaker. . . . The sound of this diminutive speaker is nothing less than astonishing.”

Hirsch-Houck Laboratories — Equipment Test Reports
STEREO REVIEW June 1978, Copyright Ziff-Davis Publ. Co.
*Higher in the West and South.

Enter No. 3 on Reader Service Card

ALLISON ACOUSTICS 7 Tech Circle, Natick, Massachusetts 01760

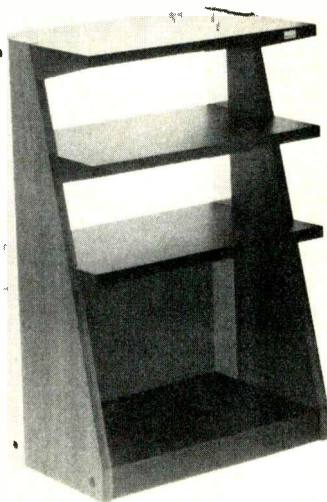
Component Racks

International Sound Alpha series component racks from Stereo Decor are low Q, high density, assembled stereo component racks in three wood finishes and three space configurations.

Marantz Model RM-3100 “Decorator” stack rack has three fixed shelves for Marantz components and features a full-length smoked glass door, divided record compartment, and wood-tone side panels. Price: \$239.95.

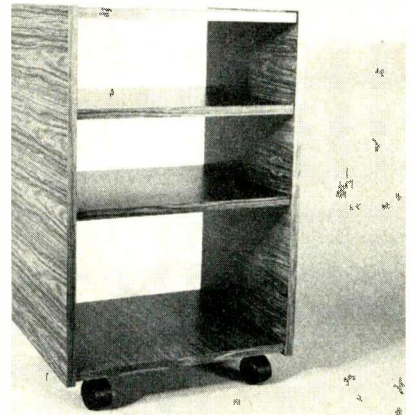


Marantz Model RM-3100 stack rack will accept up to four Marantz components equipped with either the RHA-1 or RHA-2 rack handles. Price: \$279.95.



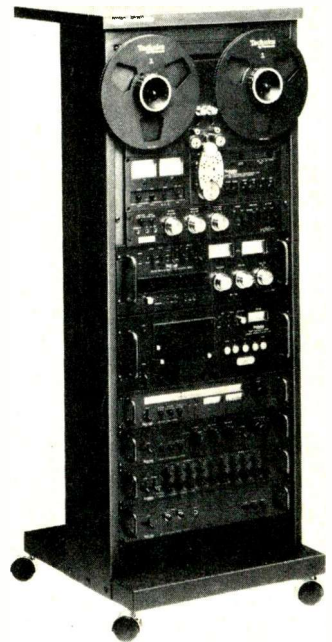
Sansui Model GX-100 is a simulated walnut, three-shelf component rack with divided record shelf and a nonvi-

brating top shelf for record player. Price: \$110.00.



Star Case Model RS30 is a four-shelf audio rack finished in rosewood formica, mounted on four steel barrel casters for easy movement, and will accommodate all 19-in. rack mountable equipment. Price: \$199.95.

Technics Model SH-999 is a studio rack, 34-in. high, specially designed to house five Technics professional series components. The unit has large casters and a lower record storage compartment. Price: \$300.00.



Technics Model SH-905ST is a metal studio rack, 45-in. high, on wheels, for mounting equipment designed for use in the standard 19-in. rack. Price: \$220.00.

The A-800: A TEAC with features you can't live without at a price you can live with.

The TEAC A-800 gives you one of the best, most affordable combinations of precision, muscle and good looks around. It's a three head, two motor, dual capstan, solenoid-operated cassette deck that lists for less than \$800.*

The A-800 transport has a computer heritage... heavy, rock-steady, reliable. The closed-loop dual capstan system isolates the tape between the capstans to provide optimum tape-to-head contact. Result: better frequency response, fewer dropouts. An



tape between the capstans to

ultra-stable motor drives the capstans while all transport functions are operated through feather-touch solenoid switching both on the deck and with the optional RC-90 Remote Control.

The A-800 uses a combined record/playback head in which both elements are incorporated into a single housing. What's more, the playback head is a unique "Delta" design which incorporates both magnetic and non-magnetic ferrite materials which assures minimum feedthrough from the record head and eliminates low



frequency contour effects.

In addition to its built-in Dolby, the A-800 also accepts an optional dbx® Type II for wider dynamic range and up to 80 dB S/N. This optional dbx interface—a TEAC exclusive—lets you improve the overall signal-to-noise performance by up to 30 dB. It's got to be heard to be believed!

TEAC®

First. Because they last.

TEAC Corporation of America
7733 Telegraph Road
Montebello, California 90640

*Manufacturer's suggested retail price.

©dbx is a trademark of dbx, Inc.



Wow & Flutter: 0.05%
Frequency Response: 30-18,000 Hz
± 3 dB (CrO₂/FeCr)

MODEL A-800

LINE OUT

TAPE COUNTER

4 4 8

RECORD

REC MUTE

PAUSE

Introducing home stereo

The Jensen R430 Receiver.
Just one of six all-new car stereo receivers from Jensen.

Individual Bass & Treble Controls.

Volume.

Unique Cassette Door/Tuner Dial.

Accepts entire cassette firmly into unit; large, easy-to-read tuner scale.

Automatic Tape Alarm.

Reminds you to remove cassette to prevent damage to pinch roller and capstan (a major cause of wow and flutter). Program lights flash, speakers beep when ignition is turned off.

Power Amplifier.

Separate power amp installs in trunk. Provides up to 60 watts of Total System Power.

Bi-Amplification.

Divides and sends correct frequencies and power levels to respective drivers through four separate amps (2 for highs and 2 for lows).

Cassette Fast Forward/Rewind.

Loudness.

Recaptures all the bass that can disappear at low volume levels.



The Jensen Car

At long last... Jensen introduces the Stereo Receiver for your car. Indash.

Monitor-quality FM broadcasts with superior sensitivity and pinpoint selectivity... from an FM multiplex section designed to the same exacting specifications as your favorite home receiver.

At the very heart of Jensen's Stereo Receiver can be found four independent, direct-coupled amplifier sections—two for each channel—delivering ample amounts of clean power over an incredibly wide dynamic range.

Several models even boast the electronic sophistication of bi-amplification. This advanced circuitry programs each of the receiver amplifiers to individually drive high

and low frequencies of each stereo channel—minimizing distortion and increasing peak power levels. For an impact, detail and transparency you never thought your car speakers capable of.

And just listen to the revelation of wide range signals stored in your favorite tapes... and encoded FM stereo broadcasts... through the

receivers for your car.



Fader.
Adjusts sound level between front and back speakers.

Balance.
Adjusts sound level between right and left speakers.

Tuning.

Tuner.
Separate Tuner On/Off retains pre-set volume level, eliminates radio blast when tape is removed.

Local/Distance.
"Local" mode offers interference-free local FM reception; "Distance" mode maximizes sensitivity for better long distance reception.

Dolby® Noise Reduction.
Processes our tape hiss on Dolby-encoded tapes; improves dynamic range of Dolby-encoded FM broadcasts.

Muting.
Eliminates inter-station noise when changing stations.

FM/AM.
Feather-touch electronic switching.

Stereo Receivers.

uncanny quiet background of a Dolby® Noise Reduction System.

Feather-touch electronic switching puts the Jensen Receiver through its sophisticated paces:

Loudness, switchable Interstation

Muting, Tuner On/Off, Dolby, and Local/Distant reception. Independent bass and treble controls offer complete tone curve flexibility. And a unique tape alarm even reminds

you to eject an engaged tape when the ignition is turned off.

These are some of the features that have created a distinct new category: Car Stereo Receiver. Three models with Cassette and three with Eight-Track. All worthy of the Jensen name.

Anything less just wouldn't do. Not from the design laboratories

that invented the loudspeaker. And the Triaxial®. And now the Jensen Receiver.

For a free color catalog write:

JENSEN
SOUND LABORATORIES

Division of Pemcor, Inc.
4136 N. United Parkway
Schiller Park, Illinois 60176

® "Dolby" and "Dolby System" are Trademarks of Dolby Laboratories, Inc.

® Triax and Triaxial are registered Trademarks identifying the 3-way car speakers of Jensen Sound Laboratories, Division of Pemcor, Inc.

Directory of Manufacturers

Ace Audio

532 Fifth St.
East Northport, NY 11731

Acoustique 3A International

871 Montee de Liesse
St. Laurent, Montreal P.Q.
H4T-1P5 Canada

Adcom Marketing

11A Jules Lane
New Brunswick, NJ 08901

Advent

195 Albany St.
Cambridge, MA 02139

Allison Acoustics

7 Tech Circle
Natick, MA 01760

American Audioport

1407 N. Providence Rd.
Columbia, MO 65201

Ampex

401 Broadway
Redwood City, CA 94063

Armstrong

See Sindell Organization

Aspen Ltd.

77 E. Floyd Ave.
Englewood, CO 80110

Audio Innovations

1432B Air Rail Ave.
Virginia Beach, VA 23455

Audiomagnetics

2602 Michelson Drive
Irvine, CA 92716

Audio Pulse

4323 Arden Drive
El Monte, CA 91731

Audio Technology

1135 Tower Rd.
Schaumburg, IL 60195

Audio Works

840 Piner Rd. #14
Santa Rosa, CA 95401

Avid

10 Tripps Lane
E. Providence, RI 02914

BASF Systems

Crosby Drive
Bedford, MA 01730

Ball Corp.

345 S. High St.
Muncie, IN 47302

Capitol Magnetic

1750 N. Vine St.
Los Angeles, CA 90028

Certron Corp.

1701 S. State College Blvd.
Anaheim, CA 92806

Columbia Magnetics

51 W. 52nd St.
New York, NY 10019

Crosspoint Instruments

12 Irving Place
Framingham, MA 01701

DB Systems

Box 187
Jaffrey Center, NH 03454

dbx Inc.

71 Chapel St.
Newton, MA 02195

Denon

See American Audioport

Eventide Clockworks

265 W. 54th St.

New York, NY 10019

Fuji Photo Film U.S.A.

350 Fifth Ave.

New York, NY 10001

GC Electronics

400 S. Wyman
Rockford, IL 61101



The truth is clearly seen in every Scotch[®] Master[™] Cassette, thanks to our see-through cassette shell. You can see the unique roller guides that reduce friction by moving the tape evenly across the head. And the two radially creased

shims that insure a smoother wind, improved mechanical reliability and reduced wow and flutter. Even the recorder head penetration.

The sexy, see-through Master Cassette shell. It's kind of like getting the naked truth.

GRT Corp.

1286 N. Lawrence Station Rd.
Sunnyvale, CA 94086

International Sound

P.O. Box 4276
Modesto, CA 95352

KLH/Burwen Research

145 University Ave.
Westwood, MA 02090

Kerry Sandborg

5937 Simpson Ave.
N. Hollywood, CA 91607

Lafayette

111 Jericho Tpk.
Syosset, NY 11791

Lectrotech

5810 N. Western Ave.
Chicago, IL 60659

Leroy Porter

3205 Caithness St.
Savannah, GA 31405

MXR Innovations

247 N. Goodman St.
Rochester, NY 14607

Mastercraft Audio

P.O. Box 2661
Huntington Station, NY 11746

Maxell

60 Oxford Drive
Moonachie, NJ 07074

Memorex

1600 Memorex Drive
Santa Clara, CA 95052

Nakamichi Research

220 Westbury Ave.
Carle Place, NY 11514

Neosonic Corp. of America

180 Miller Place
Hicksville, NY 11801

Nortronics Co., Inc.

8101 Tenth Ave.
N. Minneapolis, MN 55427

Osawa

521 Fifth Ave.
New York, NY 10017

Phase Linear

20121 48th Ave. West
Lynnwood, WA 98036

Rocelco

1669 Flint Rd.
Downsview, Ontario

Canada M3J 2J7

Russound/FMP

Stratham, NH 03885

SDS Tape

6730 Santa Barbara Court
Baltimore, MD 21227

Sansui Electronics

55-11 Queens Blvd.
Woodside, NY 11377

Sindell Organization

11046 Santa Monica Blvd.
Los Angeles, CA 90025

Sony

9 W. 57th St.
New York, N.Y. 10019

Sound Concepts

P.O. Box 135
Brookline, MA 02146

Source Engineering

P.O. Box 506
Wilmington, MA 01887

Star Case Mfg.

15525 S. 70th Court
Orland Park, IL 60462

Suporex

151 Ludlow St.
Yonkers, NY 10705

Switchcraft

5555 N. Elston Ave.
Chicago, IL 60630

Symmetry Audiophile Systems

109-16th Ave.
San Francisco, CA 94118

TDK Electronics

755 Eastgate Blvd.
Garden City, NY 11530

3M Company

2501 Hudson Rd.
St. Paul, MN 55119

Transcriber

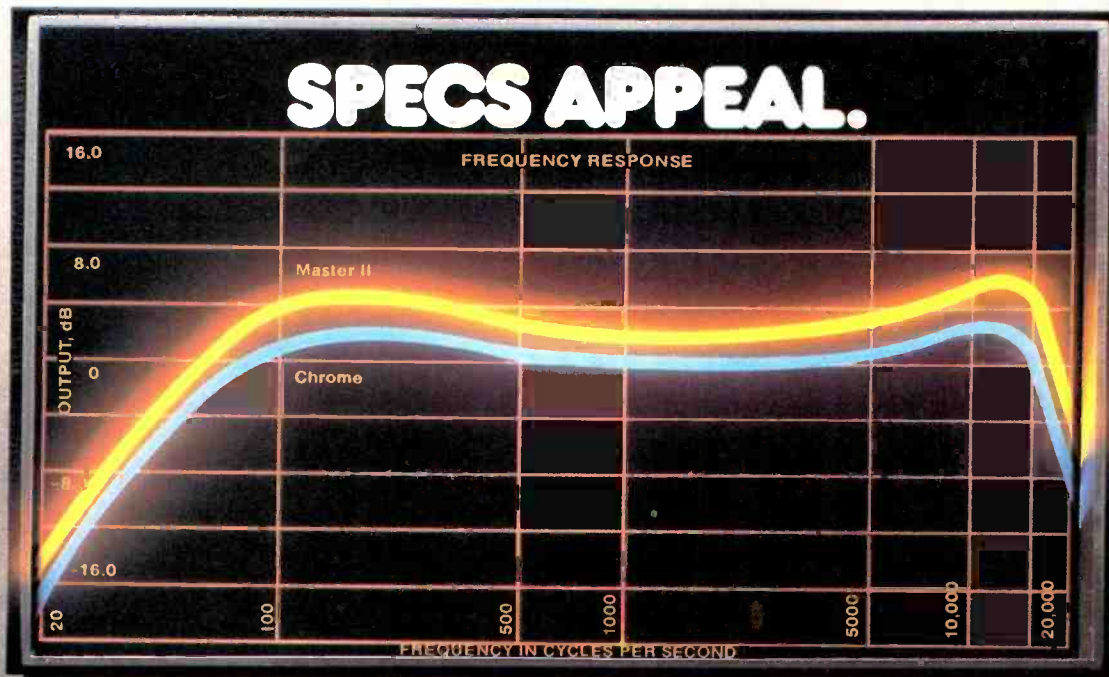
P.O. Box 478
Attleboro, MA 02703

Uni-Sync

742 Hampshire Rd.
Westlake Village, CA 91361

Wallace Electronics

4921 N. Sheridan Rd.
Peoria, IL 61614



Master I Cassette is for normal bias recording. It features an excellent dynamic range, low distortion, uniform high frequency sensitivity and output that's 10 dB higher than standard tapes.

Master II Cassette is for chrome bias recording (70 microsecond equalization). It features a special coating that gives it a 3 dB better signal-to-noise ratio at low and high frequencies



than chrome cassettes.

Master III Cassette is for ferri-chrome bias recording. It offers a 3 dB output improvement at low frequencies and 2 dB output improvement at high frequencies over chromium dioxide.

SCOTCH® RECORDING TAPE. THE TRUTH COMES OUT.

Enter No. 28 on Reader Service Card

We sound better because we listen better.

The new Harman Kardon receivers have power, features, excellent specifications.

But so do many other receivers.

What makes us better is the way we sound. More musical, with air between the instruments. Spacious, with extraordinary articulation that allows each instrument to register deep into your musical consciousness.

Why does Harman Kardon sound better?

It starts with ultra-wideband frequency response and remarkably low TIM (transient intermodulation distortion) and SID (slewing induced distortion). But these are merely minimum design parameters for Harman Kardon engineers.

Of course, it is possible for our engineers to build adequate receivers where others build them — in the laboratory. But that's not where you build exceptional ones. You make them in the listening room.

But not just when the receiver design has been

completed. Listening at every stage of development is critical.

The fact is that transistors with the same specifications, but from different manufacturers, vary in ways that affect the texture of music. That's why Harman Kardon engineers actually listened for the *musical character* of every component — singly and in combination — that went into the audio chain of all our new receivers. Every transistor. Every capacitor. Every resistor.

They listened for the subtle differences in component parts that make the immeasurable difference in the final product — changing, refining, in effect tuning the instrument until a receiver emerged that sounded exactly the way they wanted it to sound.

In short, it's not just great specifications that make the difference — it's listening to those things that others tend to take for granted.

Listen to the difference yourself. Visit your Harman Kardon dealer today.



Pictured: hk670 receiver 60/60 watts
Not shown: hk340 20/20 watts, hk450 30/30 watts,
hk560 40/40 watts



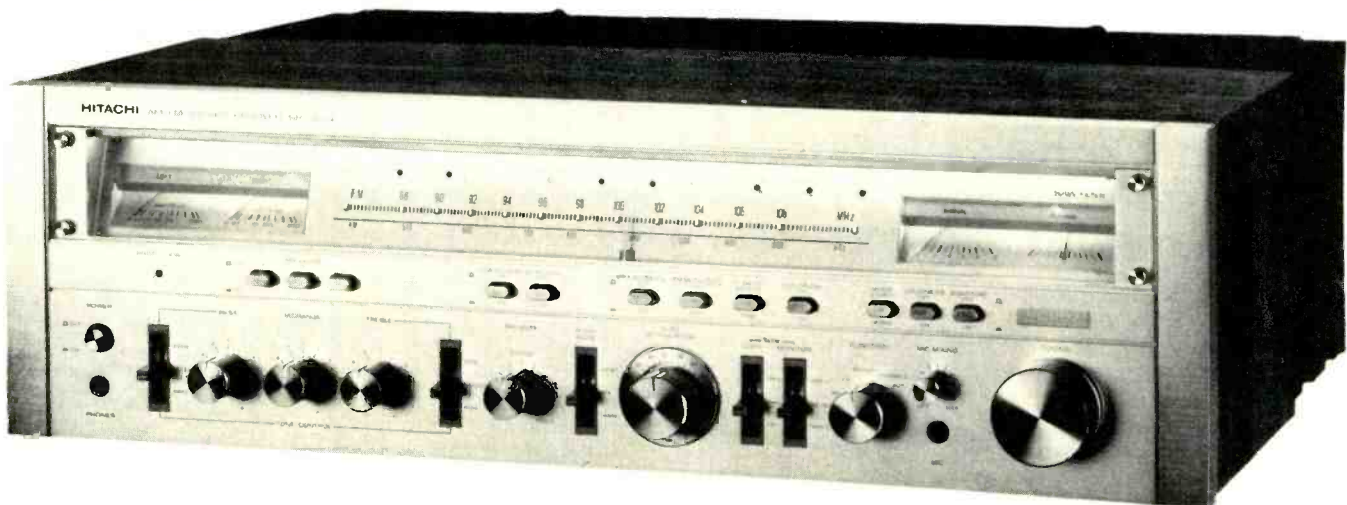
harman/kardon
Hear all the music.

55 Ames Court
Plainview NY 11803

Enter No. 23 on Reader Service Card

Equipment profiles

Hitachi Model SR-2004 Stereo AM/FM Receiver



MANUFACTURER'S SPECIFICATIONS

FM Tuner Section

Usable Sensitivity: Mono, 8.7 dBf (1.5 μ V); Stereo, 24 dBf (8.9 μ V).

50-dB Quieting: Mono, 12.5 dBf (2.3 μ V); Stereo, 36 dBf (34.5 μ V).

S/N: Mono, 75 dB; Stereo, 70 dB.

Mono THD: Wide Band, 0.07 per cent @ 1 kHz, 0.15 per cent @ 100 Hz, and

0.2 per cent @ 6 kHz; Narrow Band, 0.1 per cent @ 1 kHz, 0.15 per cent @ 100 Hz, and 0.25 per cent @ 6 kHz.

Stereo THD: Wide Band, 0.1 per cent @ 1 kHz, 0.25 per cent @ 100 Hz, and 0.3 per cent @ 6 kHz; Narrow Band, 0.2 per cent @ 1 kHz, 0.25 per cent @ 100 Hz, and 0.3 per cent @ 6 kHz.

Capture Ratio: 1 dB.

Frequency Response: 30 Hz to 15 kHz, +0.5, -1.0 dB.

Selectivity: Narrow, 85 dB; Wide, 45 dB.

Image and i.f. Rejection: 115 dB.

Spurious Rejection: 120 dB.

AM Suppression: 60 dB.

Stereo Separation: 50 dB @ 1 kHz.

Sub-carrier & SCA Rejection: 70 dB.

Muting Threshold: 28 dBf (14 μ V).

Whether you call the circuit "Series E" or "Class G," there's no doubt that Hitachi's proprietary output-stage powering system does result in increased efficiency, less bulky heat-sink requirements, and somewhat smaller overall dimensions for the SR-2004 than might be required with a conventional "Class B" output circuit.

For those not familiar with the "Class G" circuit approach, briefly, the output transistors are powered by low- and high-voltage supplies and four transistors are used for each channel, strung out in series of two. Transistors powered from the lower voltage supply amplify the output signal so long as its amplitude is below a pre-determined value. When amplitudes exceed this value, the higher-powered transistors (operating from the higher voltage supply) turn on while the others turn off. The idea, here, is that each pair of transistors operates over its most efficient region, thereby improving overall efficiency. It follows, of course, that there are now as many as six-transition points in a given a.c. alternation of the signal waveform, as opposed to the two associated with Class B operation, and Hitachi has gone to great lengths (in terms of extra circuitry) to insure against "notch" or switching distortion as these additional switching effects take place.

The Class G scheme also makes possible higher levels of dynamic or "music" power than are usually available with typical class B power output circuits. Interestingly, Hitachi chooses to publish a "music power" rating for the SR-2004 —

400 watts per channel — despite the fact that the FTC discourages the use of such ambiguous wattage notations. In terms of the new IHF amplifier standards, a statement of Dynamic Headroom would be preferable and would, of course, be equal to 3 dB (twice the continuous power rating for short-term signals). In fact, we measured an even greater Dynamic Headroom for this unit, but more on that later.

As for the front-panel layout, the easy-to-read, light-colored dial scale area is flanked by a pair of power output meters at the left and signal strength and center-of-channel tuning meters at the right. FM frequencies are linearly calibrated and above the scale are program source indicator lights, a stereo light, and an auto-lock light which illuminates when you let go of the tuning knob after tuning to the signal of your choice. The auto-lock feature is a refined form of AFC which is disabled by the capacitive switch that is relay-activated when you touch the tuning knob.

A protection-circuit indicator light is located just below the power output meters and, in line with it, are four clusters of oval shaped pushbuttons. The first three of these select speakers. Low- and high-cut filter switches are next, followed by an MPX noise filter switch, an FM-mute defeat switch (which also cancels the auto-lock feature), an i.f. bandwidth switch, and an FM multipath switch which converts the signal-strength meter to a multipath indicator. The remaining three pushbuttons are a Mono/Stereo mode switch, Loud-

AM Tuner Section

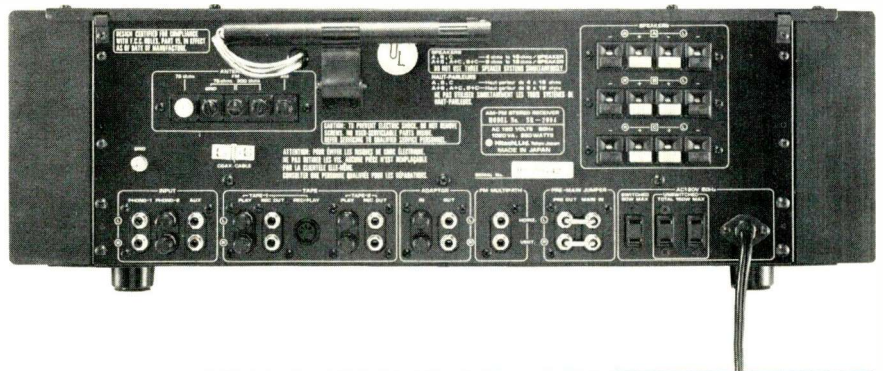
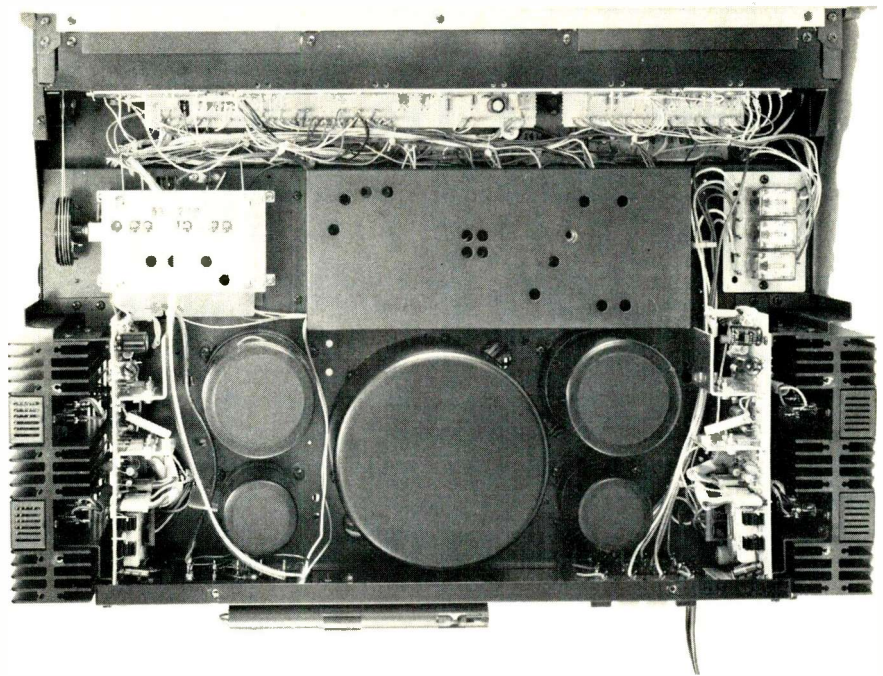
Sensitivity: 370 $\mu\text{V}/\text{M}$, internal antenna; 20 μV , external.
Image Rejection: 70 dB.
I.f. Rejection: 90 dB.
Selectivity: 40 dB.
S/N: 50 dB.

Amplifier Section

Continuous Power Output: 200W/channel, 8 ohm loads, 20 Hz to 20 kHz.
Rated THD: 0.08 per cent.
Music Power: 400 W per channel into 8 ohms.
Rated IMD: 0.08 per cent.
Input Sensitivity: Phono, 2.5 mV; High Level, 150 mV; Mike, 3 mV.
Max. Phono Input Level: 500 mV.
S/N ("A" Weighted, referenced to full output): Phono, 75 dB; High Level, 90 dB.
Damping Factor: 75.
Frequency Response: Phono, RIAA, ± 0.2 dB; High Level, 10 Hz to 40 kHz, ± 1.5 dB.
Bass Control Range: ± 10 dB @ 50 or 100 Hz (depending upon turnover selected.)
Treble Control Range: ± 10 dB @ 10 or 20 kHz.
Midrange Control: ± 6 dB @ 1 kHz.
High-Cut Filter: -10 dB @ 10 kHz.
Low-Cut Filter: -10 dB @ 50 Hz.

General Specifications

Power Consumption: 850 watts, 120 V, 60 Hz.
Dimensions: 22 $\frac{3}{4}$ in. (57.8 cm) W x 7 $\frac{1}{2}$ in. (19 cm) H x 17 $\frac{1}{2}$ in. (44.5 cm) D.
Weight: 56.2 lbs. (25.5 kg).
Price: \$950.00



ness switch, and an *Adaptor* switch which creates a "circuit-break" for insertion of accessory devices such as Dolby decoders; equalizers, etc.

Controls along the lower section of the panel include a power *On/Off* switch, phone jack, three-position bass and treble turnover switches, *bass*, *mid-range*, and *treble* tone controls, *Balance* control, muting lever switch (with -20 and -40 dB positions), master volume control, tape copy and tape

monitor lever switches, program selector switch, mike mixing level control, microphone input jack, and a large tuning knob coupled to an effective flywheel tuning arrangement.

In addition to three sets of spring-loaded speaker terminals, the rear panel is equipped with three a.c. receptacles (two unswitched, one switched), preamp-out/main-amp in jacks, horizontal and vertical output jacks for connection to an oscilloscope (for observation of multipath effects), and

Fig. 1—Mono and stereo quieting and distortion characteristics in the wide-band setting.

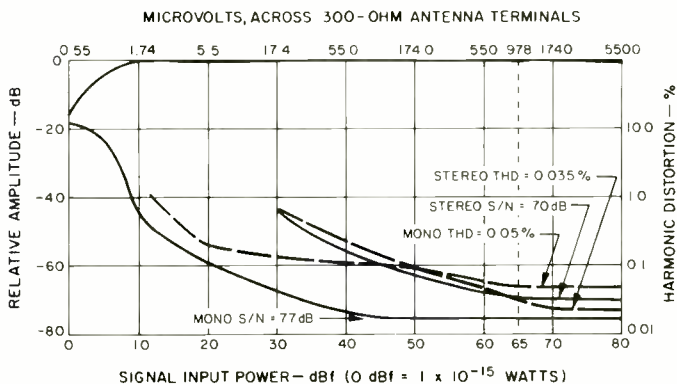
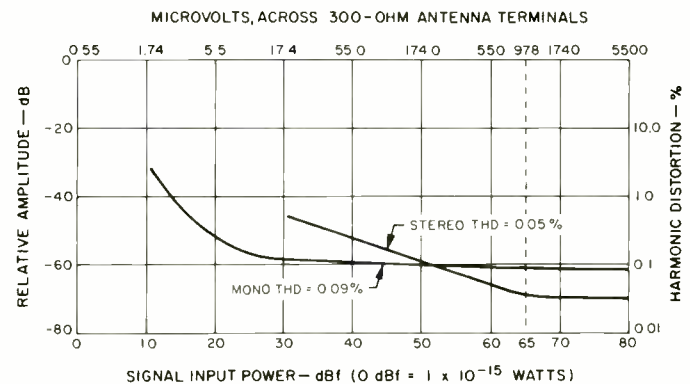


Fig. 2—Mono and stereo distortion characteristics in the narrow-band setting.



**While others are reaching
for this technology,
Sony brings it within
your reach.**



It takes a sharpened sense of technology to deliver innovation at sensible prices.

Who else but Sony could manage it? We know turntables backwards and forwards. Even as far back as 1966, we were surprising people with our developments: that one, the application of a slow-speed, servo-controlled motor to turntables.

Today, we present the PS-X7, X6 and X5. Three fully automatic, direct drive turntables that are a direct challenge to the competition.

And the competition will soon find that we've got the features they don't want to face.

**The X-tal Lock.
X-act speed accuracy.**

Good as it is, a traditional servo system has two flaws. When playing a record for a long time, it heats up and you're continually forced to correct for speed drift.



More critically, increased friction between the stylus and record during loud passages can slow down the speed. It will then fall into a range wherein a conventional servo isn't sensitive enough to read. But your ear can.

Sony's X-tal Lock system cannot be accused of any of the above. Its quartz generator serves to regulate the servo. The speed is electronically locked in. Impervious to changes in temperature, load, or voltage.

Quartz can help Bach. Quartz can help rock.

Our brushless and slot-less is matchless.

Sony's new motor gives brushes the brush. The ring shaped permanent magnet rotor and fixed coil windings eliminate cogging.



The torque is high—and that's not just talk.

Its rotation is smooth, and start-up, quick.



**Sony's Speed Monitoring System.
Like millions of tiny State Troopers.**

The X-tal Lock system is worth x-actly nothing, unless the right information is relayed to it. Our system uses a precise magnetic pulse signal, recorded on the outer rim of the platter. An 8-pole magnetic pick-up head receives it. Then transmits it to the servo electronics.



Most systems base their information on only one pole. By using 8—and averaging them—we get above average accuracy.

**Want functional controls?
The case is closed!**

Sony believes a dust cover should live down to its name—it should stay closed, protecting record and turntable from dirt. You have immediate access to the controls without lifting the cover. (On the X7 and X6, the controls are touch sensitive.)

There's a lot more built into these machines; a lot more reasons to look into them.

A safety clutch mechanism protects the tone arm against damage, should you grab it while in motion.

And on the X7 and X6, an optical sensing system is included. It automatically returns the arm at record's end. (In the X7, a carbon fiber tone arm.)



What's more, these turntables are worth more dead, than alive. Because their cabinets are made from an acoustically dead material. That way, acoustic feedback caused by the speakers can't come back and make the cabinet vibrate.

Vibration is also cut by our thick rubber mat, and heavy aluminum platter. Viscous filled rubber feet give vibration the boot as well; the same viscous material fills the rubber mat on the PS-X7.

All this, so while you're vibrating to the record, your turntable isn't.

Much has been engineered into these turntables that we haven't mentioned, including lightweight tone arms with a cast aluminum alloy headshell.

So tightly built are they that we didn't even have room for one more thing: bigger prices.

Cartridges are not included

SONY

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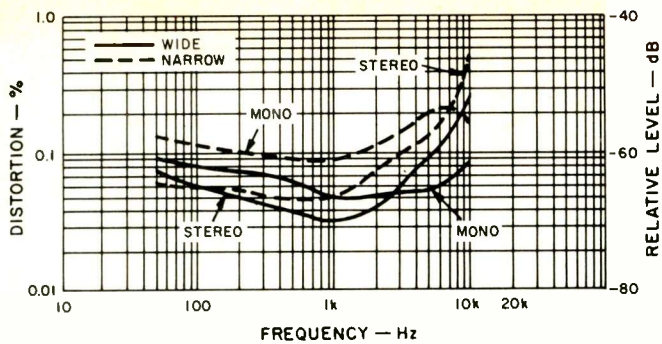


Fig. 3—Distortion vs. frequency in the wide- and narrow-band settings.

the usual array of tape-out/tape-in jacks, AUX input jacks, and two pairs of phono input jacks. An extra set of jacks is provided for the adaptor or accessory connection controlled from the front panel. Antenna terminals include AM, 300-ohm FM, and 75-ohm coaxial connector, and a chassis ground terminal is located adjacent to the phono inputs. A ferrite-bar AM antenna swings away from the rear panel for improved AM reception.

Circuit Highlights

The FM front end of the Hitachi SR-2004 employs three dual-gate MOS-FETs and a five-gang variable capacitor. In the wide-band setting of the i.f. system, a "saw"-filter including a four-pole LC linear-phase arrangement is employed, while for the narrow, higher selectivity setting, two linear-phase ceramic filters are employed. The i.f. amplifier is a six-stage differential type and utilizes three ICs. Quadrature detection is used to recover the composite FM stereo signal which is decoded by means of a phase-lock-loop circuit contained in the MPX IC.

A ceramic filter is employed in the AM section of the receiver, along with a three-gang tuning capacitor.

The Class G output circuit has already been described and, in the SR-2004 it is combined with an electronic protection circuit which disconnects speakers in the event of a circuit fault or amplifier current overload.

FM Performance Measurements

While ultimate signal to noise measured the same for both the narrow and wide i.f. settings (77 dB in mono, 70 dB in stereo), there were, as might be expected, significant differences in the distortion observed when using the two available i.f. bandwidths. Figure 1 shows the mono and stereo quieting and distortion characteristics using the wide band setting. Harmonic distortion in mono was an incredibly low 0.05 per cent and 0.035 per cent in stereo. We suspect here that such low readings are partly the result of distortion inherent in our test equipment serving to cancel the minute distortion actually generated by the tuner circuits, since we

would not normally expect to read lower THD figures in stereo than we do in mono.

Figure 2 is a plot of harmonic distortion versus signal input level, this time with the tuner section switched to the "narrow" setting. Despite the high selectivity achieved with this setting, distortion figures were still very low, with readings of 0.09 per cent in mono and 0.05 per cent in stereo for a 1-kHz test signal. In Fig. 3 we have plotted distortion versus test frequency for mono and stereo for both the wide-band and narrow-band settings. Even under the very worst conditions (6 kHz), stereo distortion was still a low 0.6 per cent. While frequency response was not at all affected by choice of bandwidth settings (see Figs. 4 & 5), separation did decrease slightly when the narrow-band setting was used.

In the narrow-band mode, separation measured 48 dB at 1 kHz, 44 dB at 100 Hz, and 34 dB at 10 kHz, while in the wide-band mode the separation increased to 58 dB at mid frequencies, 44 dB at 100 Hz, and 52 dB at 10 kHz.

Capture ratio measured 1.2 dB, and selectivity was 88 dB in the narrow mode and 43 dB in the wide mode. All forms of rejection were better than 100 dB below 100 per cent modulation and AM suppression measured 60 dB, exactly as claimed. Both muting and stereo threshold were on the high side of where we prefer to see them, with readings of 15 μ V (28.7 dBf) and 18 μ V (30.3 dBf) respectively. Sub-carrier output products were buried beneath the residual noise level in stereo which, itself, was 70 dB below full modulation.

The response of the AM section of the receiver is plotted in Fig. 6. Vertical divisions in all of the 'scope photos of this report are calibrated to 10 dB each, so that the AM response was down some 20 dB at 5 kHz, referenced to the output at 1 kHz.

Amplifier Section Measurements

Continuous power output per channel, with an input test signal of 1 kHz, was 252 watts per channel for the rated THD figure of 0.08 per cent. At 200 watts per channel output, using 8-ohm loads, THD measured only 0.01 per cent while IM distortion measured 0.04 per cent. With power bandwidth (at the 200-watt level) extending from a low 9 Hz to 44 kHz, actual FTC rated power within the stated power band from 20 Hz to 20 kHz was 222.6 watts as opposed to the 200 watts claimed. Dynamic headroom was higher than that of any receiver we have measured since we began testing for this new specification. It measured just under 4.0 dB, substantiating Hitachi's claim that the receiver can deliver far more power under short-term musical signal conditions than might be suggested by its continuous power rating. Harmonic distortion plus noise is plotted as a function of continuous power output per channel for this receiver in Fig. 7, while in Fig. 8 we have shown the THD plus noise at all frequencies within the audio band for rated (200 watts per channel) output. Damping factor, measured at 50 Hz, was 86.

Fig. 4—Frequency response and stereo separation in the wide-band setting.

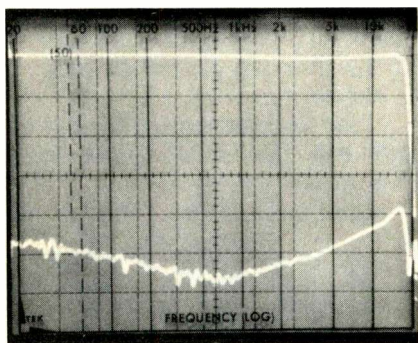


Fig. 5—Frequency response and stereo separation in the narrow-band setting.

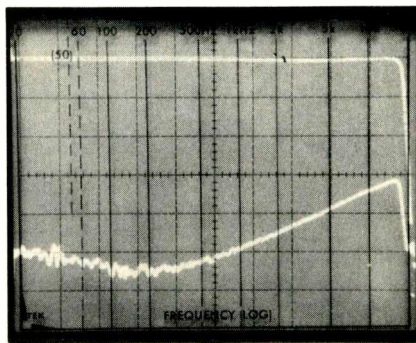
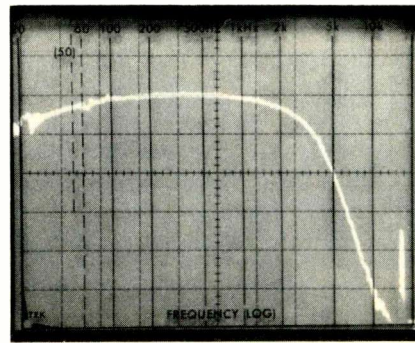


Fig. 6—AM frequency response.



Power-hungry speakers have finally met their match.

If you're enthusiastic about today's less efficient, super-accurate speaker systems, you know you need a very efficient, super-power receiver to drive them.

And if your ears are good enough, you know the value of lots of power to handle critical musical passages with any speaker system.

That's why we created the new KR-8010. With 125 watts per channel, minimum RMS both channels driven at 8 ohms, from 20 to 20,000 Hz with no more than 0.03% total harmonic distortion, you've got all the power you really need.

But more important, the KR-8010 gives you an extremely clean, low-distortion signal at the same time.

For example, the signal-to-noise ratio through the phono input is the best you'll find on any receiver (90 dB). Its overall frequency response is matched

precisely to the RIAA curve ± 0.2 dB. And the tuner delivers sensitivity and selectivity that you'll really appreciate in signal-crowded cities.

To shape that signal into music, the KR-8010 offers a full range of front-panel controls usually found only in esoteric separates and recording studios. Like tape dubbing while listening to another source. And dual FM muting levels. MIC input and fade control. Bass, treble and midrange tone controls. And more.

The point is simply this: At \$675.00*, the KR-8010 is made for the listener who demands as much from his receiver as he does from his speakers.

Next time you're at your Kenwood dealer listen to your favorite speaker with the KR-8010.

We think that your ears will finally meet their match.

*Nationally advertised value. Actual prices are established by Kenwood dealers.



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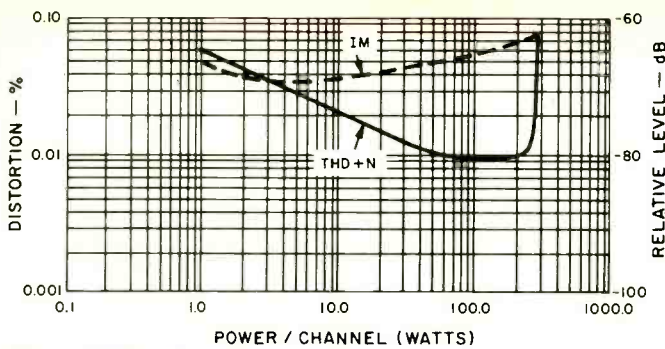


Fig. 7—THD and noise vs. power output.

The phono sections had an input sensitivity for rated output of 2.6 millivolts which, translated to the new IHF standards, works out to an input sensitivity of 0.18 millivolts for 1-watt output. Phono overload with a 1-kHz input signal occurred at 640 millivolts, while phono S/N measured 74 dB referred to full output. Measured in accordance with the new IHF specs, phono S/N was 63 dB, while high-level S/N was 64 dB. RIAA equalization was accurate to within 1.0 dB from 20 Hz to 20 kHz, while high-level frequency response was flat to within 1.5 dB from 10 Hz to above 30 kHz, measured via the AUX inputs.

Figure 9 is a composite sweep-frequency plot of bass and treble control range when the 100-Hz and 3-kHz turnover points are selected. These frequency designations are actually erroneous, since the 3-dB turnover points of the tone controls using these settings turn out to be more like 200 Hz and 2 kHz. The same thing applies to the alternate turnover settings, the control range of which is plotted in the 'scope photo of Fig. 10 and upon which has been superimposed the control range of the mid-range tone control. Loudness control action is plotted for various settings of the volume control in Fig. 11.

Listening and Use Tests

During the brief time in which we have been using and listening to the Hitachi SR-2004, we have been particularly impressed with its ability to deliver high levels of short-term transient musical signals to our reference speaker systems. Normally, when driving these speakers to exceptionally loud levels, we are able to perceive a certain amount of raggedness in the high-frequency region as clipping levels are approached. This was not the least bit in evidence in the case of the SR-2004, and the reason becomes clear if one monitors output signals on a calibrated 'scope. Some of the transient peaks we observed were actually more than 4 dB greater in amplitude than the continuous power output reference lines on the 'scope (adjusted for the equivalent of 200 watts per

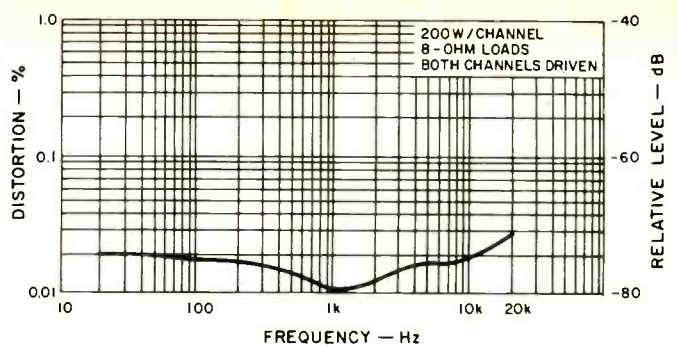


Fig. 8—THD and noise vs. frequency.

channel) and yet there was no evidence of either compression or clipping. Sustained listening at such levels did not induce the kind of listening fatigue which normally occurs when repeated short-term overload takes place. Nor were we able to detect any switching distortion caused by the novel Class G circuit (and to which we were particularly sensitive, since we suspected that such distortion might be audible).

While in theory (and on the bench) we heartily subscribe to the "wide band" FM alternative provided by the FM tuner section of this receiver, we were unable to detect any difference in overall tonal quality when switching from the wide to the narrow mode. This bodes well for the SR-2004 if it is to be used in areas where use of the wideband setting is impossible because of station crowding on the dial.

Phono reproduction was impressive, with no evidence of poor transient overload recovery and tight, unmuddied overall response. "Transmitting" the same recorded material via our FM generator and picking up the signal on FM made for a good comparison between FM reception qualities of the tuner and direct listening via the preamp/amplifier section and, aside from a slight increase in residual noise level (our radiated signal, though close to the receiver, does not quite deliver 65 dBf of signal strength at the antenna terminals and we prefer to make this test without direct connection from signal generator to antenna terminals).

The Hitachi SR-2004 offers a classic example of a receiver that delivers "louder" sound without distortion than other similarly rated units. The new IHF Dynamic Headroom specification permits Hitachi to properly boast about this achievement without resorting to obsolete "music power" wattage ratings, and we would hope that the company will quickly avail themselves of this new and important specification in future representations of Class G products. The receiver is fairly priced for the performance it delivers and, thanks to its high efficiency, saves a bit of power in the process, not to mention the fact that it's a bit easier to cart home than most others in the same power category.

Leonard Feldman

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Fig. 9—Bass and treble control range with 100 Hz and 3 kHz turnover settings.

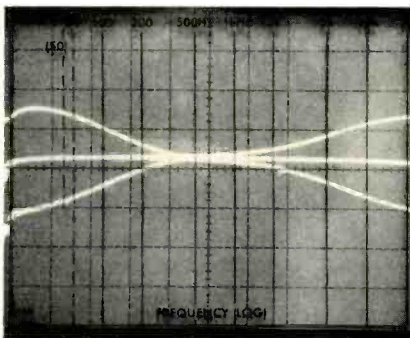


Fig. 10—Bass and treble, plus midrange control range, with 50 Hz and 6 kHz turnover settings.

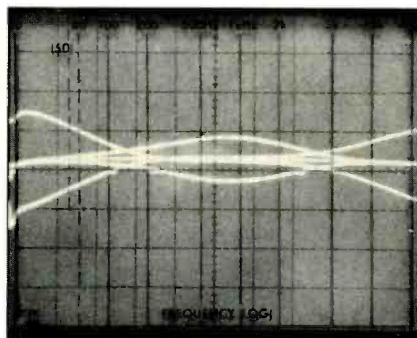
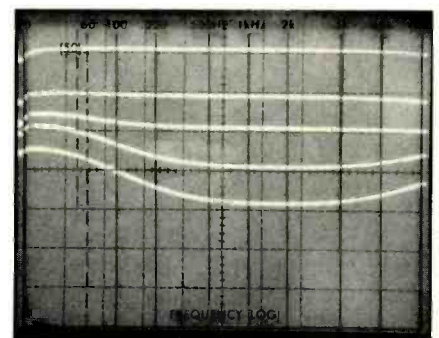


Fig. 11—Loudness control characteristics.



Nikko. Accuracy Unlike Any Stereotype.



Hearing the seed of sound is what high technology is all about. Many stereotypes will predictably claim they've reached it . . . but only Nikko Audio actually delivers that pinnacle of purity through three new components in our professional series.

Gamma V Synthesized FM Digital Tuner

Six of your favorite stations can be exactly tuned into the memory bank for instant recall. With phase-lock-loop, twin-staged synthesized manual or automatic tuning circuitry throughout the entire FM band, you can be assured your stations will never fade away as the LED readout brightly shows the locked-in MHz numbers. Accuracy on the burton.

Alpha III Power MOS-FET DC Amplifier

Accentuated accuracy. DC powered MOS-FET circuitry assures ultra wide frequency response at rated output, while the continuous DC operation from input to output stages guarantees absolute stability and extremely low distortion.

The LED window monitors the pulse of power in each channel. Plus, the THD is the lowest in the industry at anywhere near the price range —



0.008% (80 watts per channel, both channels driven into 8 ohms, 0 to 20kHz).

EQ 1 Graphic Equalizer

For the discerning ear, you can shape the acoustics of your room into those of a recording studio with Nikko's EQ 1. At 10 bands per channel providing ± 12 dB boost or cut and ± 6 dB gain control, you will be in master control of all your live-sounding performances.

All three components can be professionally stacked into Nikko's new 19" rack mount cabinet. But hearing is believing.

Call our toll-free number for the name of your nearest Nikko dealer at (800) 423-2994 and find out why Nikko's reputation for accuracy is forever sound.

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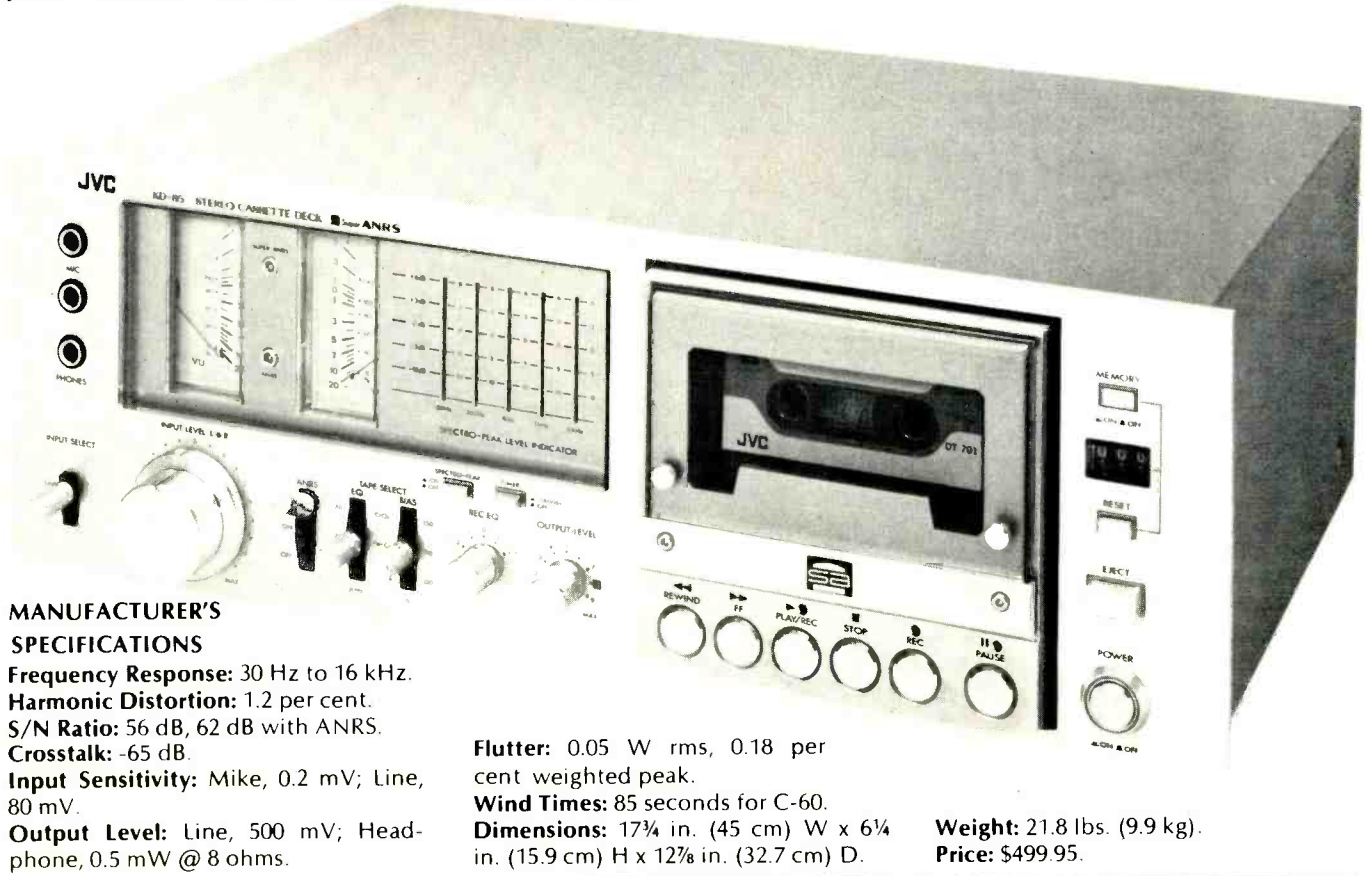
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JVC Model KD-85 Stereo Cassette Deck



MANUFACTURER'S SPECIFICATIONS

Frequency Response: 30 Hz to 16 kHz.

Harmonic Distortion: 1.2 per cent.

S/N Ratio: 56 dB, 62 dB with ANRS.

Crosstalk: -65 dB.

Input Sensitivity: Mike, 0.2 mV; Line, 80 mV.

Output Level: Line, 500 mV; Head-
phone, 0.5 mW @ 8 ohms.

Flutter: 0.05 W rms, 0.18 per cent weighted peak.

Wind Times: 85 seconds for C-60.

Dimensions: 17 $\frac{3}{4}$ in. (45 cm) W x 6 $\frac{1}{4}$ in. (15.9 cm) H x 12 $\frac{7}{8}$ in. (32.7 cm) D.

Weight: 21.8 lbs. (9.9 kg).

Price: \$499.95.

100

The JVC KD-85 is an attractive unit which has performance and user features in addition to a pretty face. The level meters get immediate attention because they have non-typical, facing vertical scales. This arrangement is faster and more convenient for matching channel levels. To the right is the Spectro-Peak Level Indicator which shows the peak levels in five separate bands, centered at 100, 300, 1k 3k, and 10 kHz, respectively. Each band has five vertical-bar LEDs with thresholds at -10, -5, 0, +3, and +6 VU. The scheme has much to offer the recordist, helping to ensure the highest possible recording level with acceptable distortion. The dual-concentric, input-level pots have large, knurled knobs with friction clutching for separate or tracking adjustment as desired. The single output level pot has a much smaller knob, slightly touchy for setting accurate levels, albeit smooth in rotation. Spring-loaded lever switches select mike or line input, ANRS mode, 70- or 120-microsecond EQ, and bias. ANRS mode can be set for Off, ANRS, or Super ANRS. Regular ANRS, as most readers will know, is a Dolby-like noise reduction system and is compatible with Dolby B-type N/R. Super ANRS is not compatible with any other noise reduction system. For lower record levels, its action is the same as with regular ANRS, at

higher record levels, however, *SUPER ANRS* introduces controlled reduction in the levels of the highest frequencies. On playback, a reverse boost is given to gain a flutter in/out than if normal tape saturation had occurred. Certainly a good idea, the tests reported below show that it works quite well.

The bias switch has positions labelled 100 per cent, 110 per cent, and 150 per cent for LN, FeCr, and CrO₂ tapes, and the EQ switch has an "extra" 70-microsecond position, so the two switches will always line up. A five-position REC EQ switch provides a very useful aid to matching various tape types with equal steps over a range of about -3 to +3 dB at 10 kHz. The two-motor tape-motion drive is logic controlled and solenoid operated. Operations can be made in any order, and there are helpful status lights. Record will function as a preset, and flying-start recording is possible. Any tape motion locks out the eject button, which otherwise starts the smooth opening of the door. Head accessibility was quite good with the door cover removed, which required the loosening of two non-captive screws. The deck also has a counter with memory and a timer-start switch.

There are phone jacks on the front panel for mikes and headphones. The line in/out phono jacks and a DIN socket

Fig. 1—Frequency response with Maxell UD tape.

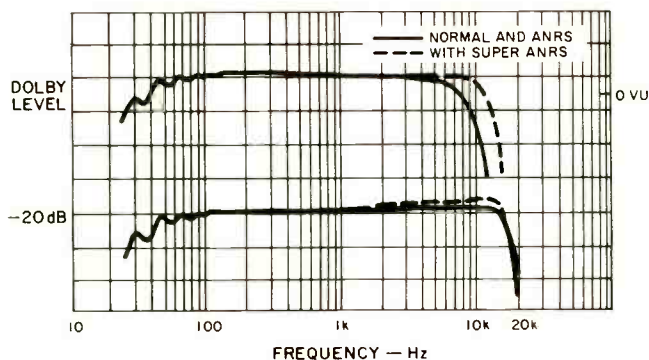
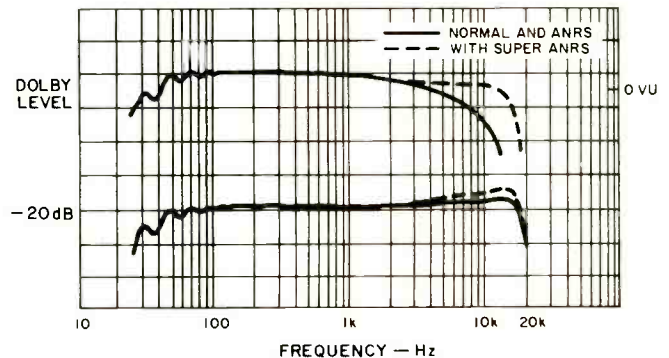


Fig. 2—Frequency response with Sony FeCr tape.



Better Than Any Pusher

**No matter how fine the fibers or how soft the "plush"
—everything other than the Discwasher system is a pusher.**

Pushers only line up dirt and microdust into an even line of contamination. Run your pusher off the record at a tangent—and you spread these particles into a tangent line. And microdust becomes permanently welded into vinyl by a tracking stylus.

Only the Discwasher system has the patented micro-tipped fibers which are directional—slanted—to pick up, hold and thus remove particles from your discs. These same directional fibers also remove fluid and solubilized contaminants by capillary action.

**The superior record cleaner—
better than any pusher.**

 **discwasher[®], inc.**
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COLUMBIA, MISSOURI 65201

are on the back panel. The internal construction was of high quality with excellent soldering on the PCBs and the chassis frame was quite rigid. Adjustments were well marked, and parts were identified on both sides of the boards in many cases. This nicety is unusual, and it is a definite aid if troubleshooting is needed. Inter-card connections utilized wire wrap and most runs were bundled neatly. Other items of interest: The good-sized fly-wheel in the capstan drive and the mounting of power resistors on standoffs.

Measured Performance

The playback responses with alignment tapes were generally within a dB or so with the exception of a droop of just over 3 dB at 40 Hz and lower. Meter indications were within ½ dB for the standard levels. Playback tape speed was about 0.7 percent fast. The ½-octave RTA showed that it was possible to match a large number of quality tapes with the aid of the five-step record EQ switch. The record-playback responses were excellent, in general, with superior flatness from less than 100 Hz to over 10 kHz. In all cases, the differences between normal and ANRS responses were insignificant, much better than what happens with too many decks with Dolby being switched in. All responses had a lower limit of 40 Hz, not to spec, but only slightly limiting for most music. Maxell UD had a high-end response to 17.0 (ANRS) or 18.0 kHz (normal and Super ANRS). At Dolby (or ANRS) level, switching to Super ANRS increased the high frequency limit from 8.0 to 12.6 kHz, a significant improvement. The change with Sony FeCr bordered on the dramatic, for the -3 dB point shifted out from 6.0 to 15.0 kHz. Benefits were apparent as well with Fuji FXII tape where the Dolby-level response extended from 7.6 to 12.1 kHz, although the +3 dB peak at 15.5 kHz at the lower record level is on the edge of being too much. The phase jitter in the playback of a recorded 10-kHz tone was 30 degrees, very good for a cassette deck. Bias in the output during recording was quite low, which can help to prevent bias-beat tones if you're recording with another machine from the same line.

HDL₃ (third harmonic distortion) was determined from 10 dB below Dolby (or ANRS) level to the 3 per cent distortion point with a 1-kHz test signal. Results were as expected for the Sony FeCr and the Maxell UD, but the figures for Fuji FXII were notably lower than for CrO₂ type tapes with most recorders. HDL₂ was relatively high at the lowest record levels with Sony FeCr, but HDL₅ was very low with all formulations. HDL₃ vs. frequency was measured with the Fuji tape and was quite low over the majority of the band, especially between 50 Hz and 2 kHz. The use of ANRS or Super ANRS did not introduce any increase in distortion products, except of a very minor nature in a couple cases. The signal-to-noise ratios at ANRS levels were 51.4, 55.5, and 55.3 dBA for Maxell UD, Sony FeCr, and Fuji FXII, respectively. For levels where HDL₃ = 3 per cent, the figures were 55.7, 58.5, and 59.9 dBA. With ANRS the latter values were increased to 63.8, 65.7, and 66.8 dBA for the Maxell, Sony, and Fuji tapes. Super ANRS increased these excellent figures a bit more, to 64.9, 66.5 and 67.7 dBA for the same order. Erasure was almost 90 dB, and crosstalk was more than 80 dB down, excellent performance. Separation from one track to the other was 47 dB, much better than most decks.

Mike input sensitivity was 0.18 mV, and input overload was reached at 68 mV. Line sensitivity was 74 mV with input overload somewhere above 11 V, the maximum output of the test generator. Output clipping appeared at a level equivalent to +16.6 meter indication. The input level pots tracked within a dB from maximum to 60 dB down, very good indeed. Line output was 470 mV, a little lower than the specified 500 mV. The sections of the output pot tracked within a dB from maximum to greater than 50 dB down. Meter indications were substantially to VU meter standards for both frequency response and ballistics. Scale calibration was very close with

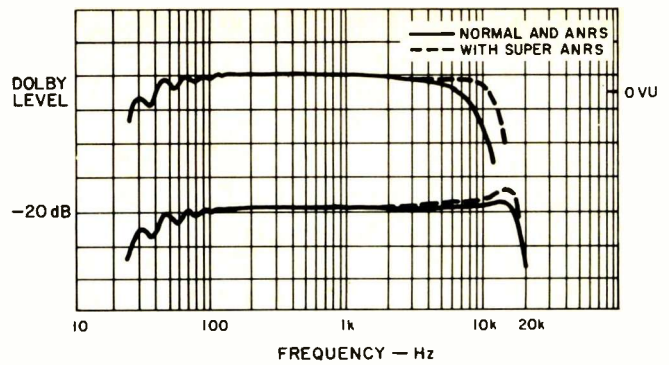
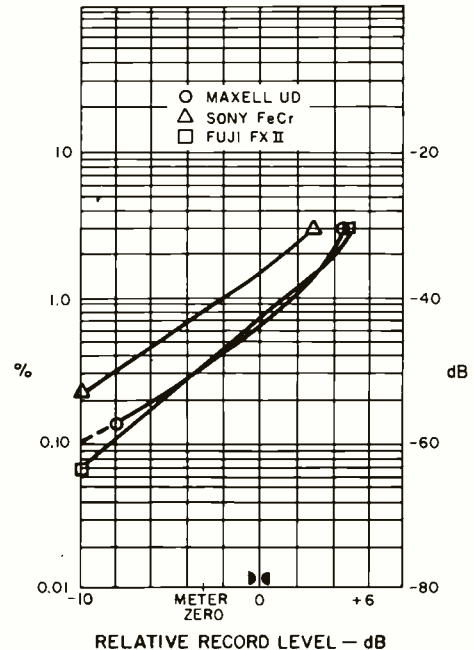


Fig. 3—Frequency response with Fuji FXII tape.

Fig. 4—Third harmonic distortion vs. level at 1 kHz with Maxell UD, Sony FeCr, and Fuji FXII tapes.



a maximum of 0.5 dB error over most of the range. The illumination was on the low side, but compatible with the bar LEDs in the Spectro-Peak level indicator.

Tests with continuous wave (CW) tones showed that the thresholds in each of the Spectro-Peak indicator's five bands (center frequencies = 100, 300, 1k, 3k, and 10 kHz) were within 2 dB of stated thresholds (-10, -5, 0, +3, and +6) within each band and compared to each other. This is certainly very good performance, demonstrative of excellent design and careful adjustment. With a tone in a center channel, responses were down about 4 dB in adjacent channels and about 11 dB down two bands away. Filtering is obviously not really intended to be sharp enough for any form of critical analysis by bands, but the filter shape is adequate for the purpose. With a pink-noise source, thresholds were within a 2-dB spread, the same as with the CW tone. Each band indicated a response with a burst of 25 ms or so, with the CW level set just above threshold. The bar LEDs were a bit faint, and use of this great mini-RTA was aided with relatively low room light.

During playback, the line voltage was varied from the normal test setting of 120 V down to 100 V and up to 130 V. Tape speed changes relative to that at 120 V had a total spread of about 0.1 per cent. Flutter performance was excellent, typically less than 0.04 per cent W rms and less than 0.06 per cent weighted peak. Wind times were 70 seconds, reasonably fast, as well as being quiet and smooth. Logic response time was very short, without any excessive stresses being observed.



IT'S NOT WHAT IT DOES, BUT WHAT IT UNDOES.

It's no wonder your records are flat. Before they're pressed, about half of the music's dynamic range has been squeezed out. The vice is the recording process. Live music's dynamic range can be more than 100 dB, but the studio recorders have only approximately 58 dB of useable dynamic range capacity. So the engineer has to compress the signal, making the loud sounds quieter and the quiet ones louder. And that's where the live gets squeezed out. Your conventional discs most often offer less than 50 dB of dynamic range. You can undo much of the damage. Just add a dbx Dynamic Range Expander to your system, and you'll restore most of the

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Once you hear dbx in action, you'll wonder how you ever listened to music without it.

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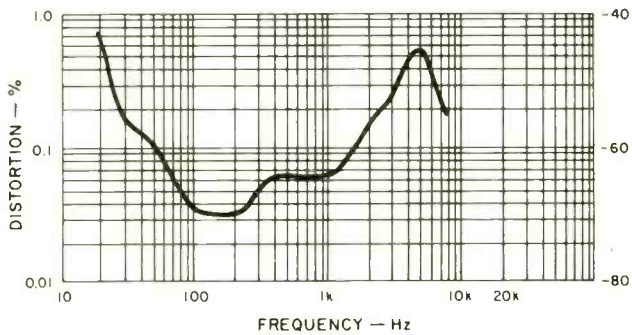
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Fig. 5—Third harmonic distortion vs. frequency at 10 dB below ANRS level with Fuji FXII tape.



Listening and Use Tests

No matter what was tried, tape motion control was fast, smooth, and without any form of malfunction. The combinations possible with this deck are among the best available. Flying-start recording is one, and having *Pause* turn on the *Play* status light is another. Cassette loading and unloading was convenient and gentle. Keeping the heads clean with the door plate removed was easy, but I wish the screws were captive. Pot rotation was very smooth, and the lever switches had a nice snap action going into position. Metering with the combination provided with the JVC deck was fast and convenient, and it gave the user the sense of being in control of recording levels, more so than with VU meters and one or two LEDs for peaks. The adjustable record EQ was of definite value with some of the tapes used. Memory and timer start worked reliably whenever used.

The instruction book is trilingual, and there is considerable detail in the instructions with some technical background included. The text is well illustrated with figures for interconnections and control settings. Recommendations are given for setting the tape select and *REC EQ* switches. There are

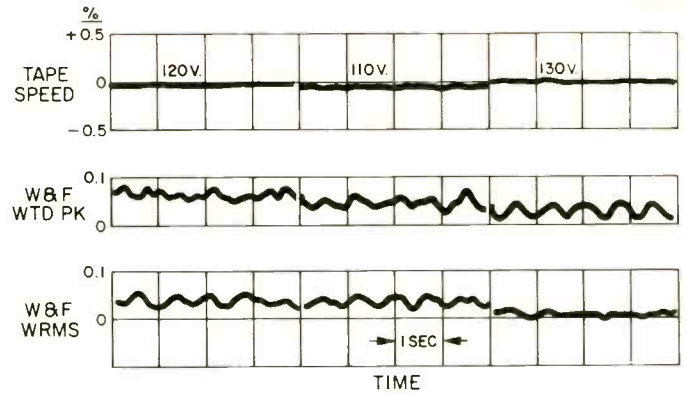


Fig. 6—Wow & flutter and tape speed variations.

helpful discussions on the effects of ANRS and Super ANRS and what happens if the selector switch is in a different position in playback. The section on the Spectro-Peak indicator gives explicit instructions on the level limits for each of the bands with various tapes and ANRS settings.

The JVC KD-85 delivered most satisfying results while being interesting and pleasurable to use. In general, the deck sounded just fine with any of the tapes. With record levels pushed up, however, there was an improvement in the sound with use of Super ANRS. There were no changes in sound, except for lower noise, when switching from normal to ANRS. Pauses during recording were undetectable. Record starts caused a "thump" about 5 dB out of tape noise. Record stops were more of a click and at a slightly higher level. The JVC KD-85 cassette deck has very little to fault it and a lot of convenience and performance for a good price.

Howard A. Roberson

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For record-lovers, it's the complete amplifier. And it's really and truly... new!

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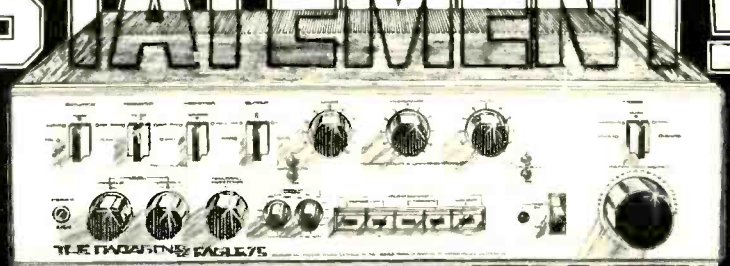
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You'll find it at dedicated audio dealers throughout America. It's a no-nonsense statement of practical superiority, and a price based on dollars... not marks, kroner, kickbacks, or yen. If you doubt it... or can't find it... drop us a line!

PARAGON

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THE PARAGON/EAGLE 75

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Stanton Model 881S Stereo Phono Cartridge

MANUFACTURER'S SPECIFICATIONS

Stylus Description: Nude Stereohedron.

Tracking Force: 3/4 to 1 1/4 grams.

Frequency Response: 10 Hz to 20 kHz, ± 1.5 dB.

Output: 1.01 mV/cm/sec.

Channel Separation: 35 dB at 1 kHz.

Inductance: 518 mH, each channel.

Resistance, Each Channel: 889 ohms.

Load Resistance: 47 kilohms.

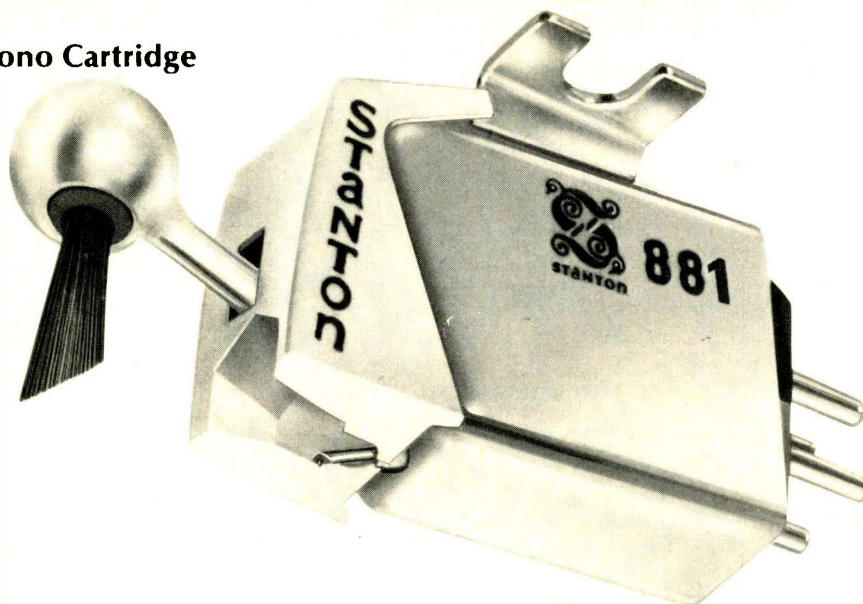
Load Capacitance: 275 pF.

Replacement Stylus: D81.

Accessory Stylus for Mono LP Records: D810.

Accessory Stylus for 78-rpm Records: D827.

Price: \$150.00, with "longhair" brush attached.



Stanton Magnetics introduced the first American-made CD-4 cartridge, which was capable of reproducing frequencies up to 30 kHz with their now historical Quadrahedral® stylus. Continued research and development brought about the new stereo stylus shape, Stereohedron®, which has its roots in the CD-4 Quadrahedron stylus design. The Stereohedron stylus offers a greater contact area with the record groove, resulting in less groove wear. This stylus development is included in Stanton's new generation of cartridges whose much smaller than usual magnet is made of samarium-cobalt and positioned closer to the center of rotation for low inertia, using a newly patented suspension principle. Its cantilever is strong enough to withstand repeated rough skating across a record surface without damage, though we don't recommend the procedure. Another little known but important feature of the Stanton cartridges is that hardly any dust collects on the stylus or cantilever because the cantilever is grounded. Like all Stanton cartridges, a removable longhair dust brush is mounted on the front which is said to add some stabilization to the cartridge in fighting warps.

Measurements

As is our practice, measurements are made on both channels, but only the left channel is reported. During the test period the average temperature was 74° F $\pm 1^\circ$ (23.3° C) and the relative humidity 58 per cent, ± 3 per cent.

Frequency response using the Columbia STR-100 test record and our reference tone arm, an Audio-Technica AT-1009, mounted on a Technics SP-10 turntable, is flat within 0.5 dB from 40 Hz to 5 kHz, down almost 1 dB from 5 to 6 kHz, rises slowly to 0 dB at 9 to 13.5 kHz, and then slowly descends to -1.5 dB at 20 kHz. The optimum tracking force for the cartridge we tested was greater than the maximum tracking recommended. We found it necessary to increase the maximum tracking force by another 250 mg with the brush removed for a total of 1.5 grams if we were to track, without distortion, some of the very high recorded velocities that are present on some direct-to-disc records. However, we must state that the 881S successfully tracked some classical and jazz recordings at just 0.6 grams tracking force without distortion. This is absolutely remarkable since it is a rare cartridge that can track below 0.75 grams without distorting on this type of recording. The optimum anti-skating force was 1.5 grams. Separation was excellent, being 29 dB at 1 kHz, 26 dB at 10 kHz, and 17.5 dB at 20 kHz. The load resistance and capacitance, respectively, were 47,000 ohms and 280 pF.

Square waves show some ringing that dies rapidly, indicating that the resonances are well damped, with the peak well beyond 20 kHz.

To check the frequency response, we used the General Radio 1521-B Graphic Level Recorder and a relatively new United Recording Electronics Industries (UREI) Model 200 X-Y plotter with the Model 2010 plug-in module for frequency response with any sweep-frequency test record. This is an improvement on other graphic level recorders since they are generally limited to a special sweep-frequency test record(s) made for them. The frequency response plotted on the UREI X-Y recorder was identical to that plotted on the General Radio recorder, using the same test record. One great advantage of the UREI X-Y recorder is its ability to pick up and automatically record the recorded spot frequencies on a test record without regard to the voice announcing the frequencies. In many ways, this is the more accurate way to test cartridge frequency response than the usual recorded sweep frequencies and just as automatic.

The following test records were used in making the following reported measurements: Technics SFC-TR100; Micro-Acoustics TT2002; Shure TTR 103, TTR 109, TTR 110, TTR 115; Columbia STR-100, STR-112, SQT-1100; JVC TRS-1007; Stereo Review SR-12; B & K QR-2009; Deutsches HiFi No. 2, and Nippon Columbia Audio Technical Records (PCM) XL-7004-6.

The cartridge weighs 5.19 gm without brush; d.c. res. 830 ohms; ind. 527 mH; opt. tracking force 1.5 gm; opt. anti-skating force 1.5 gm; output 1.36 mV/cm/sec; IM dist. (4:1) +9 dB lateral, 200/4000 2.7 per cent, +6 dB vertical, 200/4000 6.1 per cent; crosstalk -35 dB (Shure TTR 109); ch. bal. 1 dB; trackability, high freq. (10.8 kHz pulsed) 30 cm/sec, mid-freq. (1000 + 1500 Hz lat. cut) 31.5 cm/sec, low freq. (400 + 4000 Hz lat. cut) 24 cm/sec; Deutsches HiFi No. 2 300 Hz test bands tracked to 95 microns (0.0095 cm) and lateral to 55.4 microns (0.00554 cm) vertical. Arm-cartridge resonance curve was double peaked with the first resonant peak being +1 dB at 6 Hz and the second as +2 1/2 dB at 7.5 Hz.

The Micro-Acoustics Transient and Tracking Ability Test Record TT-2002 was used to check for tracking ability first and then transient ability. The Stanton 881S cartridge had no difficulty in playing all tracking-ability bands, including one with the highest level a modern stereo cutter head can record just prior to tripping its overload protection circuit. The stereo percussion levels check the cartridge for both vertical and lateral tracking ability. The transient ability of the 881S is

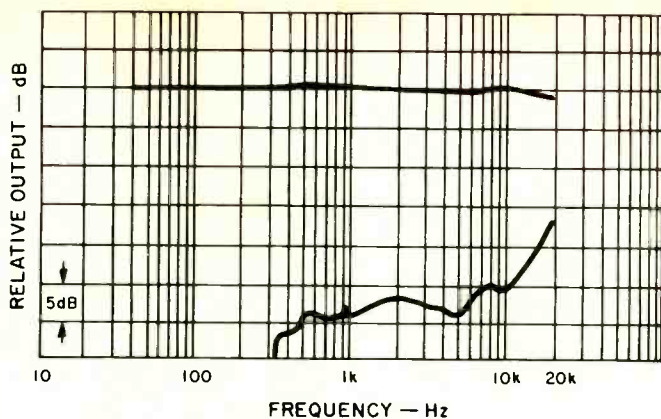


Fig. 1 — Frequency response.

excellent. The computer-generated high, low, and the high/low mixed frequencies presented no problems to this cartridge.

The 881S performed excellently on all bands of the Shure Audio Obstacle Course — Era III (TTR-110). With the newer Shure Audio Obstacle Course — Era IV (TTR-115) the trackability of the 881S on the bells and flute individually was just shy of reproducing the very highest level cleanly. However, the cartridge had no difficulty in reproducing the highest level of the same flute and bells playing a duet. These results clearly point out the excellence of the tracking ability of the Stanton 881S phono cartridge.

Listening and Use Tests

Our listening tests are performed both prior to actually testing the cartridge parameters and after all tests have been completed. While listening to the various records played with the Stanton 881S cartridge, we were quite impressed with the excellent sonic clarity, bass response, and the transient and tracking ability of this cartridge, particularly on some of the direct-to-disc recordings with their very high levels. Continued listening brought out the fact that the Stanton 881S did not introduce any sound or coloration that could be ascribed to the cartridge, per se. In general, we found that the listening tests were in agreement with the various measurement tests.

The following equipment was used for the listening evaluation: Technics SP-10 turntable with Audio-Technica AT-1009 tonearm, Technics SP-10 Mark II turntable with EPA-100 tone arm, Crown IC-150A preamplifiers, a pair of Crown DC-300A amplifiers used as monophonic amplifiers, and a pair of stacked Duntech DL-15B speakers for each channel. One turntable was equipped with a Platter Pad (Dundis Distr. Co., Waterloo, Neb. 68069) which appeared to be an improvement over the usual rubber pad, particularly in damping out extraneous vibrations. The speakers were connected to the amplifiers with Polk Audio high-definition, low-distortion speaker cables, which appear to have improved bass defini-

tion and high-end detail and smoothness. The SQ quadraphonic decoder was the Columbia SQL-400A Full Logic Decoder and Stereo Enhancer.

As is our practice, a rigorous listening evaluation was conducted utilizing the specific records listed below as well as some of the records listed in our past reviews. These excellent recordings demonstrate very effectively the ability of the Stanton 881S cartridge to reproduce difficult high level recordings faithfully. All records were cleaned with the Discwasher and destaticized with the Zerostat. The SQ records listed are compatible and can be played as stereo records.

Stereo

Pops Concert, the Israel Philharmonic Orchestra, Mehta — London CS 7065.

Vladimir Ashkenazy: *The Piano Music of Chopin, Volume 3* — London CS 7030.

The Art of Regina Resnik — London OS 26574.

Organ Recital, Volumes 1 & 2, Earl Barr — The Sound Environment TR-1003 and TR-1006. (Suite 114, Butler Sq., 100 North 6th St., Minneapolis, Minn. 55403).

Zgodava Plays Recital Favorites — The Sound Environment TR-1001. (Note the great clarity and brilliance of the nine-foot Steinway on Side 1. A seven-foot Steinway was used on Side 2. These exceptionally good recordings were recorded by Russell Borud of St. Paul, Minnesota).

Rogers and Hammerstein: *The King and I* — RCA ABL 1-2610.

Check Up Your Sounds, Volume 2, Audio Symphony No. 2, NHK Symphony Orchestra, K. Komatsu — RCA (Japan) RVL-2. Distributed by Audio-Technica, Inc. (This is a superb recording that all audiophiles should hear and own.)

Direct to Disc

Rimsky-Korsakov & Tchaikovsky: *Capriccio espagnol & Capriccio italien*, the Boston Pops, Fiedler — Crystal Clear Records CCS-7003 (225 Kearney St., San Francisco, Calif. 94108).

Virgil Fox: *The Fox Touch, Volumes 1 & 2* — Crystal Clear Records CCS-7001 and 7002. (Audio's Associate Editor, Bert Whyte, was the recording engineer for the above three super records).

Joe Marcinkiewicz and *Blu* — M&K Sound, Inc. 10014. (8719 Wilshire Blvd., Beverly Hills, California 90211).

Rough Trade: *Live!* — Umbrella UMB-DD1, Distributed by Audio-Technica, Inc.

The New Brubeck Quartet: *A Cut Above!* — Direct-Disk DD-106. (Direct-Disc, 16 Music Circle So., Nashville, Tenn. 37203).

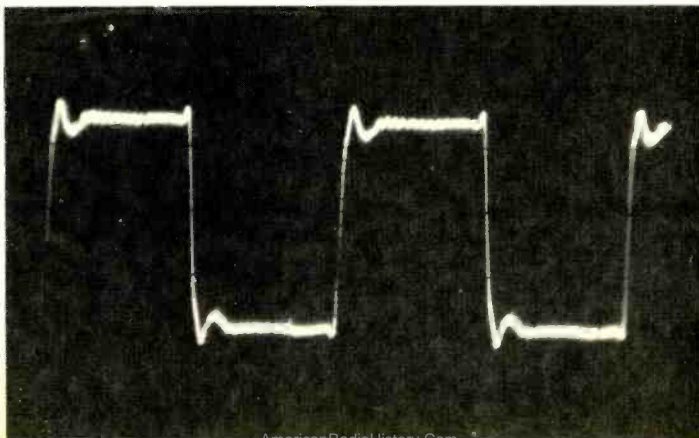
Power — Direct-Disk Labs, DD-107.

Pulse Code Modulation

Frank Foster and the Loud Minority: *Manhattan Fever* — Denon YX-7521-ND.

Tommy Flanagan: *Alone Too Long* — Denon YX-7523-ND. (Solo piano.)

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



“The Sansui AU-717 is a superb amplifier. We like it with no ifs, ands, or buts.” (Julian Hirsch)
It offers “as much circuitry sophistication and control flexibility as any two-piece amplifying system.”

(Len Feldman)



107

Everyone says great things about the new Sansui AU-717, but the experts say it best.

The Sansui AU-717 DC integrated amplifier is “Sansui’s finest It incorporates a fully direct-coupled power amplifier section whose frequency response varies less than +0, -3dB from 0Hz (D.C.) to 200 kHz. The amplifier’s power rating is 85 watts per channel (min. RMS) from 20 to 20,000Hz into 8-ohm loads, with less than 0.025 per cent total harmonic distortion If any amplifier is free of Transient Intermodulation Distortion (TIM) or any other slew-rate induced distortion, it is this one The slew rate ... was the fastest we have measured on any amplifier, an impressive 60 V/ μ sec.

“The preamplifier section of the AU-717 has very impressive specifications for frequency response, equalization accuracy, and noise levels ... The AU-717 has dual power supplies, including separate power transformers, for its two channels ... [and] exceptionally comprehensive tape-recording and monitoring facilities Good human engineering ... separates this unit from some otherwise fine products....

“The Sansui AU-717 is a superb amplifier. We like it with no ifs, ands, or buts.” (Reprinted, by permission,

Stereo Review Magazine, Feb. 1978. Julian Hirsch Test Report. Copyright © 1978. Ziff-Davis Publishing Company. All rights reserved.)

“One clear advantage of DC design is apparent. Even at the low 20Hz extreme, the amplifier delivers a full 92 watts – the same value obtained for mid-frequency power – compared with its 85 watt rating into 8 ohms....

“The equalization characteristic of the preamplifier was one of the most precise we have ever measured, with the deviation from the standard RIAA playback curve never exceeding more than 0.1dB....

“Sansui claims that this unit has reduced transient intermodulation distortion – a direct result of the DC design, and, indeed, the model AU-717 delivered sound as transparent and clean as any we have heard from an integrated amplifier....

“... worth serious consideration – even by those who prefer separate amplifiers and preamplifiers.” (Reprinted in part from Len Feldman’s test report in **Radio-Electronics**, January, 1978.)

Listen to the superb sound of the Sansui AU-717 at your Sansui dealer today. And be sure to ask him for a demonstration of the matching TU-717 super-tuner.

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Archie Shepp: *On Green Dolphin Street* — Denon YX-2524-ND.

(Denon records are available through local outlets from American Audioport, 1407 No. Providence Rd., Columbia, Mo. 65201).

Quadraphonic

Stokowski Conducts Sibelius, The National Philharmonic Orchestra — Columbia M34548.

Preservation Hall Jazz Band — Columbia M34549. *Boulez Conducts Varèse*, New York Philharmonic Orchestra — Columbia M34552.

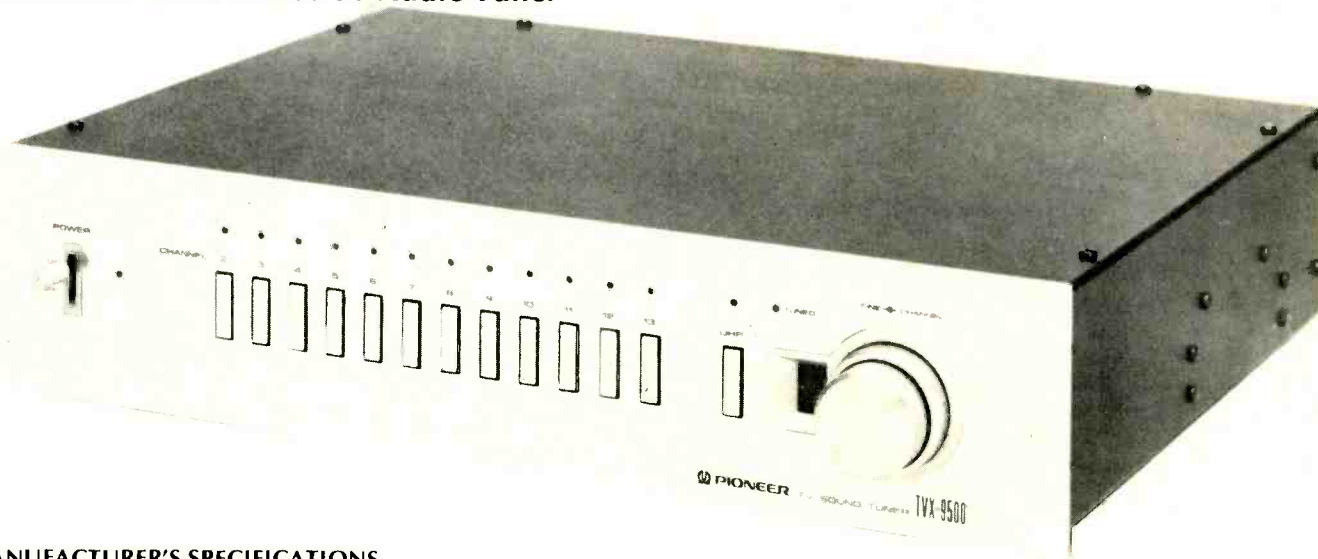
The Stanton 881S played all the above records without difficulty, particularly *The Fox Touch, Volume 2*, and the Boston Pops recording of *Capriccio espagnol*, with their high level bass. It appears that most all direct-to-disc recordings are challenging the modern cartridge to reproduce the music with sonic clarity.

In conclusion, we are impressed with the Stanton 881S cartridge, particularly with its ability to reproduce flawlessly any recorded sound, including those at the high velocities present on many current records. The Stanton 881S merits serious consideration by all music lovers.

B. V. Pisha

Enter No. 92 on Reader Service Card

Pioneer Model TVX-9500 TV Audio Tuner



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MANUFACTURER'S SPECIFICATIONS

50-dB Quieting Sensitivity: 32 dBf (22 μ V/300 ohms).

S/N Ratio: 65 dB @ 85 dBf.

THD at 65 dBf: 0.7 per cent at 100 and 1000 Hz; 0.2 per cent at 6 kHz, for ± 25 kHz deviation.

Capture Ratio: 1.0 dB.

Alternate Channel Selectivity: 25 dB.

Frequency Response: 50 Hz to 10 kHz, +0.5, -1.0 dB.

Spurious Response Rejection: VHF, 50 dB; UHF, 40 dB.

Image Rejection: VHF, 50 dB; UHF, 40 dB.

I.f. Rejection: VHF, 50 dB; UHF, 55 dB.

AM Suppression: 50 dB.

Muting Threshold: 34.1 dBf (28 μ V).

Output Level: 400 mV for 100 per cent modulation.

Power Requirements: 120 V, 60 Hz, 12W.

Dimensions: 16 9/16 in. (42 cm) W x 3 7/8 in. (10 cm) H x 13 3/4 in. (35 cm) D.

Weight: 13 lbs., 7 oz. (6.1 kg).

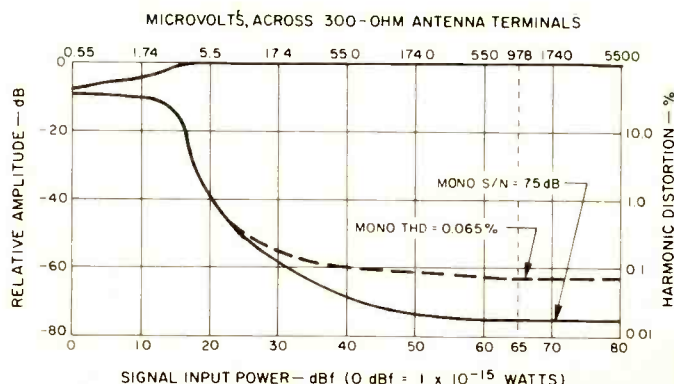
Price: \$250.00.

The typical audio enthusiast probably regards the audio portion of TV broadcasts with some disdain. Still, TV sound, as authorized by the FCC, is not only transmitted by FM, but has the very same frequency response potential as FM radio — 30 to 15,000 Hz. The fact that, up until now, TV sound has been anything but hi-fi is caused by one of those recurring vicious circles that often plague the consumer electronics industry. Initially, TV broadcasters and networks used standard telephone lines to transmit their audio signals to transmitters and to other points in the network. Since those lines, typically, cut off at around 5 kHz, the TV audio that was finally aired was strictly low-fi. TV set manufacturers, aware of this limitation (and rightly more concerned with picture quality), saw no reason to build sophisticated audio systems into their receivers.

Now, however, TV networks are beginning to employ a diplexing system which permits the audio signals to ride right along on the coaxial cable with the wideband video signals. Public Service Broadcasting has been using satellite communications to beam both its video and audio signals around the country, and both such techniques lend themselves to

wideband audio transmission. Only the TV set manufacturers have been slow to improve the audio capabilities at the receiving end. So, Pioneer decided to fill in the TV audio gap with the introduction of their TVX-9500 TV sound tuner.

Fig. 1 — Mono quieting and distortion characteristics of the Pioneer TVX-9500 TV audio tuner.



Styled to complement other components in a high fidelity system, the front panel of the TVX-9500 is equipped with a power switch at the left and twelve slim pushbuttons which are numbered from 2 through 13, corresponding to the VHF TV channels used in the United States. Above each of these buttons is an LED indicator which lights up when the corresponding button is depressed. A thirteenth button, separated from the others, is labelled UHF, and when it is depressed a rotary UHF selector knob comes into play, along with its concentric fine-tune control.

Although the VHF channels are pre-tuned by the factory prior to shipment, fine tuning of these "fixed" selectors is possible, since, under the bottom of the tuner are individual adjustment potentiometers for trimming these frequency selectors, as required. To perform this calibration operation, the user would also turn off the built-in AFC by means of a slide switch also located on the undersurface of the chassis. With the AFC switch in the *Off* position, the built-in muting circuit is also temporarily defeated to permit precise adjustment of channel frequencies. When a given TV channel's audio carrier is accurately tuned in, a green LED lights up to indicate that fact.

The rear panel of the TVX-9500 is equipped with two audio output jacks and with 300-ohm balanced UHF and VHF screw terminals, plus a connection terminal for a 75-ohm coaxial transmission line (for VHF only). As readers are surely aware, TV sound as presently broadcast is monophonic, but two audio output jacks are provided to permit connection to both high-level input channels of a stereo component system so that sound will emanate from both loudspeakers. Ideally, the TV set (with its volume control turned down) could then be placed mid-way between the stereo loudspeaker array

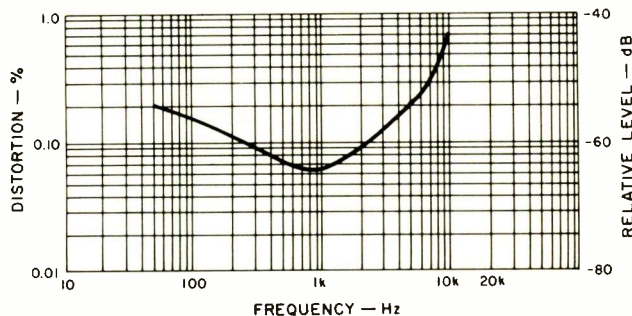


Fig. 2 — Distortion vs. frequency.

and TV audio would again seem to emanate from the TV set's location.

Circuit Highlights

The TVX-9500 circuitry is very much like that of a better grade FM tuner (which, in a sense, it is). Front ends are electronically tuned (using varactor diodes instead of a continuously variable tuning capacitor). The channel pushbuttons simply connect an appropriate level of d.c. voltage to the diode, thereby determining its effective capacitance in the tuned circuit of the front end. The i.f. circuitry employs a combination of LC and solid-state filters as well as a discrete transistor amplifier followed by a multiple purpose IC amplifier/limiter/quadrature detector. The recovered audio output from the detector is fed to a differential amplifier audio stage, while a d.c. AFC voltage is fed back to the front end in the manner familiar to anyone conversant with FM circuitry.

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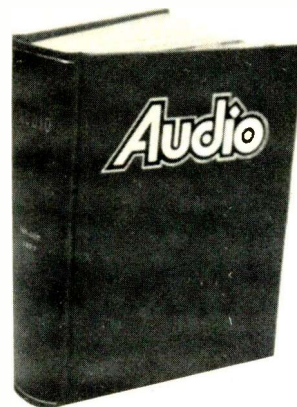
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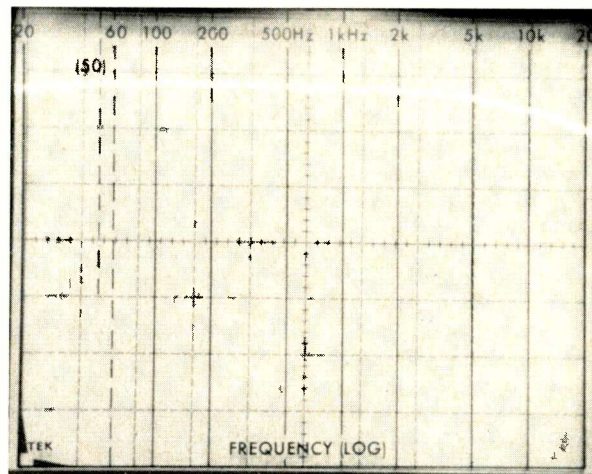
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Fig. 3 — Frequency response
(each vertical division
equals 10dB).



FM Performance Measurements

The first problem we encountered in trying to measure the performance of the TVX-9500 was to come up with a suitable r.f. signal generator. Like many other consumer electronics engineers, we still own some ancient, if rudimentary, TV servicing equipment but that would hardly do for measuring the performance of a high-fidelity TV sound tuner. Happily, our Sound Technology generator with which we measure all FM tuner and receiver circuitry, though calibrated only from 88 MHz to 108 MHz, goes a bit below the 88 MHz lower limit and, with the aid of a frequency counter, we adjusted its output to 87.75, the carrier frequency of the audio signal of TV Channel 6.

Thus equipped, we measured performance (only for Channel 6, of course) in much the same way that we would measure any FM tuner. It should be noted that standard de-emphasis on TV audio is 75 microseconds — the same value used in FM broadcasting. However, and this is an important difference, maximum audio modulation in TV is only ± 25 kHz, as opposed to ± 75 kHz used in FM broadcasting. In one respect, that makes it easier for the TV audio tuner designer, while in another sense it makes things more difficult.

Restricted to a ± 25 kHz deviation limit, the TV audio tuner has a built-in limitation of 10 dB less in S/N ratio as compared with an FM tuner. We were therefore all the more impressed with the TVX-9500's ultimate S/N ratio, which, as can be seen by examining Fig. 1, reached a high of 75 dB. Pioneer claimed only 65 dB for S/N and, interestingly, quoted that figure for an 85-dBf input signal strength. The justification for this higher signal input no doubt comes from the fact that, generally speaking, TV transmitter power is much greater than that radiated by most FM radio stations, so Pioneer no doubt presumed that there would be greater available signal strength at the antenna terminals of this product. As indicated in Fig. 1, however, the unit did just as well in quieting with the standard 65-dBf signal normally used to check S/N of FM tuners.

The ± 25 kHz deviation proves to be advantageous insofar as distortion is concerned, since the i.f. stages and detector's bandwidth need not be as wide or as linear as is necessary for heavier modulation FM reception. And indeed, the THD at 1 kHz for "full" modulation (remember, ± 25 kHz) was an impressively low 0.065 per cent. Distortion versus frequency is plotted in Fig. 2, and THD rose to 0.21 per cent at 100 Hz and to just over 0.6 per cent at 10 kHz.

Note that Pioneer makes no claims for frequency response beyond 10 kHz and, as can be seen from the sweep-frequency plot (Fig. 3) recorded on the 'scope face of our spectrum analyzer, response does start to drop off somewhat above 5 kHz and is attenuated by some 4 to 5 dB at 15 kHz. The 50-dB

quieting point is reached with an input signal of 23.3 dBf (8.0 μ V/300 ohms), while muting threshold was set for 34.7 dBf (30 μ V/300 ohms). We measured a capture ratio of 1.3 dB, and AM suppression measured 50 dB, as claimed. We note that Pioneer provides an alternate channel selectivity specification of 25 dB but cannot imagine what that specification is supposed to convey. It surely does not refer to an audio signal that is 12 MHz removed from the desired signal. Yet, if it is a measure of the rejection of a signal 400 kHz removed from the desired audio signal, that has no real meaning in the case of TV audio frequency allocations.

Listening and Use Tests

While Pioneer does supply a T-wire indoor dipole antenna for use with the TVX-9500, our own experiences with the product prompt us to strongly advise the use of an outdoor TV antenna, if possible. That old monster "multipath" is every bit as much of a problem here as it is in the case of ordinary FM reception, if not more so. It's hardly ever a question of inadequate signal strength (unless you really live in a TV fringe area), but those reflections can distort received audio from TV stations, even when the signals are fed into a magnificent stereo component system. Using a two-set coupler to your existing TV antenna is a good idea if you can tolerate a couple of dB of signal loss (which, in many cases, won't be detected, either visually or audibly).

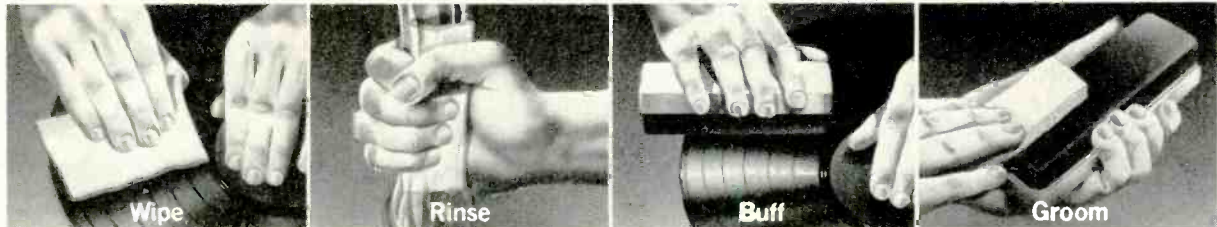
Hooked up to an outdoor antenna, the TVX-9500 performed very well indeed, being limited only by the quality of audio being broadcast by our local TV channels. We were amazed at the *variation* in audio quality we observed when tuning from channel to channel (or even on the same channel when programming switched from a live-taped studio event to a movie or, even worse, to some commercials. Some of the commercial voices sounded no better than a voice recorded and reproduced by a portable cassette deck). On the other hand, tuning to a fine concert, such as the ones often broadcast by our local Public Broadcasting Service station, was a sheer delight to both eye and ear! All it took was a simple A-B test (turn down the hi-fi volume control and turn up the TV's control) to realize that the potential for good TV sound exists and has always existed.

Now all that remains is for the TV stations around the country to avail themselves of that potential (just using the diplexing method won't help if the program's sound is of low quality to begin with). In the meanwhile, ownership of a tuner such as Pioneer's TVX-9500 will at least enable the user to enjoy the sounds of those programs where audio is worth listening to and to complain to the originators of TV programs where the audio is inferior.

Leonard Feldman

Enter No. 93 on Reader Service Card

Before this, all leading record cleaners carried a little dirt from one record to the next.



Even though you couldn't see it, the build-up of dirt on your cleaning pad was inevitable. So you were bound to spread it around.

But now Sound Guard™ record cleaner has the solution. Spray it on your record. Wipe it off with our non-abrasive sponge, and rinse the dirt down the drain. And that's only the half of it.

Once you've buffed your record with our cleaning pad, you can clean the pad itself with our grooming pad. So you've made doubly sure that you're not carrying dirt from one record (or side) to the next.

Sound Guard record cleaner is a two-step cleaner, too. It's good for light cleaning each time you play your favorites.

It's ideal for thorough cleaning and before every Sound Guard® record preservative application.

So stop burying dirt in a buffer. Wash it down the drain. Like every one of our Sound Guard products, Sound Guard record cleaner is sold in audio and record outlets.



Sound Guard® keeps your good sounds sounding good.



Sound Guard preservative—Sound Guard cleaner—Sound Guard™ Total Record Care System
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Bib Universal Tape Head Maintenance Kit, \$7.95.



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The Bib maintenance kit is made for the specific task of cleaning oxide and other dirt deposited on tape heads and other elements used for guiding and driving the tape. To provide the capabilities justifying the term "universal," Bib includes much more than cleaning fluid and a few Q-tips. To be sure, there is a plastic bottle of fluid which can be squeezed for either a drop or a squirt as desired.

The cleaning tool, however, consists of a three-inch handle, one of two angle extensions, one of two felt holders, and felt to fit the holder. The end of the handle is tapped to take either a 30-degree or a 90-degree angle extension. The ends of the angle extensions, opposite the screw that matches the handle, are square in cross-section. The felt holders are made so that they can be installed along the axis of the extension or crossways. The holders also include square receptacles for the felt pieces. The recommended practice is to use the gray felt holder for first-cleaning and the white holder for final cleaning and polishing. Felt pieces are provided with both angled and square ends. A soft cloth is included for wiping off the ends of the cleaning felts to

maintain their effectiveness. The kit also includes a soft brush for cleaning away loose oxide around the heads and a dental-type mirror for inspection purposes. All items are neatly mounted in a case/holder with a clear plastic cover.

For some who, in the past, "made do" with Q-tips, the complexity of the kit may seem unnecessary. The sophistication of the kit, however, does provide benefits that are not immediately apparent . . . for example, Revox owners and others have had to deal with the lack of ready access to the tape heads. With the choice of two angle extensions, three ways to mount the felt holder and two felt shapes, there are many possible configurations for the cleaning tool to get around shields, guides, or whatever. The shape is also changed easily to match the cleaning needs of other recorders.

The Bib kit was used with Revox and Sony open-reel machines, and with Harman-Kardon, Advent, and Technics cassette recorders. Improvements in the ease and completeness of cleaning were most obvious with the Revox and Technics units. It was also easier to clean the playback head of the Sony,

as a head shield had interfered with the use of Q-tips in the past. Use of the kit with the cassette decks confirmed a prior conclusion; using felt to do the cleaning eliminated the problem of fibers from the Q-tip getting stuck on the capstan and other points. Overall, having the choice of angle extensions and felts and ways of putting them together made cleaning both easier and more effective.

There were small differences in the sizes of mating parts and the felts (four of each shape). Sometimes it was a bit difficult to get parts together, but there were no failures. Wiping the felts off on the cloth became almost second nature after some time of use. There were some minor reservations about the long-term reliability of snug fits with extended use, but there was no evidence of any deterioration.

If you have been having any problems reaching and cleaning the heads of your tape recorder(s), take a look at the Bib tape head maintenance kit. With its combination of extensions, holders, and felts, it really is a universal kit. *Howard A. Roberson*

Enter No. 94 on Reader Service Card

AUDIO • November 1978

Le Finale
De L'era



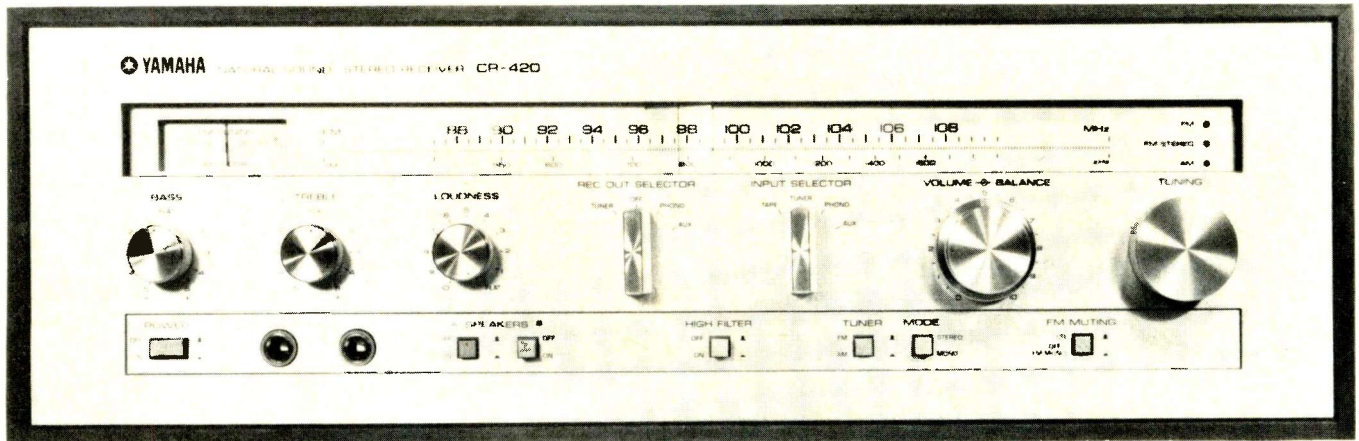
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SUMO
SUMO ELECTRIC COMPANY LIMITED
1230 NORTH HORN AVENUE, WEST HOLLYWOOD, CALIFORNIA 90069
213 - 659-4370

Enter No. 48 on Reader Service Card

Yamaha Model CR-420 AM/FM Receiver



MANUFACTURER'S SPECIFICATIONS

FM Tuner Section

Usable Sensitivity: 10.3 dBf (1.8 μ V) mono.

50-dB Quieting: Mono, 16.1 dBf (3.5 μ V); Stereo, 38 dBf (43.5 μ V).

Image Rejection: 50 dB.

I.f. & Spurious Rejection: 75 dB.

AM Suppression: 56 dB.

Capture Ratio: 1.0 dB.

S/N Ratio: Mono, 77 dB; Stereo, 71 dB.

THD: Mono, 0.15 per cent @ 100 Hz & 1 kHz, 0.3 per cent at 6 kHz;

Stereo, 0.25 per cent at 100 Hz & 1 kHz, 0.8 per cent at 6 kHz.

Sub-Carrier Rejection: 40 dB.

Frequency Response: 30 Hz to 15 kHz, +1.0, -3.0 dB.

Stereo Separation: 40 dB at 1 kHz, 30 dB at 100 Hz & 10 kHz.

Muting Threshold: 19.2 dBf (5 μ V).

Selectivity: 65 dB.

AM Tuner Section

IHF Sensitivity: 18 μ V.

Selectivity: 20 dB.

S/N Ratio: 50 dB.

Image & I.f. Rejection: 40 dB.

Spurious Rejection: 50 dB.

THD (30 per cent Modulation): 0.6 per cent.

Amplifier Section

Power Output: 22 watts per channel, 8-ohm loads, 20 Hz to 20 kHz.

Rated THD: 0.05 per cent.

IM Distortion: 0.05 per cent.

Damping Factor: 40.

Noise Distortion Clearance Range for 0.1 per cent, 8 ohms, 20 Hz to 20 kHz:

From 100 mW to 22 W, phono in to speakers out, volume at -20 from maximum.

Input Sensitivity: Phono, 2 mV; High Level, 120 mV.

Phono Overload: 110 mV.

Frequency Response: Phono \pm 0.5 dB re: RIAA; High Level, 20 Hz to 20 kHz \pm 1.5 dB.

Bass Control Range: \pm 12 dB at 50 Hz.

Treble Control Range: \pm 11 dB at 20 kHz.

Low Filter Cutoff: 10 Hz at 12 dB/octave.

High Filter Cutoff: 10 kHz, at 6 dB/octave.

S/N Ratio: Phono, 91 dB re: 10 mV in, "A" weighted; High Level, 97 dB, "A" weighted.

General Specifications

Power Consumption: 130 W at 120 V, 60 Hz.

Dimensions: 17 $\frac{3}{4}$ in. (45 cm) W x 6 $\frac{1}{2}$ in. (16 cm) H x 12 $\frac{3}{4}$ in. (32.4 cm) D.

Weight: 19 lbs. (8.6 kg).

Price: \$290.00.

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With high-efficiency speakers making a comeback, the budget-minded audiophile is often hard-pressed to find a relatively low-powered, low-priced integrated receiver which offers the control features and flexibility commonly found on higher powered, higher priced models. The Yamaha CR-420 is just such a receiver and, in fact, some of its front panel features are not to be found in many competitive products from other sources regardless of their price and power ratings.

The rather narrow dial opening along the upper section of the front panel of this unit has linearly calibrated FM and conventional AM frequency scales, with FM frequencies delineated at every 0.5 MHz. To the right of the frequency scales are indicator lights for AM, FM, and stereo FM, while, over at the left, a single meter serves as a signal-strength indicator for AM tuning and as a center-of-channel tuning indicator when FM listening is selected. Controls along the center section of the panel include the usual bass and treble knobs (step-type), a separate continuously variable loudness control (about which more in a moment), separate input and record-output selector switches (whereby the listener can direct any program source to the speakers, while any other program source is channeled to the record output jacks), dual concentric volume and balance controls, and a frequency tuning knob coupled to a flywheel.

Controls along the lower edge of the front panel include a Power On/Off push-button switch, "A" and "B" speaker

buttons, a high-cut filter switch, a tuner selector (for AM or FM selection), a Mono/Stereo Mode switch, and an FM Muting On/Off switch. With the muting circuit defeated, only mono reception is possible.

The rear panel of the CR-420 is equipped with two sets of spring-loaded speaker terminals, a pair of a.c. convenience outlets (one switched, the other unswitched), pairs of phono, AUX and tape-input jacks, a pair of tape-out jacks, and antenna terminals for connection of 75-ohm, 300-ohm, or external AM antennas. As shipped, a shorting bar is connected between the AM antenna terminal and one terminal of the 300-ohm antenna connection. In this way, the connected FM antenna (indoor or outdoor) also is made to serve as an AM antenna. If an AM external antenna is found to be required, the shorting bar must be removed.

Circuit Configuration

A block diagram of the circuit layout of the Yamaha CR-420 is shown in Fig. 1. A junction FET is used for r.f. amplification in the FM front end, as is a three-section variable capacitor. The i.f. stage includes a two-element ceramic filter and a two-stage direct-connected amplifier. The two-element ceramic filter and current limiter compose a three-stage differential amplifier. A wide-range, modified balanced-type detector is used for FM demodulation, and this is followed by a negative-feedback, phase-lock-loop, multiplex stereo decod-

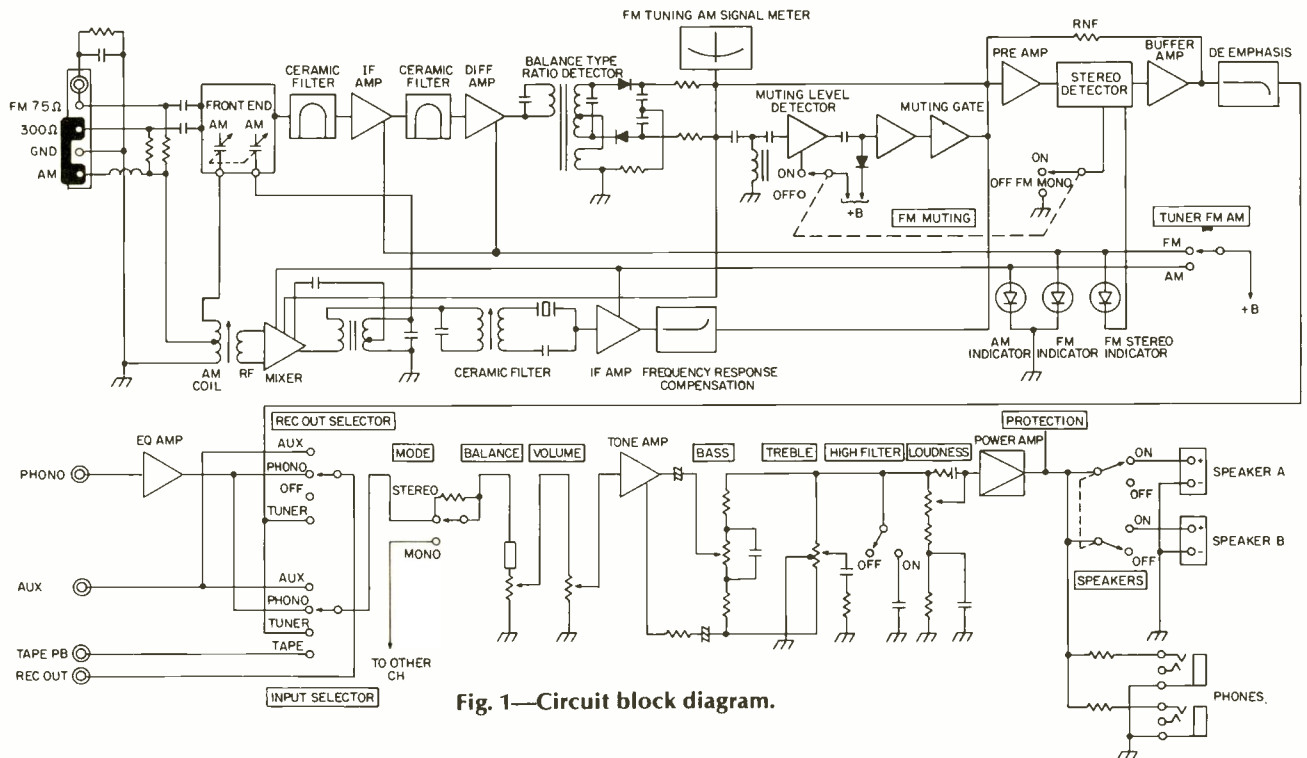


Fig. 1—Circuit block diagram.

er circuit. The AM tuner section consists of an untuned r.f. first stage, a self-oscillating converter, a ceramic filter for the i.f. section, and a peak type detection circuit.

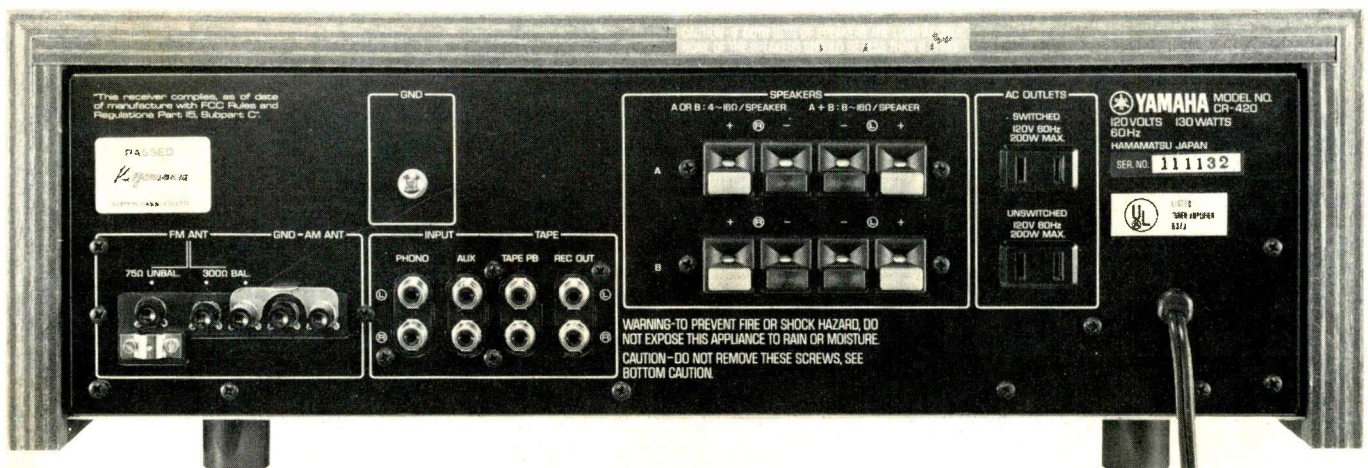
The audio section includes a two-stage, direct-coupled equalizer amplifier; a negative feedback-type, RC tone control circuit; a differential-input stage to the power amp section, and a single-ended, push-pull, output-capacitorless power amplifier stage with a speaker protection circuit. Auxiliary circuits include a recording-output selector, mode switch, high filter, dual speaker system selector, and two headphone jack circuits.

Note the use of a separate continuously variable loudness control, apart from the regular master volume control, which is located at an earlier point in the block diagram (ahead of the tone control circuitry). With the loudness control set to its maximum clockwise position, there is no loudness compensation. In use, the listener would adjust the main volume control so that the given program source sounds as loud as it

might in a "real life" situation. Then, the loudness control is rotated counterclockwise and, as this is done, overall listening level is attenuated, while the bass and treble response are progressively accentuated to take care of the well-known Fletcher-Munson hearing effect. In arranging the controls in this manner, Yamaha offers meaningful loudness compensation, regardless of the level of the incoming program source or the efficiency of the speakers with which the receiver is ultimately used. In the more commonly found volume/loudness switch arrangement, effectiveness of the loudness compensation is purely a matter of chance (depending upon incoming signal levels) and rarely works as it should, so Yamaha has done something worthwhile and very special here.

FM Tuner Section Measurements

Major FM tuner section characteristics are plotted in Figs. 2, 3, and 4. Usable sensitivity measured 1.7 μV (10.3 dBf) in



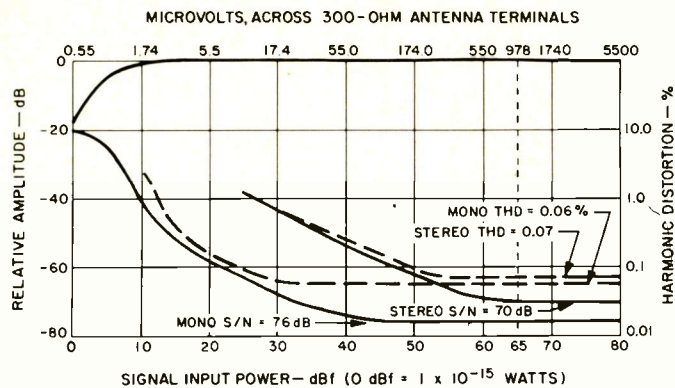


Fig. 2—FM mono and stereo quieting and distortion characteristics.

mono and 8.0 μV (23.3 dBf) in stereo, the stereo threshold or switching point. The 50-dB quieting point for mono was 13.2 dBf (2.5 μV) as against 16.1 dBf (3.5 μV) claimed, while in stereo the 50-dB quieting point was obtained with signal inputs of 35.6 dBf (33 μV) as against 38 dBf (43.5 μV) claimed. Best quieting in mono measured 76 dB; 70 dB was the case in stereo. Distortion, for a 1-kHz signal measured an extremely low 0.06 per cent in mono and an almost equally low 0.07 per cent in stereo, as indicated in the curves of Fig. 2. Figure 3 is a plot of frequency response (upper trace), which was virtually flat right out to 15 kHz, and separation (lower trace) which measured 54 dB at mid frequencies, 45 dB at 100 Hz, and a very high 43 dB at 10 kHz. Figure 4 is a plot of mono and stereo harmonic distortion over the frequency spectrum of interest. Even at the difficult 10-kHz test point (measurement standards require that THD be measured only up to 6 kHz), stereo THD was still a low 0.4 per cent. These measurements were all made with the prescribed band-pass filter in the circuit, and so the rather minimal sub-carrier product rejection capability of the receiver (only 47 dB) does not contribute to the distortion readings.

Capture ratio measured 1.2 dB, while alternate channel selectivity measured exactly 65 dB as claimed. Image rejection was on the low side, at 50 dB, while i.f. rejection measured 78 dB and spurious rejection was 80 dB, somewhat better than claimed. AM suppression measured 56 dB as claimed. Muting threshold measured 20.8 dBf (6 μV), while stereo switching occurred at around 23.3 dBf (8.0 μV), a bit higher than claimed.

Figure 5 is a spectrum-analyzer sweep-frequency plot of the frequency response of the AM section of this receiver. While off-hand it seems nothing to write home about, it actually is somewhat better than the run-of-the-mill AM tuner responses we have been measuring of late, with high-end roll-off beginning above 3 kHz as against the "usual" 2.0 to 2.5 kHz cut-off points we have been finding lately.

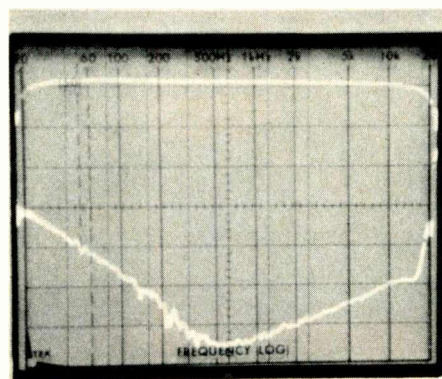


Fig. 3—FM frequency response and stereo separation. (Each vertical division equals 10 dB.)

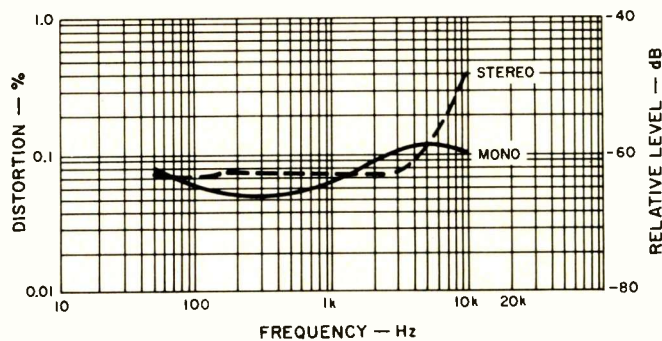


Fig. 4—Distortion vs. frequency in the FM section.

Amplifier Section Measurements

The power amplifier section of the Yamaha CR-420 delivered nearly 34 watts of power per channel into 8 ohm loads at a test frequency of 1 kHz. At 20 Hz, the rated harmonic distortion figure of 0.05 per cent was reached when the amp was putting out 31 watts per channel, while at the high end, even greater power was available before reaching rated THD. Based upon FTC rules, the amp section could have been rated at 31 watts per channel instead of the 22 watts per channel which Yamaha publishes. At the published rated output, THD for 1 kHz measured only 0.008 per cent, while IM distortion was almost as low, at 0.009 per cent. These characteristics are plotted in Fig. 6, while IM and THD versus frequency are graphed (for rated output levels) in Fig. 7.

A word is in order concerning one of Yamaha's specifications (which appears in the introduction to this report) which may not be familiar to readers of *Audio*. It is called NDCR and it stands for Noise Distortion Clearance Range. Yamaha maintains that most of the noise and distortion claims for amplifiers, as usually published, do not tell the prospective user what levels of noise and distortion he or she is likely to encounter under actual use. That is because the S/N ratios are quoted with respect to full rated output (with the volume control at maximum, where it is seldom if ever set). Their NDCR spec (0.1 per cent from 100 mW to rated output, via the phono input, with volume control set -20 dB below maximum) attempts to correct this by stating that over the range given, the combination of noise and harmonic distortion will not exceed 0.1 per cent. (In terms of noise, 0.1 per cent is equivalent to a -60 dB figure).

As a matter of fact, the new IHF Standards for Amplifier Measurements (IHF-A-202), discussed in the June, 1978, issue of *Audio*, does deal with this problem in a very positive way. The S/N figures which we measured for the Yamaha CR-420 were measured using the new IHF Standard and, if they seem not to correspond with Yamaha's other published specs (es-

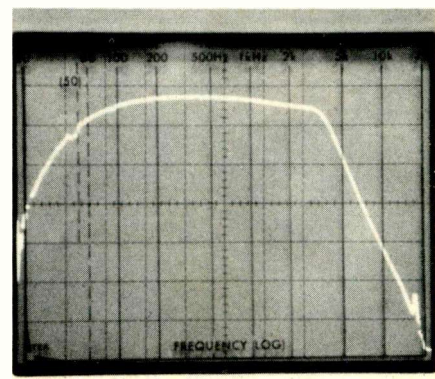
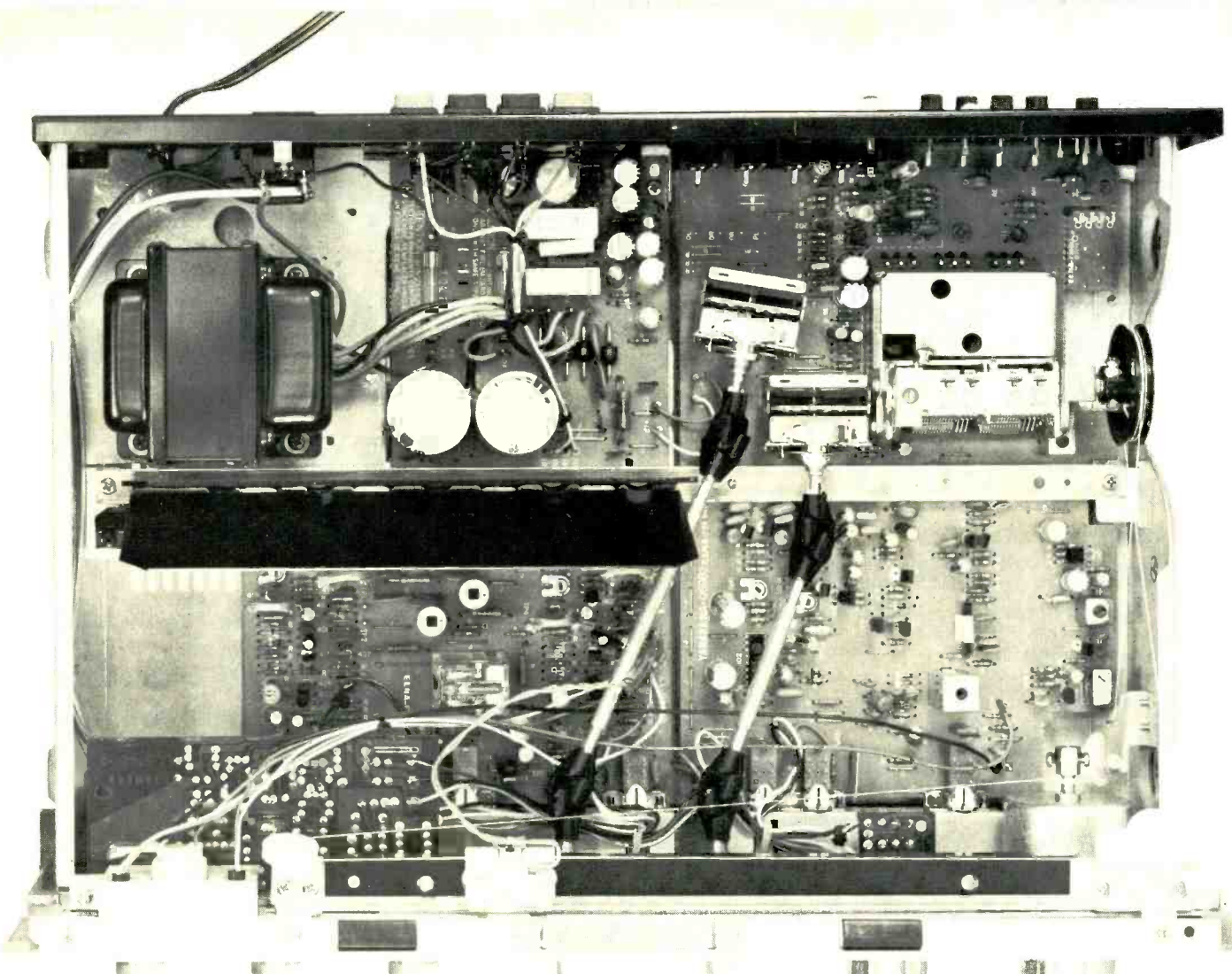


Fig. 5—AM frequency response.



pecially as regards input sensitivity and S/N), bear in mind that we are now using input reference levels of 5 mV (for phono) and 0.5 V (for high level inputs) and output reference levels of 1.0 watt. This necessitates reducing the main volume control settings in a manner not unlike that suggested by Yamaha in their NDCR specification.

In any event, damping factor for the power amp (now measured specifically at 50 Hz) was 51.4, well above the 40 claimed. Dynamic headroom measured 3.29 dB, while clipping headroom measured 2.2 dB above rated power. Frequency response, measured via the high-level AUX inputs, was down 3 dB at 8 Hz and 100 kHz. The amplifier has a built-in (non-switchable) sub-sonic filter with a nominal cut-off point of 10 Hz. RIAA equalization was accurate to within +0.5 and -0.0 dB. Input sensitivity in phono (for 1-watt output, remember) was 0.43 mV, while for the high level inputs

it was 22.4 mV. S/N ratio in phono ("A" weighted, referred to 5-mV input and 1-watt output) was 80 dB, while for the high level inputs (referred to 0.5 volts in, 1 watt out) was 84 dB.

Figure 8 is a spectrum-analyzer plot of bass and treble tone control range. Note, that while only a fixed turnover is provided for each of these controls, the turnover points are set a bit further away from the center of the audio spectrum than usual — a feature with which we heartily concur if the price of the set precludes having selectable turnover points.

The action of the separate loudness control is depicted by the curves of Fig. 9. Total audible adjustment range of this secondary control is some 20 dB (at mid frequencies), enough to lower overall listening levels from real-life sound pressure levels to "background music levels" for which loudness compensation is actually required.

Fig. 6—Distortion vs. power output at 1 kHz.

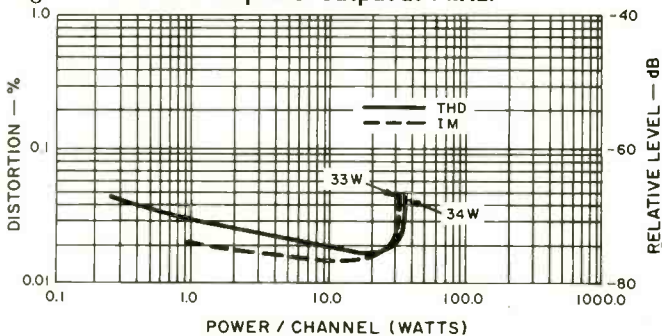
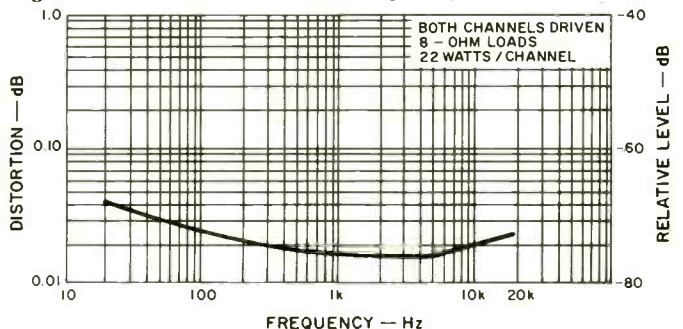


Fig. 7—Harmonic distortion vs. frequency.



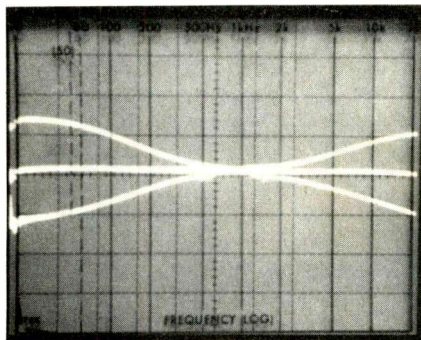


Fig. 8—Bass and treble control range.

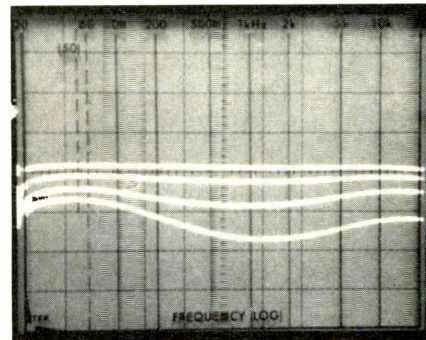


Fig. 9—Continuous loudness control range on the Yamaha CR-420.

Listening and Use Tests

As we have already suggested, if you examined the features and control panel of this receiver, you would never guess either its price or its power output capability. For the audio enthusiast who needs a lower powered receiver with as many control features as possible, the Yamaha CR-420 is a worthy contender. Two sets of tape monitor circuits might have been useful here, especially if the owner hopes to do some tape dubbing, but offsetting that omission is the very handy separate selector arrangement which lets you record one program on tape while listening to another.

The power reserve of the CR-420 is surprising. We had no difficulty driving relatively inefficient speaker systems to surprisingly high SPLs. Phono overload (measured at 140 mV as against 110 mV claimed) never posed a problem, and phono

reproduction was clean and tight, responding well to fast transient material in some of the direct-to-disc records which we used for auditioning purposes.

In recording stereo FM programs using the CR-420, it would be advisable to switch on the MPX filter on your tape deck (if it has one), since the inaudible but fairly high sub-carrier output products of the tuner selection might otherwise "confuse" your Dolby circuitry.

The loudness control arrangement is particularly effective, and the bass and treble controls, used in moderation, helped to tweak a somewhat unbalanced sonic situation without exaggerating response at frequencies that required no correction. All in all, a tastefully designed and well executed receiver at a price that cannot be faulted.

Leonard Feldman

Enter No. 95 on Reader Service Card

MODEL 105 COMPUTER MATCHED.



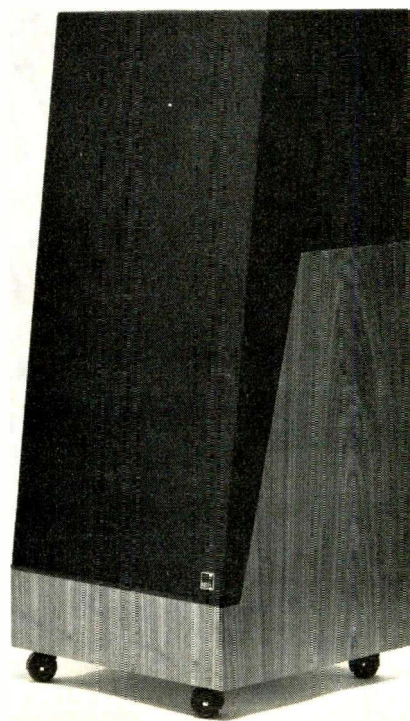
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At KEF we produce matched sets of high, mid and low frequency units, using our unique computerised test facilities. Moreover, our total system approach to the design of the enclosures and the electronic dividing networks, means that we can deliver Model 105 in pairs that are nearer to the ideal 'match' than any previous loudspeaker. KEF pioneered the use of computer digital analysis in loudspeaker design, and you, the listener, can now hear the results: the most life-like musical quality and the most astonishing stereo perspective.

Write for the full technical story and the name of your nearest dealer, who will be glad to give a demonstration.

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The Speaker Engineers



Realistic Sound Level Meter

MANUFACTURER'S SPECIFICATIONS

Range: 60 to 126 dB in six ranges.

Accuracy: ± 2 dB @ 114 dB SPL.

Weighting: IEC "A" and "C."

Response: Fast or Slow.

A.c. Output: 1.0 V peak.

Distortion: Less than 2 percent @ 1 kHz and 0.5 V.

Microphone: Omnidirectional electret, one-in. diameter (nominal).

Weight: 7.8 oz (220 gms).

Price: \$39.95.



The Realistic Sound Level Meter has reappeared, changed in configuration and improved in performance. Right now the price is the same low \$39.95, but even if it increases ten dollars, this SLM still remains an outstanding bargain. The meter fits very nicely in the hand with the scale at a convenient viewing angle. The large knob rotary range switch is easily turned with the thumb, provided you're right handed. Immediately after the *Off* position is one for battery check, and then the SLM is set for increasing sensitivity from 120 to 70 dB in six 10-dB steps. The positions of the switch, except for *Off*, have red indications, which are obvious even in bright sunlight. The weighting can be set for either "A" or "C" and the dynamic response to either *Fast* or *Slow*. The scale is marked from "-10" to "+6" which are relative (in dB) to the range setting. Thus, the total specified range is from 60 to 126 dB SPL.

The electret microphone is a nominal 1-inch diameter which permits using a standard acoustical calibrator, such as the Gen Rad 1562-A. This feature is of great value in an SLM, especially when the price is considered. Some units costing much more cannot be calibrated acoustically, lessening their value and making them more difficult to use. The calibration pot on the left side of the Realistic SLM enables zeroing any errors (One dB in the unit as received). A high-impedance mike output is available from a phono jack in the same side. The 9-V

transistor-type battery is easily replaced from underneath, near the handy tripod socket.

Performance

The Gen Rad calibrator checked the SLM response from 125 to 2000 Hz for both weightings. With "C" weighting the unit just met the Type 3 requirements of ANSI standard S1.4-1971 for SLMs. With "A" weighting, the SLM met the more rigid Type 2 tolerances for the frequencies tested. The scale markings were too low below the "0" reference and too high above, but the maximum error was just 0.6 dB. The Attenuator steps were within a dB from 70 to 120 dB with a reference of 100 dB, very satisfactory. Compression was very rapid above "0" on the 120 range, however, and higher readings were unusable. Monitoring the high impedance mike output revealed that noticeable distortion of the sinewave started at 98 dB SPL. (The input was through a phone and coupler used for audiometer calibration.) As the threshold did not vary with changes in the attenuator setting, it was diagnosed as an input circuit limitation. Clipping

occurred on any range at +12 dB above the reference zero, or another 6 dB above full scale. On the higher scales, the output at the a.c. jack had signal-to-noise ratio of 52 dB with either weighting. On the most-sensitive 70-dB range, the ratios were 42 dB for "A" weighting and 32 dB for "C" weighting.

In-use Tests

The owner's manual is quite good with most important points covered very well in both text and illustration, and there is also a schematic. The comments on high-fidelity acoustics, however, are misleading. The SLM was very easy to operate, and the readings compared very closely with other, much-more-expensive SLMs with various frequency spectrums with the two weightings and for *Fast* and *Slow* responses. However, I would have preferred having the scales from -6 to +10 dB, making the total figure a simple addition most of the time. The good signal-to-noise ratio at the phono jack indicates the possibility of adding more sensitive ranges without much redesign. Well, that might be so, but the Realistic Sound Level Meter provides performance that should be completely satisfactory for most non-professionals from 60 to over 110 dB SPL with either "A" or "C" weighting. It will tell you about listening levels, speaker dispersion, variations in audience coverage, etc., and more for a very good price. *Howard A. Roberson*

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Lenco Model C2003 Cassette Deck



MANUFACTURER'S SPECIFICATIONS
Motors: Two; one direct drive, servo controlled.
Wow & Flutter: 0.16 per cent (DIN 44507).
Pitch Control: ± 2 per cent.

Frequency Response: 30 Hz to 18 kHz, ± 3 dB, with FeCr tape.
S/N Ratio: 56 dB, 65 dB with Dolby N/R.
Heads: Three.
Dimensions: 18½ in. (47 cm) x 11½ in. (29.2 cm) x 3½ in. (8.9 cm).
Price: \$795.95.

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As we have mentioned before, European audio products do not always follow either American or Japanese designs, so most of them have a rather distinctive appearance and many of them offer something different in the way of features. The Lenco C2003, for example, has a variable speed control, two Dolby N/R sections, separate headphone level controls, provision for four different kinds of tape, and a radio input socket. The DIN microphone connectors have a 5 volt d.c. supply — useful if an electret microphone is used. Although it is a three-head machine, there is no monitor switch so if you want to make instant comparisons between the signals going into and coming from the tape, you have to use the switch on your preamp.

There are two motors, an a.c. servo-controlled type for the dual capstan drive and an asynchronous model for reeling. Electronic interlocks ensure smooth operation and prevent

tape breakages — just like the ones on those expensive open-reel recorders. Styling is predominantly black, presently very popular, though the deck is top loading which bucks the trend towards front-loading machines. A folding stand permits the deck to be placed at an angle that some people might find more convenient. The VU meters are mounted on an angled plastic panel, which extends almost the full width of the deck, with the remaining space being used to display the illuminated function and tape type symbols such as *Record*, *Fast Wind*, *Dolby N/R*, *High Output Tape*, etc.

On the front of the deck is a long row of piano keys... the first four control the *Eject* function and the tape transport, while the next one, a large red bar, is the *Record* key. Then come three for tape selection... a yellow key for Dolby, followed by keys for the *MPX filter*, *Mono*, and *ALC* (Automatic Level Control). A large *Stop* bar is located behind the

Fig. 1—Frequency response from a standard test tape.

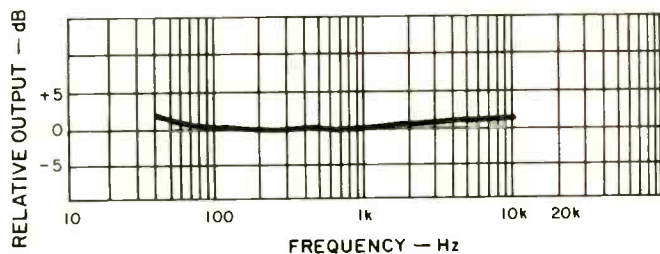
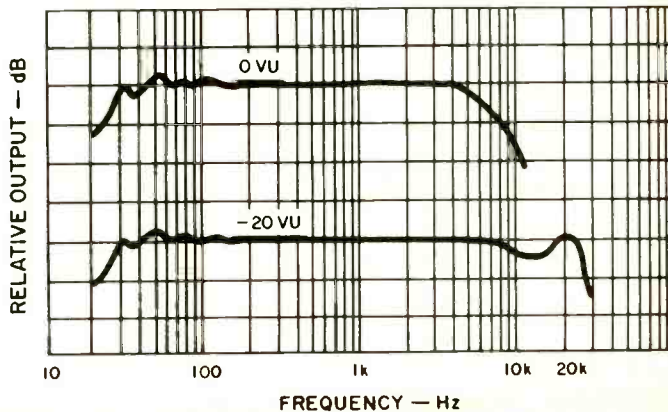


Fig. 2—Record/replay response with BASF tape.



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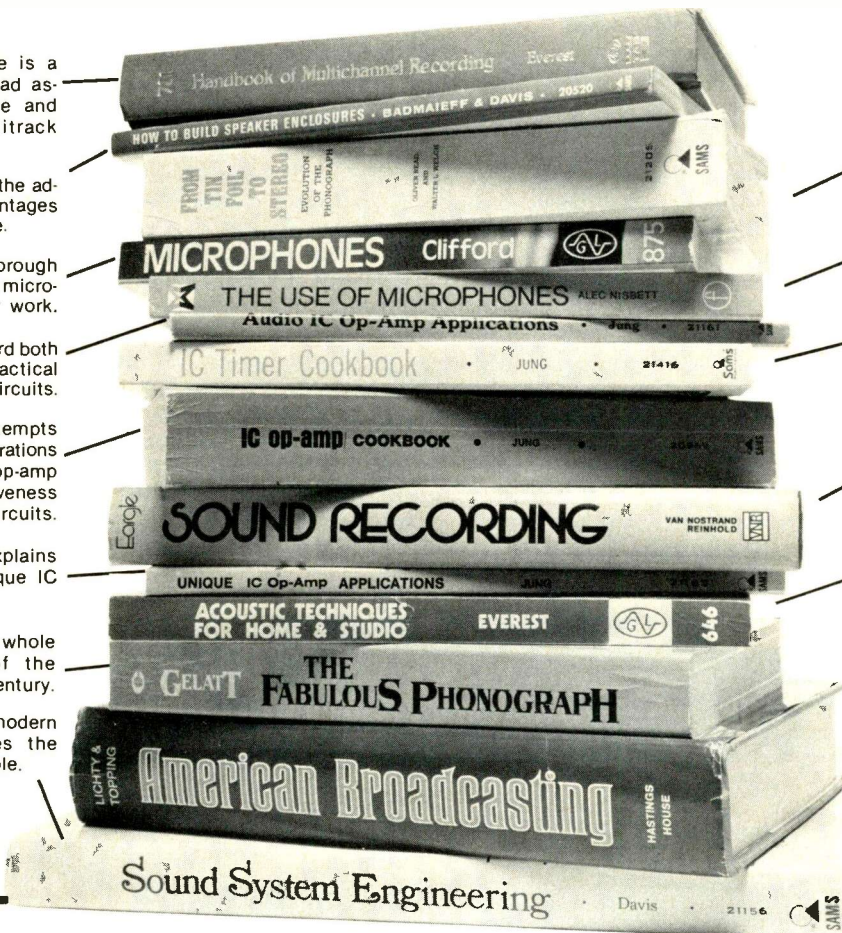
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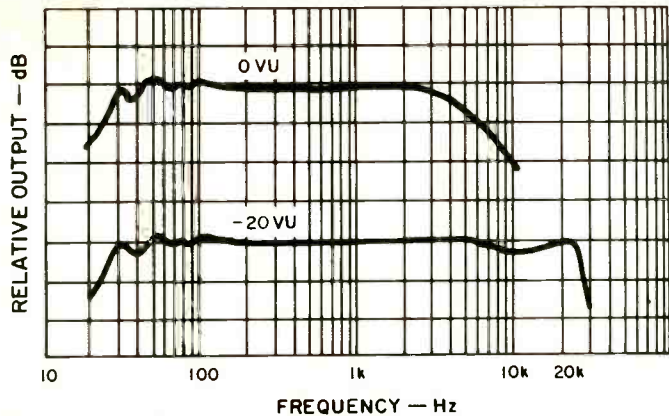


Fig. 3—Record/replay response with Scotch Master III FeCr tape.

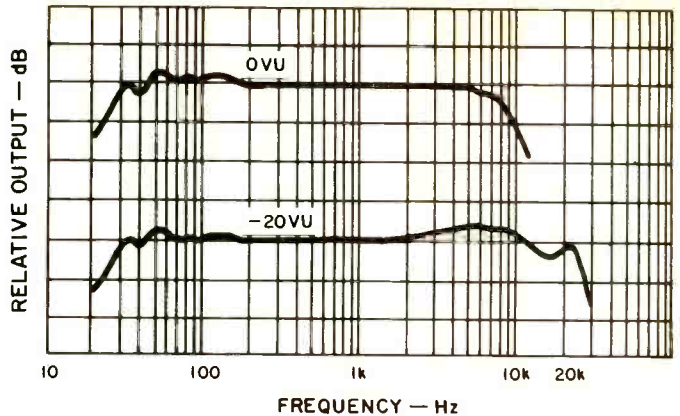


Fig. 4—Record/replay response with Maxell UDXL-1 tape.

transport keys, just in front of the tape compartment, behind which, at the rear on the plastic panel, is a digital counter with memory switch. Two record input slide controls are positioned at the right in front of the VU meters, and just to the left of them is a drum-type control for pitch or speed. On the extreme right on the front panel is the headphone jack with twin thumbwheel level controls and two DIN sockets for microphones.

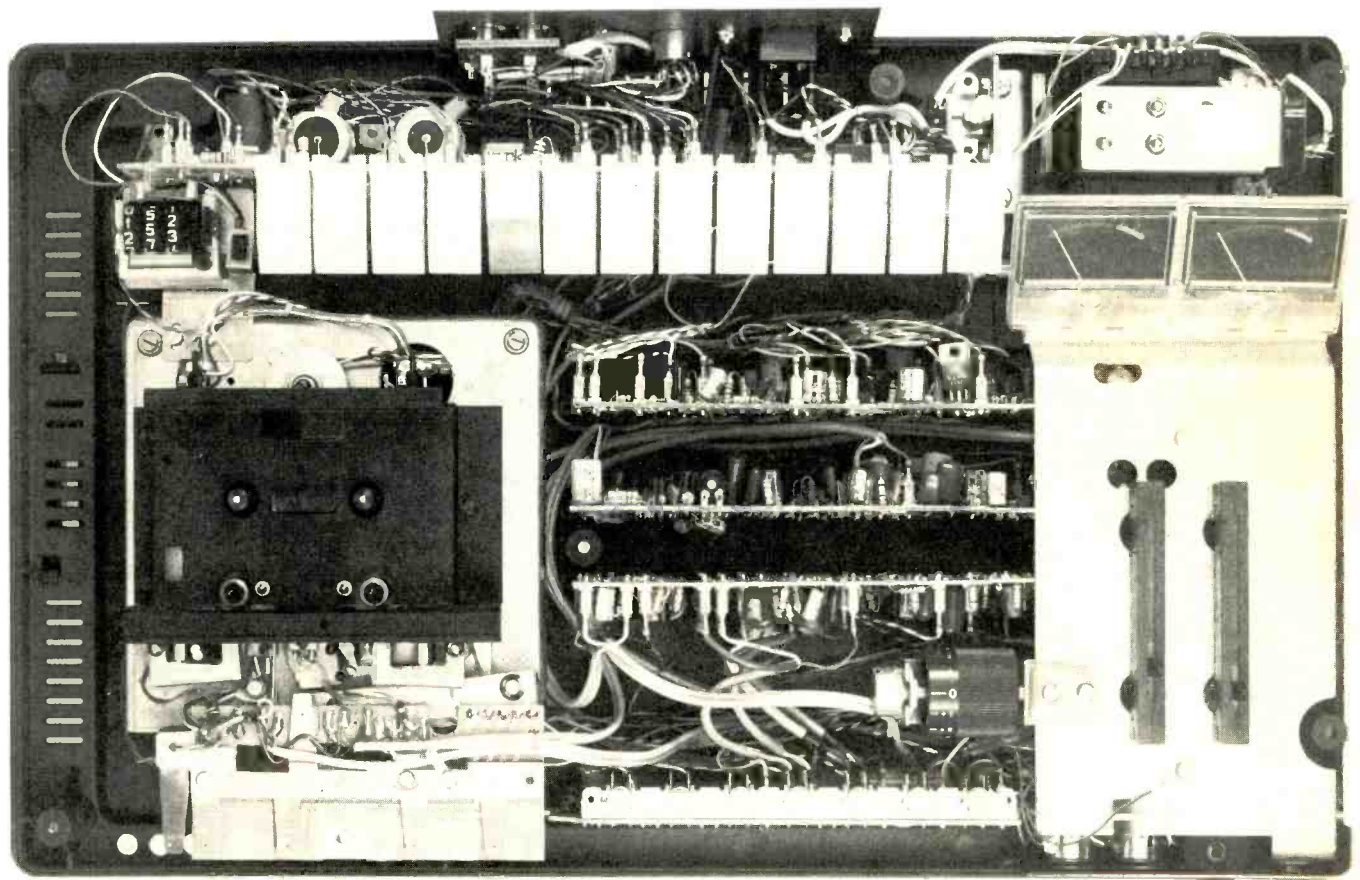
The power *On/Off* switch is behind the VU meters, and the line input and output sockets are at the rear, together with DIN sockets for radio input and a remote control unit. Also at the rear is an a.c. input socket — a suitable lead with plug comes with the deck.

The three kinds of tape matching selected by keys are: Standard, High Output, and FerriChrome; while the fourth, CrO₂, is switched automatically by the cassette and the words "Chrom Dioxyd Tape" appear on the display.

Performance

Tested with a standard test tape, the frequency response was within 2 dB from 40 Hz to 10 kHz as shown in Fig. 1. As BASF tapes were specified, a BASF Studio 90 was used for the first record/replay tests with the results shown in Fig. 2. It will be seen that the 0 VU response is fairly typical, but the -20 dB curve is somewhat unusual as it falls slightly from 9 kHz, rising again to 0 VU at 20 kHz with the -3 dB point at an amazing 25 kHz! Next a Scotch Master III ferrichrome tape was tried with similar results (see Fig. 3). Finally, Maxell UDXL-1, UDXL-11, and TDK Audua tapes were tested, and they all showed a frequency rise of +2 dB from 5 to 12 kHz, although the upper 3 dB frequency was still extended. Figure 4 indicates the results with Maxell UDXL-1, but the others mentioned within 0.5 dB of these curves.

Distortion at 1 kHz can be seen for the three tapes in Fig. 5. The TDK Audua and Maxell UDXL-1 have the greatest head-



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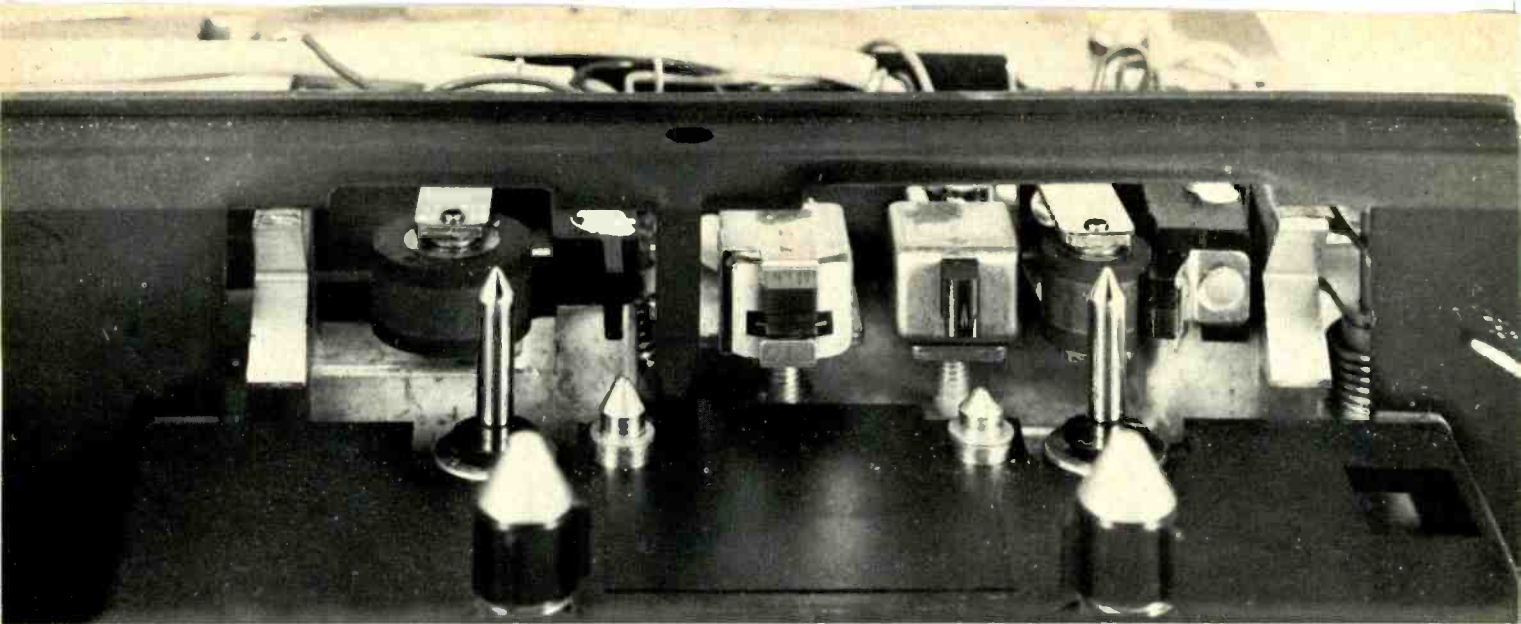
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room — 8.3 dB against 7 dB for the Scotch Master III Ferrichrome and 6 dB for the BASF Studio, so the differences were not that great. Distortion versus frequency is shown in Fig. 6, and the BASF and Scotch Master III Ferrichrome were almost identical with the UDXL-1, and the TDK Audua was also quite close. In terms of signal-to-noise ratio, the BASF Studio and Maxell UDXL-1 tied at 59 dB, with the Scotch Master and the TDK Audua not far behind at 58 dB (all "A" weighting, referred to 3 per cent THD, as measured). Switching in the Dolby N/R system improved these figures by approximately 9 dB. Incidentally, the Dolby level on this machine is 0 VU on the meters, not at the more usual +3 dB. As there are separate Dolby recording and playback sections, calibration is not a problem and I found tracking to be within 1.5 dB down to -40 dB using the BASF Studio tape. Input required for 0 VU was 32 mV line and 300 μ V for the microphone. Connecting a microphone did not affect the signal-to-noise ratio more than 5 dB. Input required at the radio input was 12 mV, and signal to noise was not increased as the signal is taken to the line amplifier. Output with a 0-VU input varied from 600 to 670 mV, depending upon the kind of tape used. Switching in the ALC brought the 0-VU sine-wave signal down to -4 dB and introduced some compression that was noticeable at the higher inputs.

Operation of the MPX filter produced a cut of 1 dB at 15 kHz with the -3 dB point at 16.5 kHz and an attenuation of more than 20 dB at 19 kHz.

Erase measured over 60 dB with the FeCr tape. Although the specifications claim 62 dB, the figure is quite good. Wow & flutter came out at 0.09 per cent (DIN 45-507), and the possible speed variation, in playback only, was +3 and -2 per cent. As the drive motor is servo-controlled, speed remains constant and unaffected even by fairly wide power line variations.

Listening & Use Tests

As mentioned above, there is no monitor switch on the deck, and the signal at the headphone and output sockets comes directly from the tape. Thus, in order to make comparisons, the output from the deck has to be connected to the preamp, or receiver, so a tape monitor switch can perform this function. Alternatively, headphones can be used for monitoring, but in any case there will be a slight time delay between the two signals corresponding to the distance between the record and playback heads.

In order to set the input levels, a slight touch on the *Record* bar switches on the electronics, and after adjusting the input sliders, the tape transport is activated by another touch on the *Record* bar while depressing the *Playback* key. All of these functions are clearly displayed on the rear panel which makes the Lenco C2003 one of the easiest decks to use. In fact, if the ALC key is depressed, there is no need to touch the input controls as the levels are set automatically. Because of the electronic interlock controls, it is possible to go from one tape mode to another without pressing the *Stop* key first — something you cannot do with most cassette decks.

As far as the basic performance is concerned, the figures speak for themselves. The frequency response is extended at both ends of the scale with low distortion, while the signal-to-noise ratio is excellent. On the mechanical side, it is a beautifully made deck with Swiss precision throughout.

In summation, the Lenco C2003 is a fine cassette deck with many outstanding features that more than compensate for the possible inconvenience involved in the lack of monitoring. A final word of praise for the instruction book which is unusually detailed and written in seven languages.

George W. Tillett

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Fig. 5—Distortion at 1 kHz.

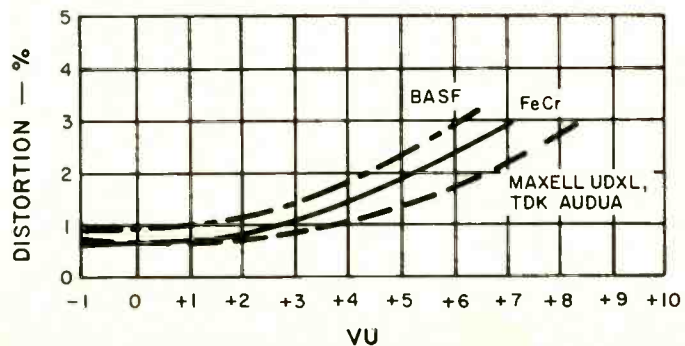
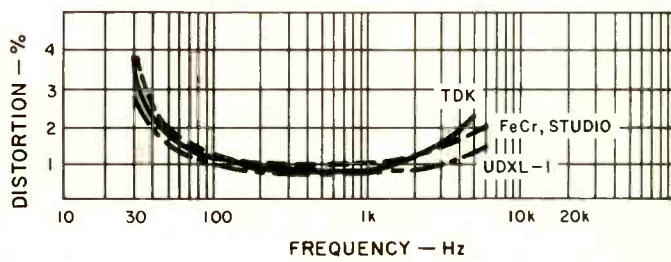


Fig. 6—Distortion vs. frequency.



Workbench PROfiles

White Instruments Model 4100 Stereo Equalizer



MANUFACTURER'S SPECIFICATIONS

Number of Channels: Two.
Number of Bands: 10.

Bandwidth: One octave.
Boost & Cut Range: ± 10 dB.
Rated Output: 6.1 V rms.
THD at Rated Output: 0.1 per cent.

S/N: -92 dB at rated output.
Dimensions: 18½ in. (47 cm) W x 3½ in. (8.9 cm) H x 6¾ in. (17.1 cm) D.
Weight: 7½ lbs. (3.4 kg).
Price: \$599.00.

The White Instruments Model 4100 Stereo Equalizer is an active, two-channel, octave-band equalizer. The front panel controls consist of a power *On/Off* switch, *EQ In/Out* switch, and — for each channel — a variable frequency low-pass filter, peak overload indicator, and 10 filter controls, each capable of a ± 10 dB change at the center frequency. The center frequencies being 31.5, 63, 125, 250, 500, 1 k, 2 k, 4 k, 8 k, and 16 kHz. The rear panel consists of a left and right input and two sets of outputs, the second of which is used in conjunction with an optional two-way stereo crossover which plugs into an octal socket.

The quality of construction in relation to both the mechanical and electrical aspects is generally good throughout. The circuit boards are well laid out, using metal film resistors and mylar-mica capacitors. These boards are mounted to the aluminum front and back panels, held together by two wooden end blocks. Two additional metal panels mount to the front and back plates to form the final unit, and the finish is black with white lettering. The unit is also available in a rack-mount configuration.

The circuitry in the 4100 utilizes a quad 741 op-amp as its gain block, with the usual resonant filter circuit in the feedback loop. Unlike most other units, however, White chose to use pot-core inductors instead of gyrators as inductive reactive elements in the filter circuits, which has the advantage

of not injecting the transfer characteristics at the gyrator op-amp into the feedback loop of the 741 gain block.

In the feedback loop there are 10 resonant circuits, each of which corresponds to the appropriate frequency control on the front panel. It is a credit to the White engineering department that they chose the more expensive inductor approach, with the resultant effect of less noise and a simpler high-frequency transfer characteristic so important to accurate reproduction of high frequency transient information. The inductors are in the feedback loop, but they are divided five and five with the adjacent bands staggered to minimize interaction between the bands.

Measurements

This unit exhibited a rising high frequency distortion characteristic, suggesting that the open-loop response of the op-amp was falling as a function of frequency. The nature of the distortion residual became more complex as frequency increased and was dependent upon the position of the output equalization controls. When they were set to the cut position, the output capability was reduced, putting out only 2 volts maximum at -5 dB. It is possible to clip the unit with the controls set in the minus position without the overload light coming on. A plot of the harmonic series of a 1-kHz distortion residual is shown. This series contains primarily odd-

125

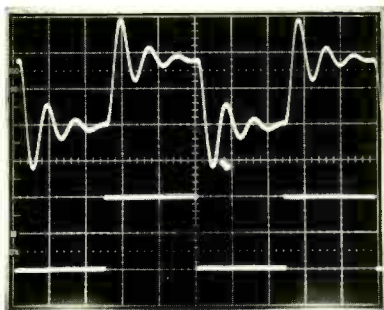


Fig. 1—Square-wave response with the controls set flat.

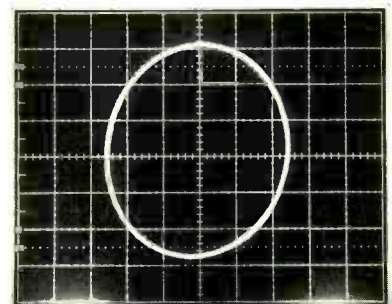


Fig. 2—Phase response at 28 Hz lags 90°.

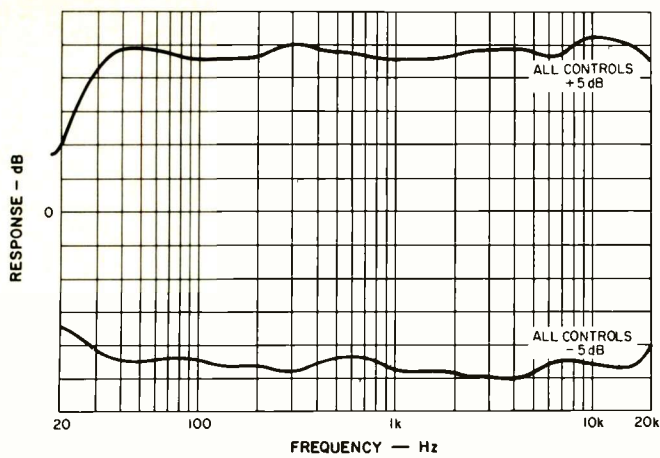


Fig. 3—Frequency response with the controls set at +5 dB (top) and -5 dB.

order harmonics with substantial amounts of 5th, 7th, and 13th — odd-order harmonics generally produce more acoustic irritation than the even-order harmonics.

Driving the 4100 with a sine wave at 4-volts output above 20 kHz produces slewed triangle waves at a rate of 2 volts per μ S. The 10 kHz square-wave response, measured with controls set flat, showed severe ringing as demonstrated in Fig. 1. The unit was capable of driving 600 ohms at a slightly reduced output. Maximum output measured into 10 kilohms was 6.8 volts rms at 1 kHz.

Listening and Use Tests

This inductor-based unit was compared with two other gyrator-type (non-inductor) active equalizers. An A-B comparison was done, and the 4100 was found to be substantially less offensive. In fact, the gyrator-type equalizers were found to be intolerable to the listening group comprised of this reviewer and his friends. Even in the case of recordings that required considerable equalization, the group preferred listening without equalization to avoid the degradation of sound caused by the electronics on the spatial and ambient information of the recordings. The gyrator units and the White unit, to a lesser extent, totally eliminated the spatial reality of the sound. High frequency transient information, such as cymbals, etc., were distorted and had an obvious electronic sound. A well-recorded cymbal sounds like brass, a sound which was totally lost, and a metallic-electronic change was observed. In all fairness to the manufacturers, it should be pointed out that the author's binaurally-recorded, live concert material contained lots of ambient information and was played through the cleanest possible electronics, equipment not available to the normal consumer. The effects we observed were extreme because the total signal path was as perfect as possible. It should also be kept in mind that in highly processed studio recordings with no ambient information, the differences became far less pronounced.

Because of this, a second set of listening tests were performed with a top-end Japanese preamp and a 300-watt Japanese power amp in place of the reference units, with the same live binaural recordings. The listening group found the White unit to cause a mild degradation (i.e. subtle edginess and some loss of space), while the other units caused considerably more irritation and a drastic loss of spatial sense.

In place of the tapes, we then played an assortment of standard studio recordings. These recordings were made in a highly dead environment with considerable utilization of complex electrical circuitry in the signal path (op-amp mixing boards, noise reduction circuitry, recorder electronics, etc.). Subtle differences were noticed between the units, however the panel generally preferred (in the case of the 4100) to use the equalizer as opposed to the bypass position on it.

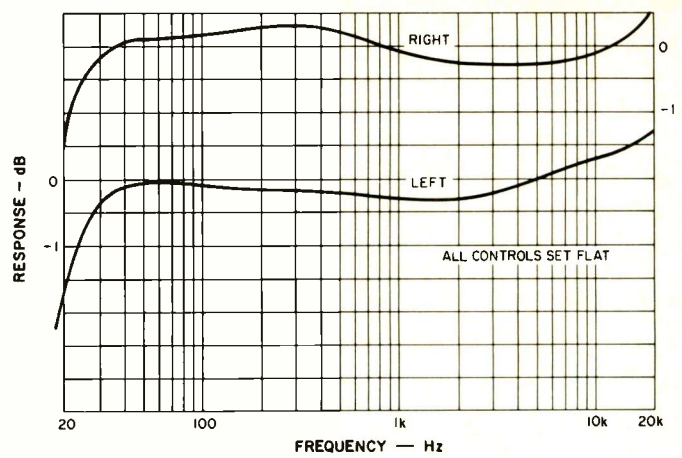


Fig. 4—Frequency response for the left and right channels with the controls set flat.

For most highly processed studio recordings played through commercially available high-end components, a subtle degradation of resolution was found, but this is outweighed by the obvious benefits of equalization.

As a final test a White third-octave passive equalizer was utilized with the ambient tape and reference electronics. None of the listening group could tell when the passive unit was in or out of the circuit, with the equalizer in the flat position.

The White unit is one of the best active, octave-band graphic equalizers we've encountered. Its price is very attractive and the unit is functionally well laid out. This unit, properly utilized, would improve the sound of a majority of studio recordings played through the typical high-end home hi-fi system.

Geoff Cook

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Test Measurements

In our opinion distortion measurements, in terms of magnitude, have little correlation to the actual listening experience. However, there may be some correlation between the nature of the residual distortion and sound.

I. Harmonic distortion w/10 kilohm load, EQ switch "In."

A. All controls flat	LEFT %	RIGHT %
1) 4 volts rms		
a) 20 Hz	0.002	0.0036
b) 200 Hz	0.0018	0.002
c) 1000 Hz	0.0023	0.0024
d) 10,000 Hz	0.013	0.0015
e) 20,000 Hz	0.075	0.16
2) 1 volt rms		
a) 20 Hz	0.0025	0.004
b) 200 Hz	0.0024	0.003
c) 1000 Hz	0.0025	0.0027
d) 10,000 Hz	0.01	0.012
e) 20,000 Hz	0.0215	0.023
B. Output at 1 volt rms		
1) All controls at +5 dB		
a) 20 Hz	0.015	0.01
b) 200 Hz	0.0075	0.0044
c) 1000 Hz	0.0084	0.003
d) 10,000 Hz	0.006	0.0084
e) 20,000 Hz	0.0058	0.0072
2) All controls at -5 dB		
a) 20 Hz	0.013	0.01
b) 200 Hz	0.011	0.0044
c) 1000 Hz	0.022	0.008
d) 10,000 Hz	0.025	0.029
e) 20,000 Hz	0.0375	0.03

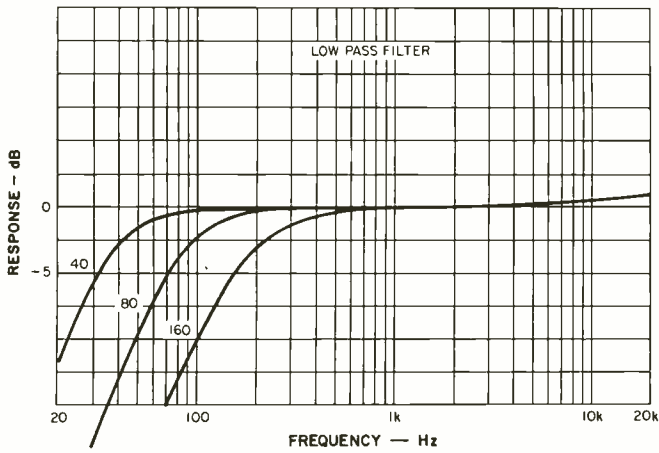


Fig. 5—Effects of the low-pass filter with the controls set at 40, 80, and 160 respectively.

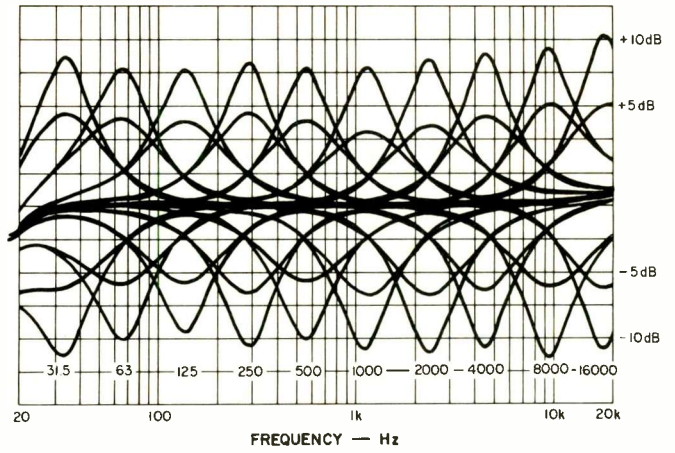


Fig. 6—Octave-by-octave display of the boost and cut range.

Total Distortion at 1 kHz, 4 volts rms output

	RIGHT %	LEFT %
2nd Harmonic	0.0002	0.00065
3rd "	0.0013	0.0012
4th "	0.00014	0.00017
5th "	0.0009	0.00073
6th "	0.00005	0.000035
7th "	0.0006	0.00048
8th "	0.00008	0.000083
9th "	0.0006	0.00044
10th "	0.00005	0.00003
11th "	0.0003	0.00023
12th "	0.000075	0.00007
13th "	0.00025	0.0003

Test Oscillator Residual Distortion

2nd Harmonic	0.0008	%
3rd "	0.00032	%
4th "	0.000075	%
5th "	0.0001	%

1M Distortion w/10 kilohm load, EQ switch "In" all controls "flat."

4 volts rms	0.0022%
1 volt rms	0.0015%

Noise: Both channels exceeded manufacturer's specifications of -92 dBV over 20 kHz passband.

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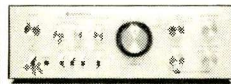
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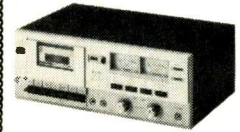
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MANUFACTURER'S SPECIFICATIONS

Oscillator

Output Voltage: 1.2 V.

Level Deviation: ± 0.2 dB.

Distortion: 0.3 per cent, less than 0.01 per cent at 400 Hz for THD tests.

Frequencies: 21 steps from 20 Hz to 20 kHz.

Frequency Accuracy: ± 2 per cent.

Pink Noise Output: 20 Hz to 20 kHz, ± 2 dB

Output Impedance: 600 ohms.

Level Measurement

Range: -80 dBV to +30 dBV.

Frequency Response: 20 Hz to 20 kHz, ± 0.3 dB.

Display Ballistics: VU or peak, selectable.

Wow & Flutter Measurement

Input Range: 3 mV to 30 V.

Indication: DIN peak.

Test Signal: 3000, ± 4.5 Hz.

Speed Range: ± 3 per cent.

Distortion Meter

Test Frequency: 400 Hz.

Input Range: 0.1 to 30 V.

THD Range: 0.01 to 3.0 per cent.

Noise Measurement

Weighting: IEC A.

Range: -100 to -10 dBV.

Dimensions: 13½ in. (34.3 cm) W x 3 in. (7.5 cm) H x 9½ in. (24 cm) D.

Weight: 9.5 lbs. (4.3 kg).

Price: \$800.00

128

The Nakamichi T-100 audio analyzer provides a well-thought-out combination of audio test capabilities in a compact package. It is best to examine the unit when turned on, for then the two parallel bar graphs will be illuminated (with input signals). One is immediately struck, not just by the novelty, but by the great ease in reading the orange bars against the horizontal 4.5-in. scales. The topmost scale is for tape speed, from -3 to +3 per cent. The middle level is in linear dB from -20 to +10 dB, and it applies to both top (L) and bottom (R) bar graphs. The bottom scale is for THD and W&F in per cent and for signal level in volts, and it is scaled from 0.1 to 3.2, with 1.0 at 0 dB. The selectable functions are: *Speed Cal*, *Speed (L)*, and *Unweighted W&F (R)*, *Speed and W&F (Wtd)*, left channel *Level and THD (400 Hz)*, right channel *Level and THD*, *Level (both channels)*, *-20 dB level*, *Noise-A (40 dB reference)*, and *Peak Level*. In the *Speed Cal* position, a multi-turn adjust pot on the front panel is used to set zero reference to any source or tape playback as desired. The meter range switch adds 20 dB of gain in the 0.1 per cent position, relative to the reference 1 per cent position. The input level switch decreases gain by 20 dB in the 10-V (+20 dB) position and increases gain 20 dB in the 0.1 V (-20 dB) position. Multi-turn input level pots allow setting peak levels for lower indications as desired, but the pots are inoperative in other positions of the function switch, a good way to keep from putting the instrument out of calibration with other switch settings.

The oscillator has a total of 21 step frequencies: 20, 40, 63, 100, 160, 250, 400, 630, 1k, 1.5k, 2k, 3k, 4k, 5k, 6.3k, 8k, 10k,

12k, 15k, 18k, and 20 kHz. Most of the steps are at specific ISO-recommended 1/3-octave center frequencies. There is no complaint about not having each and every one of them, but my own preference would be for added steps at the lower end, dropping out a couple in the middle. The inclusion of a pink-noise source is sizable plus for the T-100, much more useful than discrete tones for listening checks. The oscillator output level can be lowered from its calibrated setting with a front-panel multi-turn pot.

The top of the high-impact plastic, wrap-around case has a block schematic for handy reference. Near the back on one side are the left and right channel inputs, the paralleled outputs and the two scope connections, all phono jacks. On the other side is the power switch and the socket for the detachable cord. Feet on the bottom of the case can be swung down to tilt the front of the T-100 upwards for better viewing. Gaining access to the interior was straightforward, but it is not recommended to the curious. Soldering and wiring were excellent with all connections very neat. Construction was compact with shielding used in a number of places. A shoulder-carry strap facilitates transporting the unit in its case, which has space for cables.

Performance

All of the oscillator step frequencies were within 1 per cent of setting with the exception of 20k which was 1.8 per cent low (19.648 kHz). The majority of steps were within 0.3 per cent, which is excellent and much better than the 2 per cent specification. The output level was constant within 0.1 dB in most cases with a gentle increase with frequency, up 0.15 dB

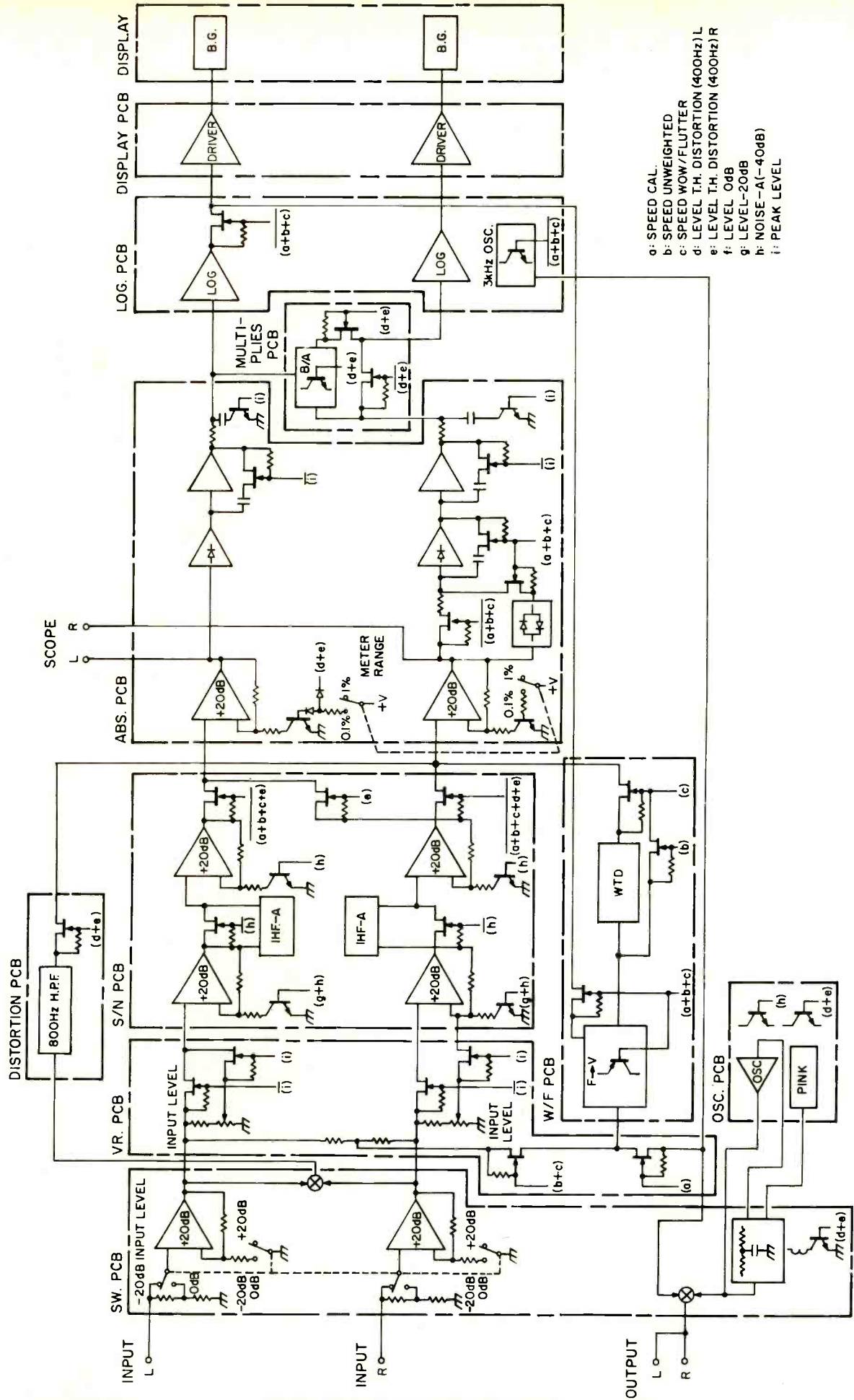


Fig. 1—Block diagram of the Nakamichi T-100 Audio Analyzer.

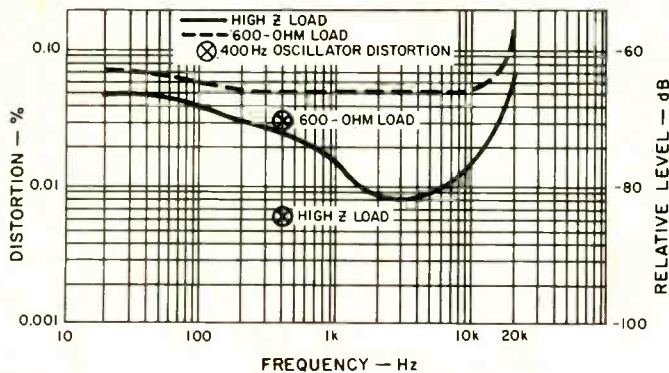


Fig. 2—Oscillator THD vs. frequency with high-Z and 600-ohm loads.

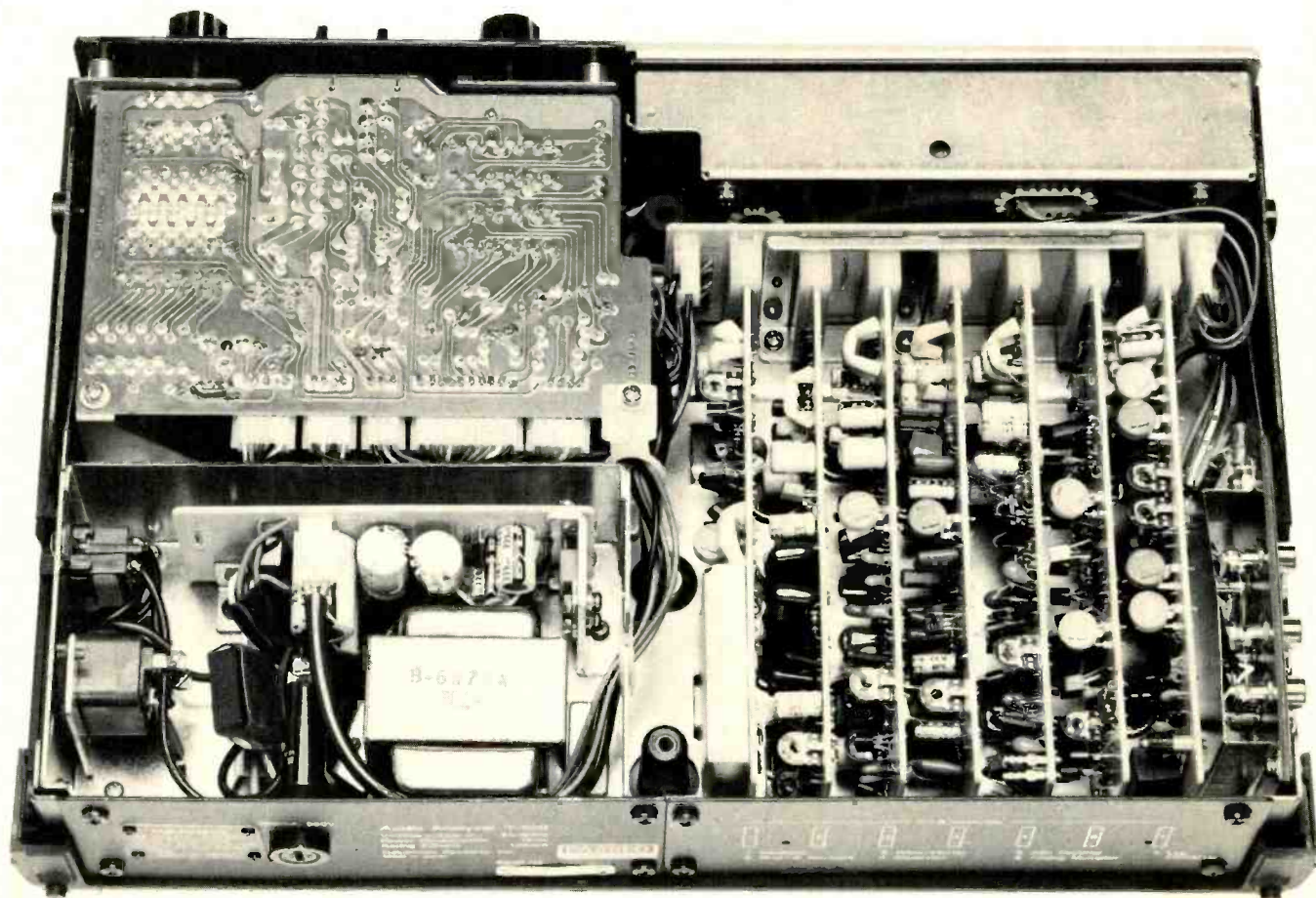
at 15 kHz and above. The maximum output was 1.2V, as specified, 0.6V with a 600-ohm load (the expected result with a 600-ohm source impedance). With 1,000 V in, the L bar graph was slightly low, 0.98 V, and the R display was as close as could be read. At the low-frequency end, the indications reached a "peak" of +0.2 dB at 6 Hz, with some following of the waveform. The metering was not down 1 dB until 1.5 Hz with -3 dB at 0.8 Hz, with the slow amplitude cycling easily observed. At the high end, the display was flat within 0.15 dB out of 60 kHz and 1 dB down at 90 kHz. This is outstanding performance, heightened by the fact that the two bar graphs matched each other exactly. The extended low-end response was superb, one of the best ever observed.

THD was measured for the oscillator at each of its step frequencies and with the switch set for THD tests. The use of

a spectrum analyzer revealed certain operating conditions as being requisite for best results. It was determined, for example, that distortion for the step-frequency oscillator was much lower with a high-impedance load, although it was still within spec with a 600-ohm load. The 400-Hz oscillator for THD checks had distortion products of 0.006 per cent at most with high-Z load, but 0.03 per cent with 600 ohms on the output. The other observation was that 60 and 180 Hz from the power supply were at low level (less than 0.03 per cent) and were eliminated with the ground pin lifted. The THD function was very convenient with its auto-level feature. An input level of 50 mV was quite sufficient to measure a case of 0.017 per cent THD, markedly less than the specified 100 mV minimum. The pink noise output was 0.95 V on a wide-band meter. The majority of the spectrum was within ± 1 dB on the 40 Hz to 16 kHz RTA display, with just a couple points a fraction of a dB higher. The spectrum was consistent with changes in output level and loading, adding to the excellent performance.

In *Level*, the two bar graphs were not quite a dB low with 300 mS bursts with frequencies anywhere from less than 5 Hz to greater than 40 kHz, basically meeting the VU meter standards. In *Peak*, the same indication was obtained with a 8.5 mS burst, accompanied by a two-second fall time, excellent for music. Slightly longer burst times obtained full indications. The output control and peak level pots provided a total of 40-dB attenuation with about 10 dB in the first half (about five turns CCW) adjustment from *Cal* (maximum). This aids in accurately setting to the levels most likely to be encountered.

The bar graph segments were each $\frac{1}{3}$ dB, but it was possible to read consistently to about ± 0.1 dB by noting the intensity of the topmost segment. The design had inherently lower



parallax than needle meters. The performance of the log converters and the attenuator/gain changes was shown to be outstanding with a maximum discrepancy of 0.2 dB from +20 dBV (10 V) to -100 dBV (10 microvolts). In the switch from Level to -20 dB, the oscillator/pink noise output was simultaneously switched an exact -20 dB. Clipping as seen at the scope output occurred at 5 dB above F.S. and was about 9.2 V p-p at that point. The input impedance for each channel was 560 kilohms, constant across the audio band.

The output in W&F was 3000 Hz on the nose, but 3150 Hz would have been more in keeping with the weighted-peak spec. The speed indication was within 1 Hz anywhere on the display, for a maximum error of 0.03 per cent. The response curves were completely to standard, usually within a fraction of a dB. Measurements were possible to the maximum meter indication (30V) and down to 1 mV with 0.1 per cent flutter, to less than 3 mV with 0.01 per cent, very impressive performance. The A-weighting curve switched in at -40 dB met the tolerances for ANSI Type I precision sound level meters from 315 to 16 kHz and was still very good at lower frequencies.

It was interesting to check test setups against the block diagram for the T-100. The imaginative use of FET switches and their logic control is judged to be a good feature of the analyzer that could contribute to long-term reliability.

In-Use Tests

The Nakamichi analyzer was used for a number of tasks and performed very well each time. The bar graph displays were very easy to use, judged to be rugged and quite superior in use to needle chasing, particularly with fluctuating signals. Having two channels, one above the other, facilitated a number of tests, run with great difficulty in the past. Tracking of pots, for example, could be checked over 60 dB or more with just two level switches. The job of checking machines

for Recording for the Blind was not only more efficient, but easier on the back. The easy-carry T-100 replaced the oscillator, the pink-noise source, the level meter, and the wow and flutter meter, plus adding the THD capability. Because of noise in the tape recording process, it was not possible to obtain any benefit from the low-distortion properties, but the auto-level operation was a great time saver.

Although the T-100 does not match the very best of the low-distortion oscillators, the THD is less than 0.1 percent across the band with high impedance loads. Spectrum analysis may be necessary to check very low-level distortion, as a regular HD meter may respond to ground-loop effects. For checks at one frequency, the THD tests at lower distortion 400 Hz should reveal if an equipment problem is developing. The knobs on the level pots are very small, but adjustment may be a sometime thing, and the multi-turn construction allows very accurate setting.

The instruction book gives detailed information on performing tests on various types of equipment, with the emphasis on tape recorders. Data sheets are provided for plotting results. A display overlay is also included which has scales for voltage and power across 8 ohms, up to 100 watts.

The Nakamichi T-100 audio analyzer is truly synergistic, providing a number of inter-related signal generation and measurement functions in one compact, convenient package. The output is single-ended, and the levels are slightly low for some professional uses, so high-impedance loads should be the rule. The excellent performance should be of interest to serious audiophiles who want to acquire test instrumentation and to professionals where its constraints are not limiting. The price tag makes the unit quite acceptable to touring bands, small studios, and others who need such an all-in-one unit.

Howard A. Roberson

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Street-Legal: Bob Dylan
Columbia JC 35343, stereo, \$7.98.

This first new album of new studio Bob Dylan songs in 2½ years appears at a crux point in Dylan's career. His well-publicized divorce action, now completed and expensive, has forced his hand. His flop movie "Renaldo and Clara" has had two hours cut out of it to bring it down to a more manageable two hours for a rerelease attempt. He has done a fresh whirl of concertizing in Japan, Los Angeles, and England during which his stage presence was described in all accounts as the most extroverted it has ever been ("I'd like to do another from my new album **Street-Legal** on Columbia...").

And finally there is the album itself. At the outset it presents a more energetic, confident, and exuberant Dylan than ever. The arrangements are full and startlingly rich, with lady voices everywhere and sax solos abounding. As a result, the album has a more "produced" sound than any previous Dylan. But I'm more sure as I keep listening that this is only facade. The backing vocals, singing not with Dylan, but merely simultaneously,

much like the unmeshed Dylan/Emmylou Harris harmonies of **Desire**, suggest that **Street-Legal**, like most of Dylan's records, is mostly live one-take in the studio with only minimal dubbing after. The undistinct drum sound is another giveaway.

The songs have a major theme running through all of them, and a not surprising one at that. In the wake of the divorce, Dylan's new songs all re-examine the man/woman relationship with great suspicion and no small measure of the misogyny of the **Highway 61/Blonde on Blonde** era. The most sweeping of these, *Changing of the Guard*, *No Time to Think* and *Where are You Tonight* (*Journey through Dark Heat*), are panoramic in the *Hard Rain's A-Gonna Fall* and *Like a Rolling Stone* tradition. They run past you with urgency and desperation. *Changing of the Guard* in particular signals a new era to Dylan — "Sixteen years/Sixteen banners united." (**Street-Legal** is Dylan's 16th gold album.) The song appears to be a thinly veiled account of the Bob and Sara story. *No Time to Think* at least partly takes place in mid-crisis, while

Where are You Tonight placed at album's end is epilogue. In between the songs can be taken as a loose chronicle of the split. *New Pony* tells of shooting the old pony with regret — "I swear it hurt me more than it hurt her" — then recalls "Miss Ex," finally getting to the new pony — "She knows how to foxtrot, lope and pace." Several songs are good pop vehicles. *Baby, Stop Crying* at the end of side one and *Is Your Love in Vain?* at side two's opening describe the fatal arguments and differences. *True Love Tends to Forget* shows the lovers getting callous. The agreement to disagree comes in the jaunty Hank Williams like *We Better Talk This Over Senor* (*Tales of Yankee Power*), early on side two, stands apart from the rest of the album, an anthem of betrayal that is the only song in a minor key, resolute and chill against the almost too cheery air of the rest of the album. That cheer runs directly counter to the central lyric theme, resulting in a dark, threatening, and insecure emotional content.

As a songwriter, however spirited, Dylan is treading water with **Street-**

Legal. His melodies are too often obvious retreads. *Where Are You Tonight?* nearly copies the changes of *Like a Rolling Stone*, as *Is Your Love in Vain* does to *Sara*, *Changing of the Guard* to *Tangled Up in Blue*, and *Baby, Stop Crying* to *Lay, Lady, Lay*.

Maybe I'm copping out to say it, but I think **Street-Legal** is going to take the passage of some time to properly digest. Clearly, it is not the timeless album **Blood on the Tracks** is, but neither does it appear to be the topical and time-fixed piece **Desire** is.

There are several things I am sure of: 1) Bob Dylan's narrative powers are as strong as ever on **Street-Legal**; 2) this is the most "commercial" sounding album from Dylan in ages, with its "big band" approach; 3) the recording quality which first appears exceptional on closer examination is standard Dylan with raw, often muddy mixes, especially with the drum sounds; 4) however, you can hear the lyrics much more clearly than usual for Dylan.

But I'm not so sure that **Street-Legal** reveals a distinct shift in Dylan's sensibilities as pop music artist and star. Perhaps for the first time he appears both comfortable in his own image and ready to trade on it in the bright glare of public view. He could easily play Las Vegas with this current "sound."

Whatever the truth is, **Street-Legal** is both alive and lively. As the best of Dylan has always done, the new songs raise far more questions than they answer. Either this album is an important statement from the soul or yet another cruel and calculated pose. M.T.

Sound: B Performance: B

Nina does not fare so well with the Hall and Oates hit *Rich Girl* and a couple other pieces, but the successful numbers far outweigh in import the failures. A large part of that success comes from an unusually fine production job by Taylor with exceptional recording quality most obvious on *Baltimore* and *My Father*.

When she went away, her last album was called **it is finished**. With **Baltimore**, it is beginning anew. M.T.

Sound: A+ Performance: B

White Mansions: Various Artists
A&M SP-6004, stereo, \$7.98.

The publicist for this album is an old and dear friend of mine, and I swore that I would review this album without slamming it into the ground in the hopes of him getting a big promotion. This was before I heard **White Mansions**, and upon listening for the first time I realized that this would be a near-impossible promise to keep. But,

Bruised Orange: John Prine
Elektra/Asylum 6E-139, stereo, \$7.98.

If you like John Prine, it must be for his lyrics and not for his musicianship. The band on his new album, **Bruised Orange**, is blandly C&W and makes few forays into finger picking, pedal steel guitar, mandolin, or other "authentic" C&W techniques. For that we should be grateful, as it allows Prine's charming voice and lyrics to work their magic unencumbered. The hokey twang and raspy vocals that animate Prine's folksy lyrics sound genu-

ine: He's a plausible enough pre-electric Dylan for those with a limited intellect or easily satisfied craving for folk.

1) This is absolutely the best record ever made about the Civil War, and contains an illustrated libretto which actually exceeds the music in entertainment value.

2) Eric Clapton makes his finest appearance on a concept album ever here, playing some "smoking" guitar.

3) Jessi Colter and Waylon Jennings' dual appearance here is truly fitting, and a fine choice.

4) This album is produced and engineered by Glyn Johns, who is a talented man at the knobs.

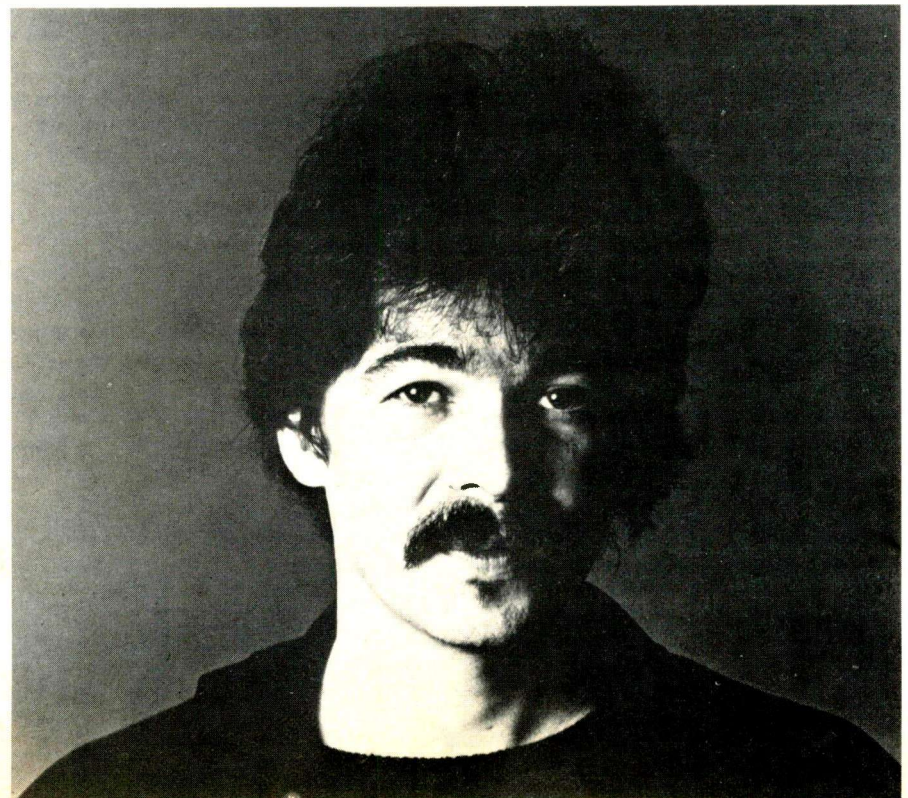
Now that wasn't too painful, and I don't think I've done one bit of damage to my reputation. **White Mansions** is guaranteed to add a bit of unusual color to the record collection of any obscurologist, and there are plenty of worse albums around.

J.T.

Sound: B Performance: D-

ine: He's a plausible enough pre-electric Dylan for those with a limited intellect or easily satisfied craving for folk.

Prine's main talent is for writing tunes that are fun for the listener to sing and whose lyrics are either sentimental or cutely amusing. I like his upbeat numbers well enough — *Fish and Whistle* is as instantly appealing as any of his earlier humorous ditties — but Prine's real strong point is the ballad to which he lends a tragic edge. Just as the best parts of his past albums have



Baltimore: Nina Simone
CTI 7084, stereo, \$7.98.

Nina Simone has been away from recordmaking for a few years. Her last several RCA albums were unsatisfactory at best. With a new label and new producer (Creed Taylor), she has come up with a mixed but mostly successful effort true to her own terms. The material shows Nina's sensitivities. The two gospel songs, *Balm in Gilead* and *If You Pray Right*, are great vehicles for Nina. The Judy Collins song, *My Father*, is gorgeous. There is a moment near its end when Nina holds and plays with the line "And watch the sun set in my father's eyes — Again." The pause between "eyes" and "again" is magical. Her version of Randy Newman's *Baltimore* is yet another song the lady transforms into something purely her own.

been the slow, dramatic numbers (*Sam Stone* and *Angel from Montgomery* come to mind), the highlights of this LP are *Chain of Sorrow* and *If You Don't Want My Love*. The latter is a short and absurdly simple song cowritten with Phil Spector: There's nothing to it but a quietly cardiac drum beat, occasional embellishments of guitar and piano, and Prine's resigned voice repeating the hook for two minutes. As the best song on the LP, *If You Don't Want My Love* is an example of the less-is-more principle whose dramatic center is Prine's stoic facade.

One of the few pop singers who can convey sorrow without being sappy, Prine is more valid as a tragic actor than as a folk sage, though he's just as astute in folk wisdom as he is in musicianship — which is to say, passably but not remarkably. Prine's songs, of which **Bruised Orange** is the dullest collection, offer us themes that occur in all folksongs but which he sings better than most. Amusing and moving, but far from innovative, Prine acts as a mouthpiece for a traditional musical genre: He's the urbanite's country cousin who refreshes our feelings by putting them into a new idiom. For people unaccustomed to C&W/folk, Prine's rural images and quaint expressions are just unusual enough, his sen-

timents just familiar enough to seem the dazzling observations of an inspired simpleton.

Sally Young

Sound: B Performance: B+

Powerage: AC/DC
Atlantic SD 19180, stereo, \$7.98.

Although there's nothing particularly wrong with the practice of taking a relatively faceless hard rock band and hyping them into the public awareness, in this case I see obvious misguidance of talent. AC/DC is a group led by the younger brothers of the Young family, with the other brother being one half of the production team (Vanda & Young) responsible not only for this album but the far superior efforts of *The Easybeats* (late Sixties), *The Marcus Hook Roll Band* (early Seventies), and *Stevie Wright* (mid-Seventies). It annoys the living daylights out of this aesthete that AC/DC, a band so obviously derivative (they sound very much like *The Sensational Alex Harvey Band*) but lacking character and distinction, should be the focus of so much in the way of promotional dollars. This, their third American album, contains nine songs which are virtually identical and aren't bad so much as

there's no particular reason why they should have been written or recorded in the first place. Perhaps the new MOR is a throaty lead singer backed by a simplistic drummer and two Gibson guitarists, playing nothing but D and A chords — but I ain't takin' the bait. J.T.

Sound: B Performance: C-

RadioActive: Roger C. Reale and Rue Morgue
BSLP 028, stereo, \$6.98.

Roger C. Reale's debut album, **RadioActive**, has everything a rock record needs for success — the beat, the voice, and funny lyrics besides. His testosterone-inspired LP proves to the punk herd that you can be loud, sneering, and melodic at the same time. Rue Morgue plays as fast as the Ramones but the songs on **RadioActive** are more varied and complex, studded with humorous lyrics, as well as animated by Reale's growling baritone.

Reale's songs are dense pieces that explode at the start (he begins *Kill Me* by screaming "go!") and continue to burn until their abrupt ending some two-and-a-half minutes later. The drums have been mixed to an assertive volume and Reale's awesome voice

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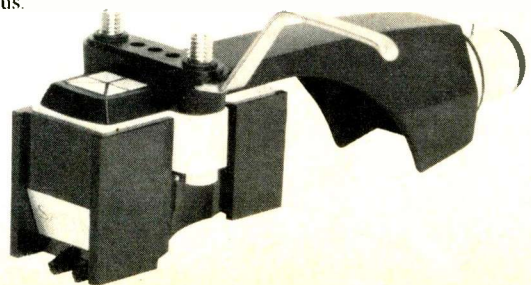
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contends with his burping bass, possibly the loudest in the history of recorded music. **RadioActive** is aggressive music in the most masculine sense of the word: It's no surprise that Reale covers a song by the Troggs' Reg Presley, another macho man from the old school of pelvis-oriented singers.

More interesting than his relentless libido, as far as I'm concerned, are Reale's lyrics. Songs like *High Society*, *Stop and Go*, and *Madonna's Last Stand* are as amusing as they are dance-inspiring. Although a lot of musicians are loud, fast, and spunky, Reale transcends the cosmetic prerequisites for rock by playing in the groove all the time. Not only does he keep a merciless beat, play fast and loud, sing tough, and assume various comic personae, but more importantly, Reale infuses his music with more energy than I've heard in a long time.

For all his musical dynamism, Reale is as appealing to the imagination as his LP is to the rhythmic centers of the body. According to the album's back cover, a mystery surrounds Reale's life. I can't help but envision him as a post office clerk leading a double life as an office Milquetoast who eats guitars during lunch break. This is an interesting as well as immediately accessible record which I hope is quickly fol-

lowed by a second, though I suspect that Reale will need some time to rest from the recording of his first LP.

Sally Young

Performance: A Sound: A

Pyramid: The Alan Parsons Project
Arista 4180, stereo, \$7.98.

However well made, lavishly produced, beautifully recorded and admirably and gamely played this is, I know cotton candy when I hear it. M.T.

Sound: A Performance: C

Live on the Queen Mary: Professor Longhair
Harvest SW-11790, stereo, \$7.98.

Professor Longhair is the dean of the New Orleans piano sound with such notables as Fats Domino, Huey "Piano" Smith, and Allan Toussaint as disciples. This set was recorded in live performance at a party Paul and Linda McCartney gave on the Queen Mary oceanliner to celebrate completion of *Venus and Mars*, and on *Live* we find Fess, as he is called, in fine shape. He sings signature numbers like *Tipitina* and *Mardi Gras in New Orleans* plus his own versions of the Ray Charles classic *Mess Around* and the Hank

Snow (and later Ray Charles) hit *I'm Movin' On*, and that New Orleans anthem *Stagger Lee*.

The recording quality might best be described as casual. It is probably a tape made off the house PA's mix, but to hear Longhair in concert is worth it. If you like that New Orleans rock and roll, you gotta dig Fess. M. T.

Sound: D+ Performance: A-

David Gilmour: David Gilmour
Columbia JC 35388, stereo, \$7.98.

David Gilmour is guitar and most usual lead voice for Pink Floyd. His solo album comes a year and a half after Floyd's excellent *Animals* and at a time when no new Floyd is expected soon. The album's cover photo, looking like nothing so much as a winter version of the *Ummagumma* cover, is a sure hint to what is inside.

David Gilmour's music is stripped down Floyd with loping meters, doomy, desperate lyrics, and production values consistent with the parent band.

As an obvious attempt to buy time for Floyd to deliver, the album is a success if modest. Its only real surprise is how conservative an album it is. M.T.

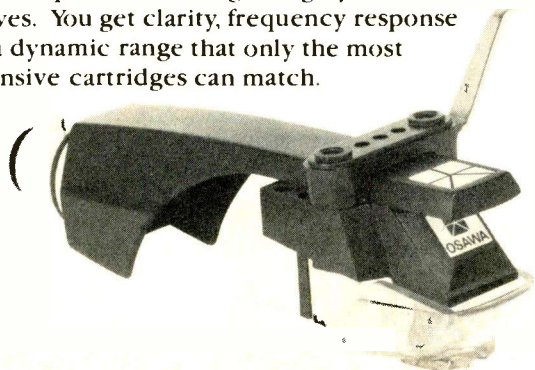
Sound: A Performance: B

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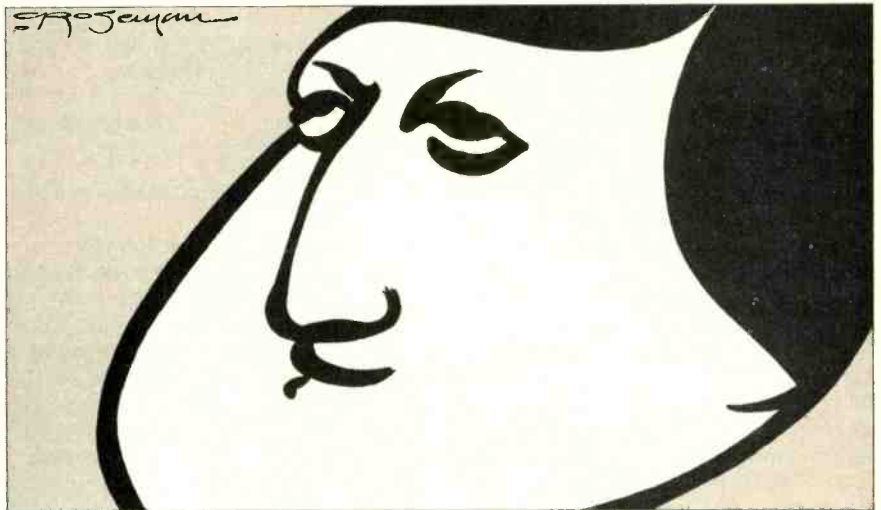
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**Edward Tatnall
Canby**

Classical reviews



Rossini—Overtures. Academy of St. Martin-in-the-Fields, Marriner. **Philips 9500 349**, stereo, \$8.98.

Three kinds of Rossini, the opera music itself, the ballet music, and the opening instrumental overtures. This disc has six of these last, including the well known Wm. Tell, otherwise known as Heigho Silver or something.

The Academy with the funny name is now famous for precision playing and styling. This one has the precise playing all right, down to every tiny bit of perfectly coordinated ensemble — but I found the styling wrong. The music is too fast and too tense. Operas of the Rossini sort just do not begin that way; the required intensity is built into the music, when and if (as in the famous storm in Wm. Tell) and does not need to be forced. These performances, so to speak, grit their teeth. Too nervous, in spite of the outward precision.

Sound: B+ Recording: B+
Surface: B+

Rossini—The Ballet Music. Orch. Nat. de l'opera de Monte Carlo, Almeida. **Philips 6780 027**, 2 discs, stereo, \$17.98.

A number of familiar present day ballets are set to music by Rossini, but none were original with him; however in his operas there is plenty of original ballet music, notably in the French-based works, where ballet was absolutely obligatory regardless of plot.

(Even Wagner had to add ballet music for the Paris production of *Tannhäuser*.) Here are four excellent sides of this original Rossini ballet stuff, and for any ear it immediately has the genuine ballet sound — casual, pleasing in its texture, full of tunes and fancy endings and changes of tempi — all designed, exactly as today, for a predominantly festive audience watching a lighted stage and one or a hundred dancers. Transferred to the home stage, this music makes ideal pleasing background stuff for almost any moment. Play it while you cook, eat, party or whatever; it will fit in perfectly. And if you miss a few notes here and there, it really will not matter much.

The Monte Carlo opera orchestra knows all about this sort of thing and the music is done with exactly the right combination of rhythmic tension, for the dance, and casualness, for the audience. Excellent.

Sound: B+ Recording: B Surface: B-

Rossini-Sedlak: The Barber of Seville, Overture and Highlights; Three Overtures. Netherlands Wind Ensemble. **Philips 9500 395**, stereo, \$8.98.

These wind instrument transcriptions of Rossini were made far back, soon after the original operas appeared; Sedlak was born in 1776 and died in 1851. Here we have the familiar

"Barber" Overture and "highlights" from elsewhere in the same opera, then three more opera Overtures, two familiar enough and the third less well known: *Semiramide*, *L'Italiana in Algeri*, and *Corradino*. All, of course, were originally set for regular orchestra, not for winds alone.

The Netherlands Wind Ensemble is my candidate for World's Greatest, not only because of their sheer fluency and precision (you will note that they now do not list a conductor) as well as their perfect phrasing and balance of sound, but even more because invariably they play their music as *music*, in perfect style, so that you may forget the winds and hear the original, in a new guise. In two minutes of this disc you will hear what I mean. This is not wind music, it is *Rossini*, to perfection! So it is with other music these performers have recorded for Philips.

Sound: A- Recording: A- Surface: A-

Michael Murray Playing the Great Organ in the Methuen Music Hall. (Direct to Disc) **Telarc 5036 (DD-2)**, stereo, (Available from Discwasher dealers).

If you can afford direct-to-disc, here's a first rate one, the biggest, shiniest, fattest organ sound in a long time, ultra-clean and beautifully miked. The music is not "Mighty Wurlitzer" type, though; it is classic late-Romantic stuff, mostly French, by the usual organ composers we always hear — Widor, Vierne, Marcel Dupré, and Karg-Elert. But you never heard 'em like this, except on the spot.

This is an interesting old organ, maybe the only one in the world that had a special building built just to house it. The machine originated in the 1860s in the old Boston Music Hall but was thrown out of there to make room for the brand new Boston Symphony, back in the 80s. It was rescued by a wealthy Massachusetts organ admirer in the town of Methuen, who built the odd-looking building that still houses the instrument. Inside, this is a sort of cathedral slice, say like Beauvais in France though not quite that big; outside it looks like a hump-backed Victorian church, vaguely Florentine. The acoustics are superb, however, and probably a lot better than any architect could produce in today's stylings.

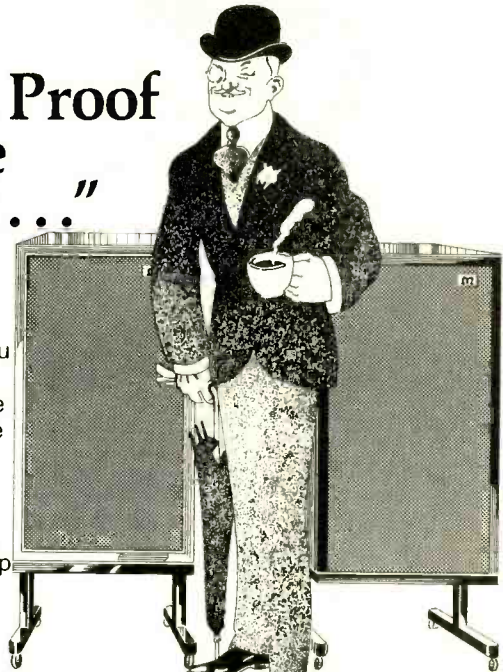
As for M. Murray, his fingers and feet are the fleetest in the business and his endurance was surely up to the try-and-try-again ordeal of d-to-d recordings. Was this the first-off try, or the 30th? Better not ask. There are more volumes to come, César Franck next.

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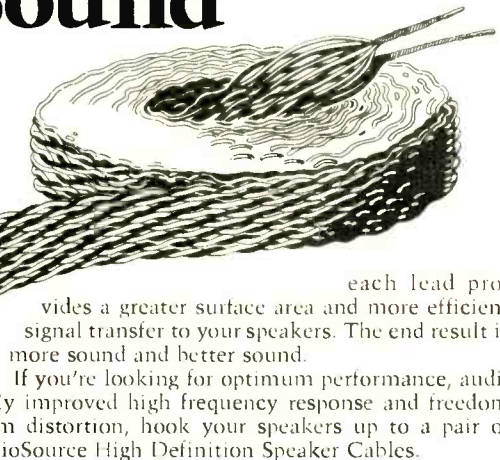
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Anatol Vieru: Clepsidra I, Clepsidra II. Studio and Symphony Orchs. Radiotelevision; Chamber Chrous "Madrigal"; Tanase Bucataru, trumpet. **Electrecord (Romania) STM-ECE 0952,** stereo.

A few import record shops may handle a selection, but generally very few Romanian records circulate in this country. Not far back, we received, direct from Electrecord, the state label in that country, a package of their discs and it was full of surprises. The biggest was the extraordinary quality of both recording and pressing, but the range

and variety of the music was equally surprising, as was the high level of performing enthusiasm and expertise. This one was the outstanding number, an absolutely first-rate recording, both in musical interest and in technical perfection.

The music is a sort most of us would think of as highly unlikely in the Eastern European region, not Soviet modern by any means but much further along the road the West has been taking. Both works, curiously, are "tape" pieces, though neither one, as far as I can figure it, uses tape. The effects are

strictly out of standard live instruments, minus computers or electronics. The sound is of the familiar sort (in the West) which combines a tape-like or synthetic substrate with live-music additions in the performance, often semi-improvised, a technique which is very popular now in the Western countries including our own. The sonic "tape" continuum, always in the background, without defined beat — a sort of ongoing wave of textured sound — is punctuated by sharp, sudden bursts of more jagged live music. Side 1 features a remarkable solo trumpet in jazz-like wah-wah outbursts, rising to an almost hysterical shriek at some points; side 2 features a chorus, sometimes singing, sometimes almost shouting — very effective and highly dramatic. I've been through each side three times already, and am set for more. A fascinating experience.

But for audio people the most interesting aspect is the quality of the sound itself and of the pressing. This is one of the cleanest records I have ever heard. The surfaces are gorgeously silent, only the sleekest of faint, steady hiss, like low-noise tape, and not the tiniest tick for 20 minutes at a time. The recording itself is superbly clean, and the sound is beautifully picked up in a vast ocean of golden liveness combined with razor-sharp clarity of detail. It's a winner on every count.

For more information write to Electrecord Recording Co., Bucharest VII, Str. Luigi Cazzavillian No. 14-16, Romania.

Granados: 12 Spanish Dances, Op. 37. Gonzalo Soriano. **Connoisseur Society CS 2105,** stereo, \$7.98.

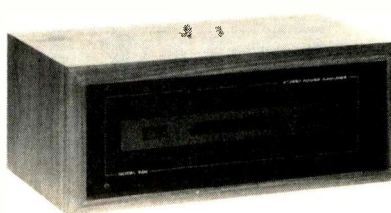
Gonzalo Soriano, as the notes to this recording say, "has within him the Spanish heritage." Well, so he does, as we can quickly hear in these gentle yet passionate renditions of mostly familiar Spanish music. It flows from the keys melliflously, with plenty of Spanish color and an equal amount of underlying power. The piano is pleasantly recorded by EMI — this is an imported tape — via Pathe Marconi, which is enough to confuse anybody wondering just where Gonzalo Soriano actually was, the day he played these works. I'd take a guess and say Paris. But then it could have been Madrid. . . .

Grenados now sounds so deliciously old fashioned that it is a bit of a shock to find that he died in the English channel, on a ship torpedoed by the Germans. He was on his way back home from New York.

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Jazz & blues



139

Inner Voices: McCoy Tyner
Milestone M-9079, stereo, \$7.98.

McCoy has reached a creative impasse over the last few years which leaves his soloing and ensemble arrangements in the same modal groove. While his solos are massively beautiful, they tend to follow the same form and development from tune to tune. His backing has become static as he straps all his drummers except Jack DeJohnette into the same heavy-handed patterns. His block is made more glaring by his attempts to get around it. He's tried a series of special projects using strings (**Fly the Wind**), different trio settings (**Trident** and **Supertrios**), and now voices. But no matter how much the settings change, the songs remain the same.

The effect of voices, like that of the strings, is superfluous. They are simply added on, echoing the tune. It does give McCoy a schmaltzy MOR veneer which will get more people to listen to **Inner Voices** than the extrapolations of **Sahara**. Yet McCoy and his sidemen Ron Carter, Alex Foster, and Jack DeJohnette are still playing as well as ever. Alex's harsh solo on *Uptown* is a

relief in this smooth recording, as is DeJohnette's slightly off-center drumming.

Inner Voices is excellently recorded with a wide dynamic range between the full-bodied bass of Carter and McCoy's percussive, orchestrally sweeping piano. Tyner is in need of new inspiration and not new clothes relief in this smooth recording, as is DeJohnette's slightly off-center drumming.

Inner Voices is excellently recorded with a wide dynamic range between the full-bodied bass of Carter and McCoy's percussive, orchestrally sweeping piano. Tyner is in need of new inspiration and not new clothes like **Inner Voices**. His compositions are modular units that are too freely interchangeable. *John Diliberto*

Sound: A— Performance: C+

Edison Lights: Harry Edison
Pablo 2310 780, stereo, \$7.98.

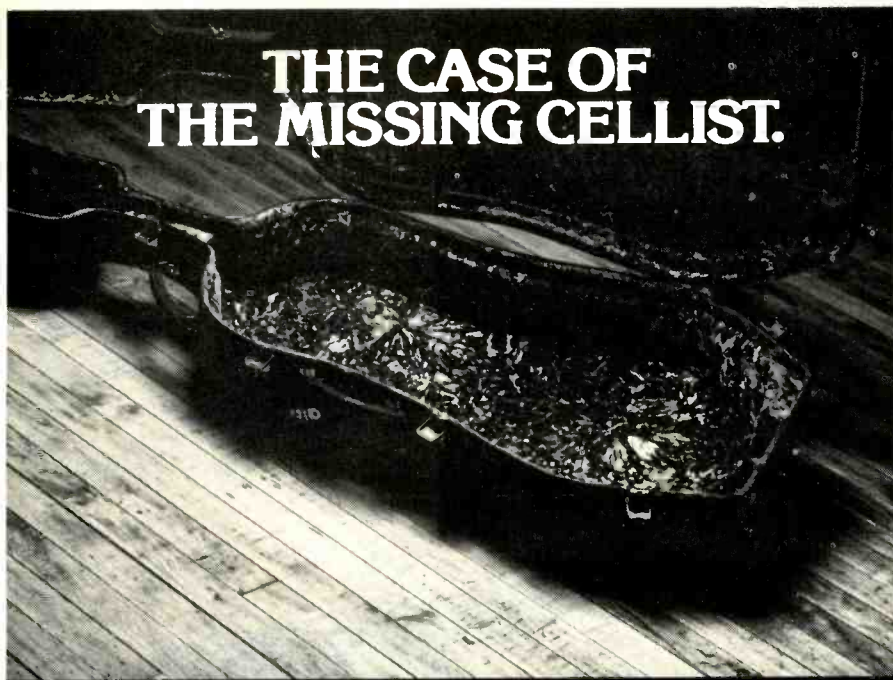
There isn't a great deal to be said for **Edison Lights** — it is a pleasant, sometimes routine mainstream jazz session

that never really heats up — despite the presence of Eddie "Lockjaw" Davis on tenor and pianist Bill Basie himself who turns up on the A side.

Edison, influenced by his many years playing with Count Basie, has evolved a trumpet version of the Count's piano style — musical economy is its outstanding characteristic; solos are often developed as elaborations of a single note. Throughout the eight cuts, Sweets' terse, angular trumpet playing dominates. The two best tracks are a muted Edison on blues called *E*, and a bossa-nova tempo'd *Spring is Here*, in which the taciturn trumpeter receives deft support from the rhythm section of Jimmy Smith, drums; John Heard, bass, and Dolo Coker on piano. The opening title track is built around a banal ensemble figure, while some of the solo work on Side Two, particularly Coker's piano, is cliché'-ridden.

This is the kind of jazz record that, while not standing up to close scrutiny, makes for ideal background music, particularly for a party. Recorded in RCA's Los Angeles studios, it has all of the cleanliness and clarity one has

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learned to expect from current Pablo releases. *John Lissner*

Sound: A

Performance: B

1976: Richard Kamuca Quartet
Jazz 104, stereo, \$7.98.

Drop Me Off in Harlem: Richie Kamuca

Concord Jazz CJ-39, stereo, \$7.98.

When Richie Kamuca died in July, 1977, at 46, his career was, ironically enough, on the upswing. Not only was he a featured soloist with several L.A.-area big bands, his long-dormant role as a recording artist in his own right was being revived through these, his first two albums since the 50s.

Kamuca's tone was light—one might almost call it delicate were it not for the warm huskiness of his ballads and his breathy virility on uptempo tunes. His vibrato was deeply expressive, unmistakably setting him apart from the chilly emotionlessness common to many of his 50s West Coast compatriots. His obvious idol was Lester Young, but the wealth of original melodic ideas Kamuca demonstrated in his repertoire of pop standards marked him as much more than just another Prez emulator.

The quartet album on Jazz is no doubt the best introduction available to the Kamuca style. Ideas flow liberally on *I Concentrate on You*, while *Say It Isn't So* is a masterpiece of simplicity elevated by impeccable timing. *When Day Is Done* has never been my idea of a saucy finger-popper, but Kamuca and guitarist Mundell Lowe draw implications from the theme Paul Whiteman never dreamed were there. Kamuca unexpectedly sings *'Tis Autumn* in a voice so gentle and wispy it reminds me of Astrud Gilberto, of all people.

Lowe is a marvelous foil for Kamuca, comping with close chords spaced with elegant precision, as well as soloing with classic understatement and a matchless touch. Bassist Monte Budwig and drummer Nick Cirello are so poised and compatible, their accompaniments are almost subliminal.

Drop Me Off in Harlem is more unconventional in format, although it often harkens back beyond the swing era for inspiration.

On three tracks, Kamuca is backed by Herb Ellis on acoustic guitar and Ray Brown on bass. Kamuca hints at a bopish Ben Webster on Duke Ellington's swinging title tune, which also has a joyful Django-tinged solo and jaunty rhythm by Ellis, plus firm, fat-toned Brown. Ellis' best guitar work and Kamuca's most sensitive blowing of the album come on *It Must Be True*.

On the other five cuts, Kamuca

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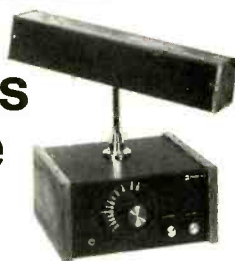
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duets with the anachronistic pianist Dave Frishberg. Kamuca's pretty ballad statements on *I Didn't Know About You* seem to clash with Frishberg's slowly loping 20s rhythm. However, they blend far better on *All Alone* and *Three Little Words* (exceptionally phrased by Kamuca), where Frishberg is in his finest neostride fettle. Best of all is Kamuca's bittersweet rendition of *Harlem Butterfly*, a likeable Johnny Mercer tune with a *deja-vu* air to it.

Concord Jazz focuses more distinctly on Kamuca's breathy tenor, while the Jazz set has a much more alive-sounding rhythm section.

Tom Bingham

Jazz

Sound: B+ Performance: A

Concord Jazz

Sound: B— Performance: A—

The Haunt: Bobby Naughton
Otic 1005, stereo, \$4.50.

The Haunt is a brilliant specimen of textural improvisation at its most concordant. Three masters of the art of spontaneous interaction expertly combine their talents and diverse influences to create music that is dissonant (in terms of conventional tonality, that is) yet euphonious, freely structured yet prudently disciplined. The results should prove accessible to anyone with an ear toward creativity and striking sound combinations, whatever the listener's normal musical preferences.

Bobby Naughton is, no doubt, the most original vibist to emerge since Karl Berger. His formative influences would seem to include Milt Jackson and Walt Dickerson, but Naughton's talent for shaping melodic phrases which take full advantage of the vibes' overtones and sustaining characteristics is entirely unique.

Naughton is joined by two artists whose towering reputations among their peers have yet to be translated into anything resembling popular recognition. Trumpeter Leo Smith, an early associate of Anthony Braxton, has a paradoxical tone — soft-focused, slightly pinched, yet with a brassy bite. Though his conceptions borrow from modern classical brass music, he plays with the spontaneity and phrasing of a first-rate, bop-rooted jazzman. Perry Robinson is, of course, the man most responsible for the return to jazz prominence of the clarinet. His expressive vibrato, polished technique, and admirable ability to extract varied tone colors from his instrument are enhanced by advanced senses of both humor and melancholy.

All three musicians — but Smith and Robinson in particular — are eminent-

ly compatible, meshing together to the utmost degree. The title piece and *Rose Island* contain interaction of an extremely high order — not only are they developed with exceptional logic and gorgeous sonorities, but the component parts sound no less inventive if listened to separately. The dream-like *Rose Island* is also notable for its excellent shifts in dynamics by all three musicians.

Places is a textural exploration in which each artist improvises in turn over quiet, extended contours supplied by the other two. *Ordette*, with its curiously familiar theme, is largely given over to unaccompanied solos by all three participants. *Slant* is the most lighthearted track, with witty Robinson and nonchalant Smith, as Naughton plays with a deceptively child-like simplicity.

All three instruments are well recorded, despite the slightly sharp edge to the tone. Naughton's vibes are mixed somewhat quieter than Smith and Robinson, so that — musical considerations aside — he often sounds more an accompanist than an equal partner. Alas, the noisy pressing is very intrusive.

Available from Otic Records, Southbury, CT 06488. Tom Bingham

Sound: B— Performance: A+

Voice: Julie Tippetts, Maggie Nichols, Phil Minton, & Brian Ely
Ogun OG110, stereo, \$8.98.

It would take those jazz anarchists that populate the catalogue of Ogun records to come up with an album of unaccompanied vocal quartet performances. But while these people are dedicated to the most intuitive forms of jazz improvisation, this album, with its unique instrumentation, is the most structured one to be released by them. The results were earlier intimated on the album by Keith Tippett's *Centipede*, **Septober Energy** (now out of print) which featured five vocalists including Julie Tippetts (formerly Driscoll) and Maggie Nichols.

Voice is a series of vocal impressions which grow out of three- or four-part harmony sections. Using wordless, nonsense, and scat syllables for the rhythms and percussive melodies, it runs a range of emotions from joyfulness, to mourning, wistfulness, and absurdity. *Singing Wood* goes through sections of laughing, argument, conversation, and screeching.

None of the vocalists are perfectly attuned to each other in the classical sense which brings an earthy feeling from the most complicated sections. This rough-hewn effect is furthered by the recording which is done live and

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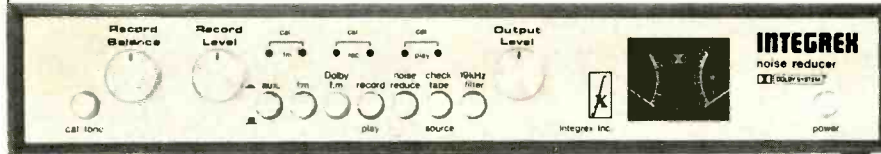
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employs no echo or reverberation as vocal pieces often do. *John Diliberto*

Sound: B+

Performance: A-

Raps: Steve Lacy
Adelphi AD 5004, stereo, \$7.98.

Raps comes to us from the edges of coherency. Steve Lacy and his European quartet travel on the brink of nodding out but instead cut a harsh, jagged line between a bleak reality and a vacant numbness. His tune consist of three- and four-note phrases repeated in a twisted parallel fashion by Lacy on soprano sax and Steve Potts on alto and soprano. While always in unison, they are never in harmony. They are bobbed along by an undercurrent of Oliver Johnson's constantly circling drums and Ron Miller's strumming, lachronic bass.

Lacy is one of the few masters of the soprano sax, his only instrument. He never exploits it for its Eastern tones but tightly controls it for tortured squeals and trills. Like Albert Ayler, he and Steve Potts trace their lineage to Sidney Bechet rather than John Coltrane. They frequently recall Dixie funeral marches in their solos and duets. On the intensely melancholy *Stamps* they weave around each other like sorrowful drunks, gradually picking up pace to a spirited free chase. *The Throes* begins with a marching rhythm and reveille styled horns.

This is Lacy's first U.S. recording since his self-imposed exile in 1965. It immediately sets him apart from the current group of avant-garde musicians in New York, where this was recorded, and his contemporaries from over 15 years ago, as a unique, slightly deviant, slightly humorous and very intense artist. *Raps* is a fill-free document, recorded with no production except that necessary to reproduce Lacy's music on vinyl. *John Diliberto*

Sound: B+

Performance: A-

Tristan and Iseult: Christian Vander
Barclay 80.528 (import), stereo, \$8.98.

Christian Vander is the leader of one of the few unique musical conceptions of this era. In the vehicle of a group called Magma, he is into the seventh of a projected nine-album epic opera entitled "Theusz Hamtaahk," which details the decline of earth's civilizations and the colonization of the planet Kobaia by a group of utopians. Most of the opera is loosely involved with the Kobaian's attempts at spreading their utopian philosophies.

On a literal level it's very hard to follow. Vander, who is French, has rendered language barriers irrelevant in understanding his story. He has done

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this by creating a language which no one understands. All the lyrics and most of the notes of "Theusz Hamtaahk" are sung, chanted or written in Kobaian, a language for which Vander has infrequently provided translation since the third album **Mekanik Destruktiw Kommandoh**.

Tristan and Iseult is the fourth album of the epic. Though recorded in 1974, it has only recently surfaced. While easily distinguishable from the rest of the recordings, it is also of a piece with the series. Vander borrows heavily from the works of Stravinsky in his dynamics, rhythms, and vocal arrangements. The bass of Jannik Top locks with Vander's drums like two demonic juggernauts. They thrust out relentless rhythms which are directed by Vander's pounding piano.

Like **Mekanik Destruktiw Kommandoh**, this is largely a vocal work. The three vocalists, Christian Vander, Stella Vander, and the outrageous Klaus Blasquiz, sing the Kobaian lyrics in a dramatic operatic style which combines dialogue with chanting recitations. Blasquiz moves from baritone or falsetto into a scating maniac at will and often has exchanges with himself.

Tristan and Iseult has a religious fervor resulting from the constant chanting which is like Tibetan Buddhism in intensity. But despite the driving rhythms and frequent changes, Magma never slips into droning or hypnotic patterns.

The recording quality of Magma records varies but **Tristan and Iseult** has brilliant reproduction. The excellent recording, mix, separation, and definition of the instruments and voices coupled with Vander's peculiar arrangements make this quartet sound almost orchestral in scope.

John Diliberto

Sound: A Performance: A

Pioneers of the Jazz Guitar

Yazoo L-1057, mono, \$7.98.

Pioneers of the Jazz Guitar is an exceptional anthology of acoustic guitar solos and duets from the 1920s and 30s by several early masters of the art.

Any collection of jazz guitar pioneers would have to pay homage to the recognized inventor of the style, Eddie Lang. Yazoo recently devoted a full album (**Jazz Guitar Virtuoso**) to Lang's diverse, though tragically truncated career, thus accounting for the absence of Lang solo features on the present album. **Pioneers** does include a duet, *Feeling My Way*, in which Lang plays poignant melodies over warm chording by Carl Kress. Also included are three of the legendary couplings of Lang with blues guitarist Lonnie John-

son. If one wishes to quibble over categories, these may be closer to blues than to jazz; it's great to have them readily available in any event. *Handful of Riffs* and *Hot Fingers* are up-tempo stomps, with Johnson happily dancing and bending notes over hot, bouncing Lang chords. The third selection is a slow blues with Johnson and Lang sharing the lead.

Well-known vaudeville and film star Nick Lucas is heard in two solos with piano accompaniment. Though best known as a crooner, Lucas was a highly adept and entertaining ragtime guitarist, if perhaps a bit heavy with the pick.

The three duets of John Cali and Tony Guttuso are, for this observer, the most revelatory tracks. Cali enjoyed a long career as a tenor banjoist, while Guttuso arranged for Major Bowes. Their pairing as guitarists was, to say the least, propitious. Their technical facility and high level of inventiveness are a joy to hear, the complex interplay between their intricate parts is simply amazing, and their choice of colorations and textures is indeed inspired. The higher-pitched guitarist (presumably Guttuso) often resembles an acoustic Les Paul, while the second guitarist moves between rhythmic and contrapuntal roles with taste.

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Carl Kress and Dick McDonough's treatment of the pop standard, *Heat Wave*, is one of the great duets of the 30s, with catchy rhythms, skillfully intertwined timbres, striking harmonies, and inventive single-string breaks. Their *Stage Fright* starts out as a novelty rag, then goes through several changes, including an exquisite ballad section. McDonough is also heard in a mirthful duet, *Dick Bernstein Ramble*, with a full-bodied bassist (unidentified; could it perhaps be Artie Bernstein?), as well as an imaginative chordal-melody solo, *Chasing a Buck*.

Despite generous helpings of surface noise on the 78s used for transfer,

the sound is much clearer and cleaner than you'd expect. The original engineers did an expert job of capturing the close-knit counterpoint of the duets, with every note and chord easily audible. Only the piano accompaniments on the Nick Lucas cuts are obscured, hardly a fatal loss.

Available from Yazoo Records, Inc., 245 Waverly Place, New York, NY 10014.

Tom Bingham

Performance: A- to A+

High Places: Walter Zuber Armstrong World Artists WA 1003, stereo. \$6.98.

Most jazz bass clarinetists have tak-

en their cue from Eric Dolphy and treated the instrument like a wayward saxophone. Walter Zuber Armstrong, on the other hand, emphasizes the rich woodwind qualities of its timbre, with a deep, full-bodied tone that displays a well-formed vibrato.

Armstrong's abundant melodic conceptions on side one of *High Places* (a 41-minute piece which takes up the entire album) are couched in a classical grace, with a feeling of tradition and permanence, as his probings approach an almost-Japanese meditateness. He weaves around the instrument, taking full advantage of the many colorations inherent in the bass clarinet's various registers. His long phrases are relaxed and limpid, while incorporating all manner of twists and turns that remain pleasingly harmonious without being bound to any identifiable tonality.

On side two, Armstrong switches to contrabass clarinet, an ungodly monster with a sardonic, flatulent tone, like a tuba being strangled to death. Accordingly, his improvisations are sassier, disclosing a sharp-tongued wit, more defiant and, consequently, less euphonious than on side one. After he returns to bass clarinet, the derisive mood continues with spirited humor, though it gradually gives way to the melodic temperament of side one, though this time with a more resolute, less reflective demeanor.

Armstrong's lone accompanist, Paul Plimley, belongs to the ECM school of pianists spawned by Keith Jarrett. On side one, he demonstrates a steadfast, yet delicate touch, an impressionistic sense of visual melodicism, and a quasi-Oriental flow to his airy rhythms. He provides a rarefied cushion for the bass clarinet while setting up harmonic possibilities for Armstrong to investigate. On side two, Plimley follows Armstrong's example by shifting to a more dissonant approach, relying on sarcastic repeated figures and dark-hued, disjointed rumblings. Midway through side two, Plimley takes his only solo, a grotesquely distorted Iberian landscape astutely developed around spastic irregular meters.

Armstrong is beautifully recorded, with a sumptuous luster to the bass clarinet and a suitably harsh edge to the contrabass model. Plimley, however, tends to be relegated too far into the background for my taste. Pops and general surface noise, while not inordinately excessive, become intrusive on the softer passages of side one.

Available from W.Z.A. Record Productions, P.O. Box 1378, Bellingham, WA 98225.

Tom Bingham

Sound: B Performance: A—

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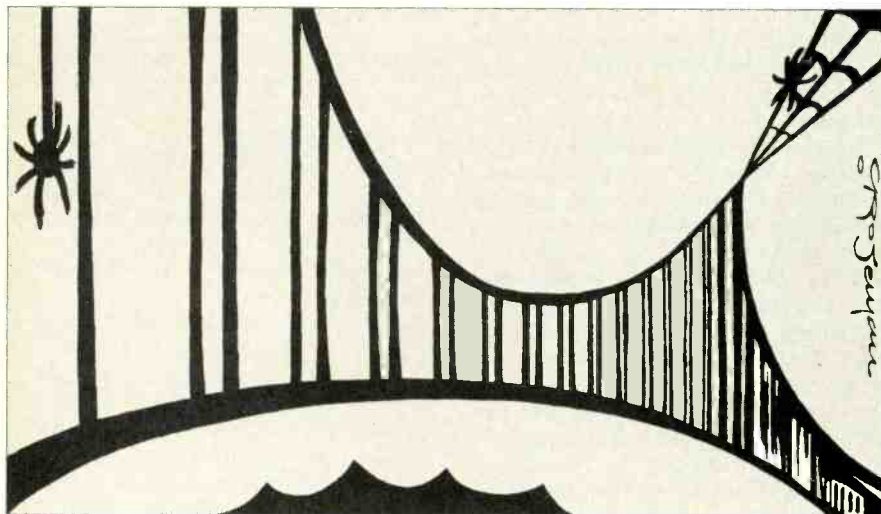
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Spider Bridge

Revonah RS-927, stereo, \$5.98.

Boston has been one of the major Northern centers of bluegrass for a good 20 years or more, producing such stellar ensembles as the Charles River Valley Boys, Joe Val and the New England Bluegrass Boys, and more recently the innovative newgrass band, Northern Lights. To this impressive list can be added the little-known — for now, at least — Spider Bridge.

Spider Bridge has obviously been influenced by Al Wood. Not only do they do two of Wood's songs — *Sing Me a Bluegrass Song*, which is rapidly becoming a standard, and the instrumental *Hombre* — but their tightly knit ensemble sound parallels Wood's "mainstream" approach, retaining the spirit of traditional bluegrass without rejecting the pre-newgrass progressive elements which entered the music during the 60s.

The quintet's most impressive musician is Jon Verdun, a facile banjo picker who rightly credits Boston luminary Don Stover as his major influence. Verdun's technique is so clean and his style so fluent, it almost slips right past you — hear *Blue Ridge Mt. Blues*, *Hamilton Country Breakdown*, and *Black Diamond*. Verdun also composed *Kennebec Ramble*, a hearty instrumental featuring excellent flat-

picked guitar by Ben Robertson, who also stands out on *Hombre*.

Ted Hilliard is a crisp mandolin accompanist who shows some good solo ideas (especially on the album's five instrumentals), played with a very staccato, high-pitched tone. Kentucky-bred Jack May has that despondent "lonesome fiddle" sound which is fast disappearing from bluegrass. Listen as he mournfully sweeps over the ensemble with extended double-stops on the beautiful *Legend In My Time* and the midtempo *No Sunshine Anymore*. May also solos in a very natural, blues-drenched style all his own.

The singing is considerably better than most Northern traditionalist bands. The leads (by Robertson and Verdun) are highly competent and confident. And even though their voices are recognizably urban, fortunately they're unsophisticated enough to pull off the distinctively blended "mountain" harmonies of songs like *Five Days of Heaven* and *No Sunshine Anymore*. *Who Will Sing For Me* is a strong gospel performance with rugged harmony and a flowing May fiddle break. The best vocal, though, comes on John Duffy's sorrowful *Victim to the Tomb*, particularly on the Seldom Scene-like chorus.

The recording is clean but distant. Even at loud volumes, the vocals seem

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far away, thus robbing the music of much of the impact it should have. Moreover, Bob Cain's bass is barely audible.

Write to Revonah Records, Box 217, Ferndale, NY 12734. Tom Bingham

Sound: C Performance: A—

The Barley Grain For Me: Margaret Christl and Ian Robb
Folk-Legacy FSC-62, stereo, \$6.98.

Margaret Christl and Ian Robb are English-born folk revivalists now living in Canada. **The Barley Grain For Me** is an exceptional collection of Canadian folksongs which made a similar trans-Atlantic journey, having been brought to Canada by English and Irish settlers.

Though Christl and Robb get top billing, this is in reality a trio album, as instrumentalist/harmony vocalist Grit Laskin's contributions are as important to the album's unqualified success as the strong lead vocals and the consistently first-rate material. Indeed, the accompaniments by Laskin and Robb are models of tact, economy, and suitability, dressing up what originally were unaccompanied songs without sacrificing their traditional character. Listen to Laskin's doubling of the melodies of *Campbell, the Drover and Jack*, the *Cow Boy* on a long-neck mandolin (lower-pitched than the standard mandolin), as well as his lovely framing of *Hard Times* and *By the Hush* on guitar. Robb is a sturdy concertina player, while his dulcimer is skillfully balanced with both his voice and Laskin's guitar on *Oh, No, Not I*. Likewise, Robb's concertina and Laskin's dulcimer are enchantingly blended on *The Foggy Dew*.

Robb's vocal approach is reminiscent of Lou Killen. Not only are their accents and phrasing similar (hear *The Banks of Newfoundland*), but Robb sings with the same feeling, verve and lyric sense, though he's much less intense than Killen.

Christl has a hearty, robust voice, with stylistic models who would seem to include Peggy Seeger and, to a far lesser extent, Frankie Armstrong. She has an emotional vibrato and well-developed sense of dynamics and pacing, along with a snapping embellishment that's quite intriguing.

The only songs the average listener would likely be familiar with are *Save Your Money While You're Young* and *The Foggy Dew*, though the latter is presented in a variant which is not only more explicit than the popular version, but has a happy ending. The rest range from the rustic humor of *Campbell, the Drover* and *The Weaver* to the period social commentary of

Hard Times and *By the Hush*, plus several tunes concerning the short-lived joys of dalliance. The *a cappella* title track, with a rousing chorus in three-part modal harmony, is most unusual, as it recounts the brewing process from the grain's point of view!

Robb's lead vocals and Laskin's mandolin are mixed more prominently than Christl's leads and the other instruments. The guitar in particular is quite distant in relation to the voices. Available from Folk-Legacy Records, Inc., SharonConn. 06069. Tom Bingham

Sound: B— Performance: A

American Stranger: Happy Traum
Kicking Mule KM-301, stereo, \$7.98.

An exceptional album. **American Stranger** is Happy Traum at his best. He is a superb guitarist, capable of nearly anything on an acoustic guitar. His singing depends on the love he has for his songs, and when he is as relaxed as he is in this set, he is marvelous. What support musicians there are, are good friends from the Woodstock community where Happy lives. They are used sparingly and to specific ends in order to be true to the songs.



An important element to how lovely **American Stranger** is, is the setting in which it was made. The studio, Woodstock Sound Studio, is actually engineer Andy Robinson's home.

The selections are a cross-section of Happy's influences. There is the hymn *I'll Fly Away*, the Dylan song *Buckets of Rain*, Leadbelly's *When I Was a Cowboy*, the Bahamian *Delia's Gone*, Merle Travis' *I Am A Pilgrim*, a stunningly beautiful Irish air *Sheebeg and Sheemore* plus several varied traditional American tunes. These last include the fiddle tune *The 8th of January* which was used as the tune for *The Battle of New Orleans*, a true cowboy song *Doney Gal*, a blues in *Dark Road Blues* and the title ballad. Finally there

is Happy's own *Golden Bird*, a recording of a song he first recorded with his brother Artie Traum. The new version is the finest piece on the album, a song whose magic is at the core of Eric Andersen's passionate liner notes.

American Stranger is a portrait of a man and music he loves dearly. The love spills over contagiously.

Michael Tearson

Sound: A Performance: A

Oba Koso: Duro Lapido
Kaleidophone KS-2201, stereo, two records, \$13.98.

Oba Koso is a stunning theater work combining drama, music, and dance in a recounting of the story of the great Yoruba thunder-god, Shango. Written in 1963 by Nigerian playwright-composer-actor Duro Lapido, this "dance drama" (as it's labeled here) was recorded in Washington during the Duro Lapido National Theatre's 1975 American tour.

Although Lapido is a professional artist who was exposed to Western music early in life, **Oba Koso** contains virtually nothing in the way of Western artifice or embellishment. Interspersed as they are among time-honored Nigerian themes, rhythms, and instrumental patterns (derived from Yoruba festival music), Lapido's own compositions are every bit as genuine and traditional sounding as any scholarly field recording. Indeed, it would probably take a trained expert to differentiate Lapido's new material from the old (I know I can't!). But the power, continuity, unity, and artistry Lapido brings to what had previously been disconnected shreds of Yoruba culture and legend results in a totally absorbing and entertaining theatrical event, whose appeal extends far beyond the specialist audience normally reserved for traditional African music.

The orchestra for the dance-drama consists primarily of three types of drums: *igbin* (log drum), *dundun* ("talking drum," with variable pitch), and the two-headed *bata*, which is easily distinguished by the high, brittle snap of the smaller head, sounding rather like bongo drums. The drums are augmented on occasion by *sekere* (a sort of oversized-beanbag rattle) and *agogo* (the Nigerian equivalent of cowbells, it would appear). The only melodic instrument is the *toromogbe* gourd flute, heard in one brief segment here.

If this almost total reliance on percussion sounds forbidding, rest assured that the dramatic choral melodies and the kinetic, quasi-musical recitatives keep **Oba Koso** from degenerating into an over-indulgent rhythm

extravaganza. Moreover, the music's continuous shifts in tempo, rhythm, texture, and dynamics, combined with the sheer energy, galvanic vigor, and cohesive strength of the ensemble insure that interest never sags throughout the play's 1¼-hour length.

The recording is exceptional, fully communicating the music's power, spontaneity, and vitality. The drums are recorded with a bone-rattling potency that can transform a mundane set of headphones into a teeming alive Yoruba village. The vocals are recorded more from an audience perspective, but are hardly less effective. Play it loud for maximum impact. The surface, alas, is not of the same high standards. Excellent liner notes. Available from the Traditional Music Documentation Project, 3740 Kanawha St. N.W., Washington, D.C. 20015.

Tom Bingham

Sound B: Performance: A+

I'm So Glad: Fantastic Family Aires
Gospel Roots GR 5004, stereo, \$6.98.

Chicago's Fantastic Family Aires is a decidedly "progressive" gospel group. However, unlike too many modern gospel artists who are more concerned with making glossily pretty surface music than with expressing their religious beliefs with feeling and conviction, the Family Aires sound sincere and committed even at their most restrained.

As with many contemporary gospel groups, the Family Aires are often stylistically closer to secular soul-music than to "traditional" gospel. *I've Been Born Again* and *The Color of God* could easily be soul hits if the religious aspects of the lyrics were removed, while *Pictures On the Wall* and *Somewhere In This World* are closer to the soul-influenced "Jesus music" of Andrae Crouch and the Disciples.

The group's vocals strengths are best displayed, though, on the more tradition-oriented material. *Movin' On Up*, *Everlasting Fire*, and *How I Found the Lord* are excellent uptempo quartet-style numbers, bringing to mind a jazz-soul adaptation of the Swanee Quintet. The album's highlights, however, are *I'm So Glad* and *Troubled Mind*, both bluesy songs featuring a melismatic baritone lead.

While *I'm So Glad* isn't always what you'd call an exciting gospel record, it's a definitely worthwhile effort by a group that should be heard from often in the future. Gospel Roots is a subsidiary of I.K., the disco giant, so this album should be easy to find.

Tom Bingham

Sound: C+ Performance: B+

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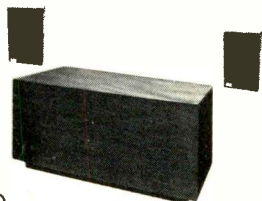
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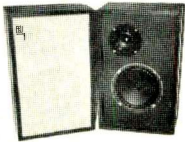
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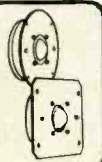
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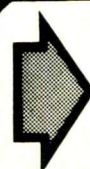
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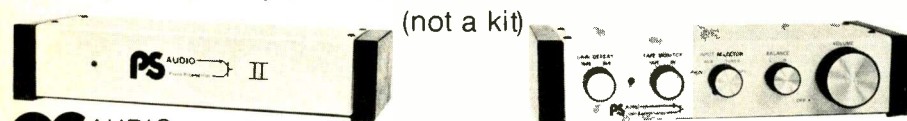
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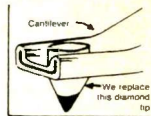
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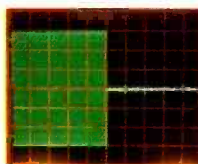
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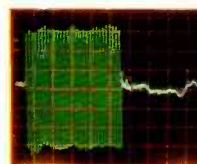
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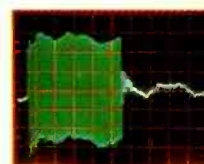
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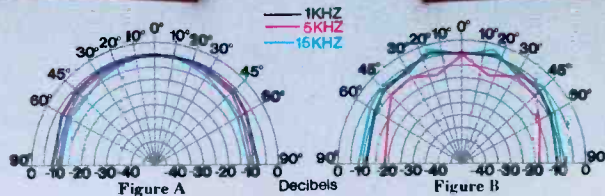
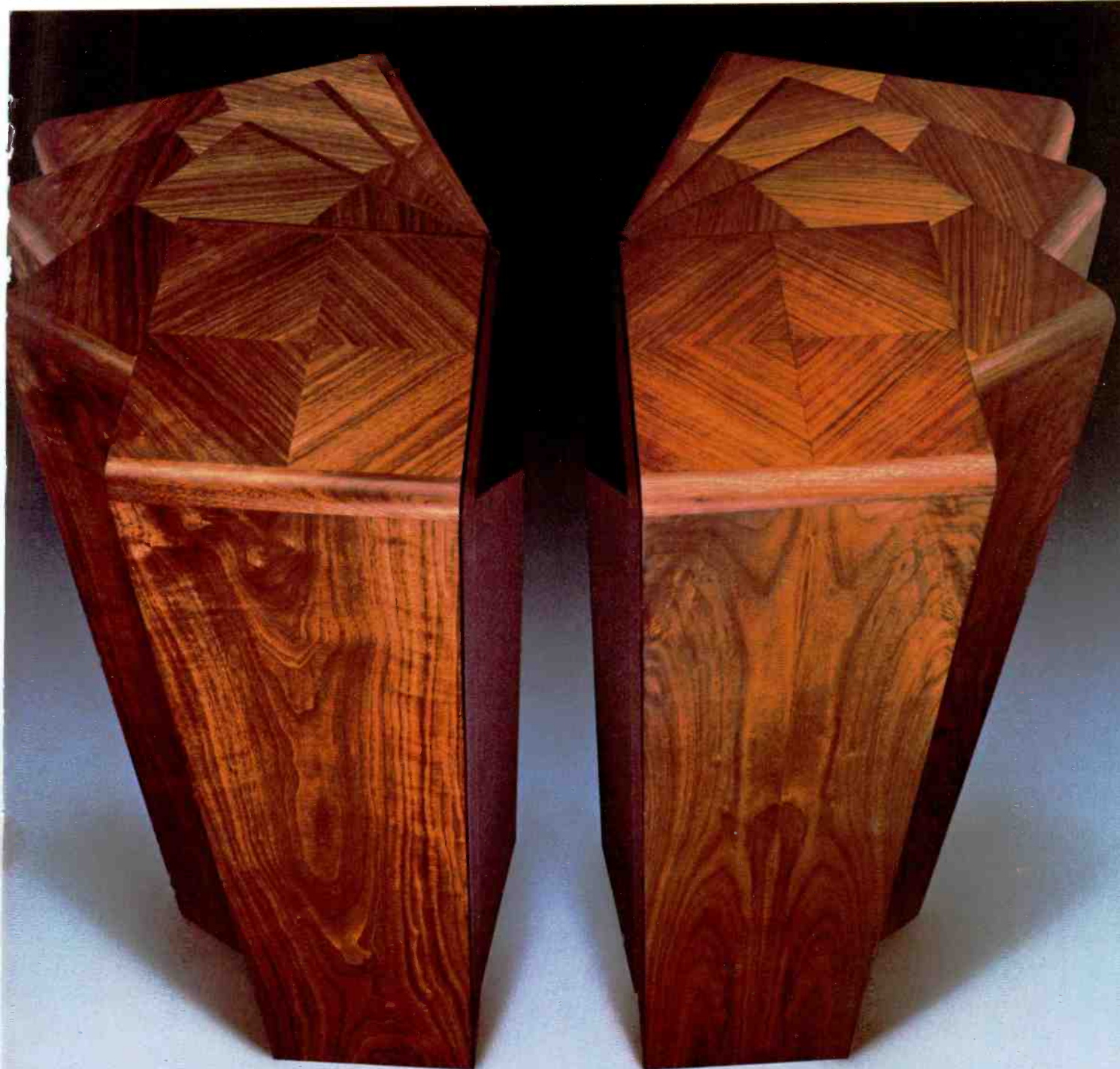
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