

Audio

E.H. Scott
- Stradivarius
of Radio

THE AUTHORITATIVE MAGAZINE ABOUT HIGH FIDELITY • FEBRUARY 1979 \$1.25

47425 


An Amp
Strapping Circuit


A Stepped
Volume Control

H
A
D
U0296146 1082 80802021P8202232
MR WILLIAM W KAYSER
424 E GILPIN AVE
NORFOLK VA 23503

through
Windows



PIONEER BUILT IT SOONER.

D, DUAL CAPSTAN CASSETTE DECK THAT OFFERS E-DOLBY, A DIGITAL BRAIN AND BIASING BY EAR.

control what you monitor.

The CT-F900 allows you to bias by ear. Which means you have almost as much control over your tape deck as you would over any other musical instrument.

By simply switching between the Source and Tape monitors and adjusting your bias control, you can make sure that what comes out of your cassette deck is as clean and crisp as what went into it.

FEATURES OTHERS DON'T EVEN OFFER.

These are just a few of the features that will soon change the face of all

cassette decks. The CT-F900 also offers features like a double Dolby® noise reduction system that eliminates noise in both record monitoring and playback. And reduces tape hiss to -64 dB. Solenoid push button controls that give you direct function switching so you can go directly from one mode to another without damaging the tape. A two motor, dual capstan drive system that gives you stable head contact, constant tape movement, and an inaudible 0.04% wow and flutter. And circuitry that lets you hook the CT-F900 to an external timer so you can make recordings even when you're not there.

Obviously, all that went into the

CT-F900 sounds impressive. But it's not half as impressive as what comes out of it.

Given all this, it's not surprising that sooner or later all cassette decks will be built along the lines of the CT-F900.

But even then there will be that fine line that has always separated Pioneer from the competition.

Value.

PIONEER®
We bring it back alive.

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High Fidelity Components,
85 Oxford Drive, Moonachie, N.J. 07074

Wood cabinet optional.



SOONER OR LATER,
ALL CASSETTE DECKS
WILL BE BUILT
ALONG THESE LINES.

Innovation is nothing new to Pioneer. We were the first to introduce the high power receiver. Sooner or later everyone followed.

We were the first to create the front loading cassette deck. And the first with a quartz lock loop turntable that was as easy on the budget as it was on the ear. Again, our competition had no alternative but to follow.

So now that Pioneer introduces the CT-F900, we expect that soon there'll be a few rushed-through imitations that have our look. But not our value.

This is no small coincidence. And it's nothing we're unaccustomed to. It's a simple case of follow the leader.

A METERING SYSTEM AS FAST AS THE SPEED OF SOUND.

Conventional cassette decks are all plagued with the same problem. Either they have slow to react VU meters that give you average readings or slightly more advanced LED's that give you limited resolution.

Pioneer offers a better resolution. A Fluroscan metering system that's so fast and so precise, it provides a more accurate picture of what you're listening to.

It covers the range of -20 dB to +7 dB in 20 easy-to-read calibrations. And while other meters may work within that same range, in terms of precision they're not even in the same neighborhood.

The CT-F900 has a Peak Button that lets you register all the peaks in the incoming signal. And lets you register an unheard of level of harmonic distortion. Less than 1.3%.

A Peak Hold Button that retains the highest peak level in each channel. So you can record at the highest level possible without fear of overload.

And an Average Button that makes the Fluroscan meter respond like an ordinary level meter.

A DIGITAL BRAIN WITH AN INCREDIBLE MEMORY.

All cassette decks have tape counters. Even the most respectable ones have mechanical counters you can't really count on.

Pioneer's designed the most precise electronic way of keeping track of your tracks.

As the take up reel rotates, pulses are fed to a microprocessor which provides a three digit readout on an electronic tape counter.

The terminology may be difficult to understand, but the benefit of all this is simple. Precision. Dependability. And convenience.

Many of these "better" cassette decks also claim they have advanced memories. But there are functions that even the best of them haven't been programmed to remember.

The CT-F900 has the first electronic memory of its kind that performs four different functions.

Memory Stop automatically stops the tape wherever you select. Memory

ONCE AGAIN, PIONEER

THE CT-F900. THE FIRST 3-HEAD FLUROSCAN METERING, DOUBLE

Play rewinds the tape to this spot and then automatically goes into the play mode. Counter Repeat rewinds the cassette when the end of the tape is reached. Then begins replaying the tape wherever you want it to begin. End Repeat automatically rewinds the tape. And then replays it from the beginning for endless listening.

WE'RE HARD HEADED, BUT SENSITIVE.

Every audiophile will agree that to achieve professional quality recording, three heads are better than two.

And while you can expect three heads from most reputable cassette

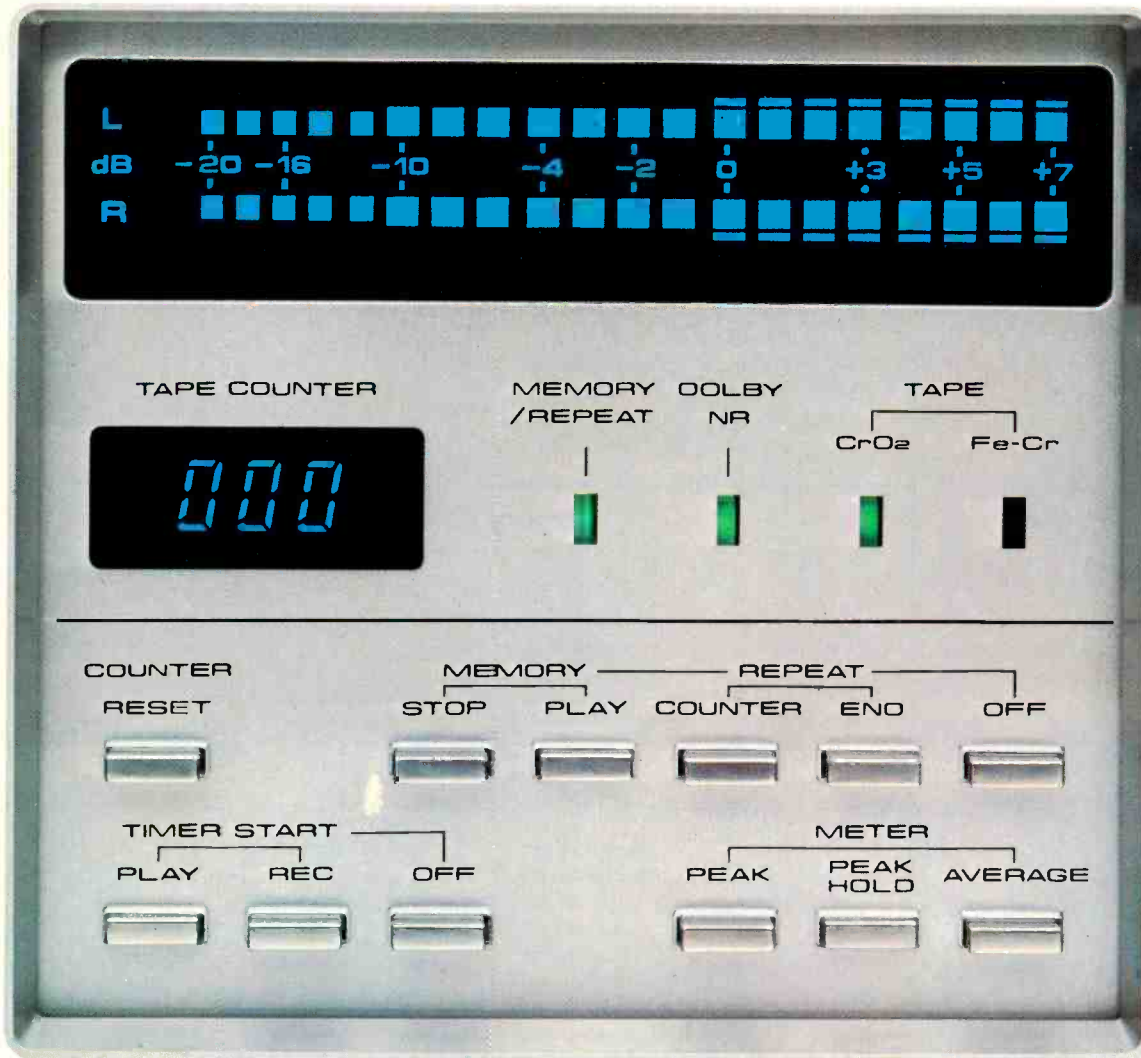
decks, you can also expect that they're either made of ferrite or permalloy.

The CT-F900 has recording and playback heads made of a newly developed Sendust Alloy. This remarkable bit of technology gives you higher frequency response (20-19,000 Hz.) and lower distortion than ferrite. And better wear-resistance than permalloy.

BIASING BY THE MOST SOPHISTICATED AUDIO EQUIPMENT KNOWN TO MAN. HIS EARS.

While many of today's "equipped" cassette decks let you monitor during recording, what they don't do is let you





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Suddenly you can hear

"MC" cartridge systems are inherently linear, inherently musical, inherently Denon.



103S—Modified elliptical reference for two and four channel material. Suddenly you can hear.



103D—The newest, most perfect Denon cartridge. Special cantilever and elliptical stylus plus lower mass allow the 103D to reproduce music otherwise heard only at recording sessions.



103T—A combination offer of matched Denon transformer and the famous 103C cartridge. The most economical way to hear with moving coils.

If you would like to hear more, go to your franchised American Audioport dealer. Listening is convincing.

American Audioport, Inc.
1407 N. Providence Rd.
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February 1979

Vol. 63, No. 2

Audio

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

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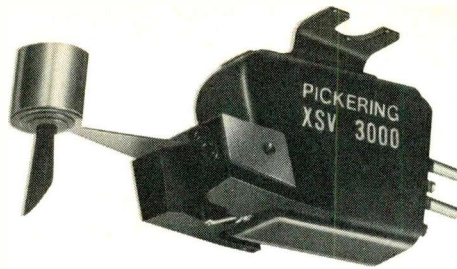
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About the Cover: You don't need a welding outfit to make a powerful amplifier; see Marshall Leach's article on page 40 on how to do it the easy way.

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The XSV/3000 is the source of perfection in stereo sound!

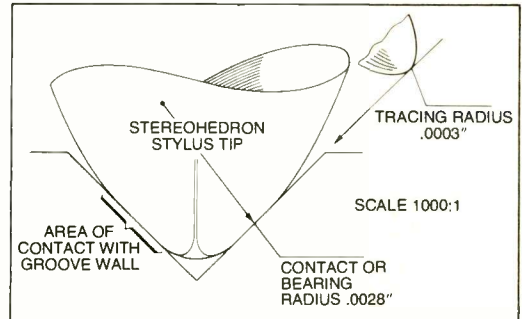
Four big features ... all Pickering innovations over the past 20 years ... have made it happen.

1976: Stereohedron® This patented Stylus tip assures super traceAbility™, and its larger bearing radius offers the least record wear and longest stylus life so far achievable.

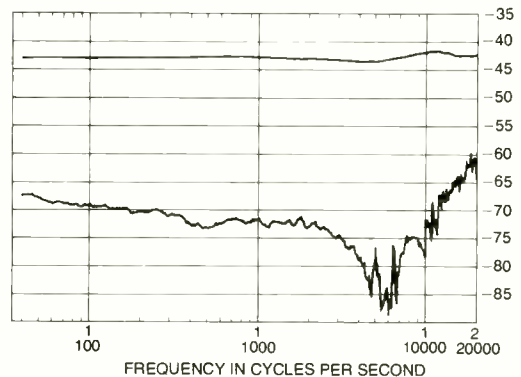
1975: High Energy Rare Earth Magnet Another Pickering innovation, enabling complete miniaturization of the stylus assembly and tip mass through utilization of this type of magnet.

1968: Dustamatic® Brush This Pickering patented invention dynamically stabilizes the cartridge-arm system by damping low frequency resonance. It improves low frequency tracking while playing irregular or warped records. Best of all, it provides record protection by cleaning in front of the stylus.

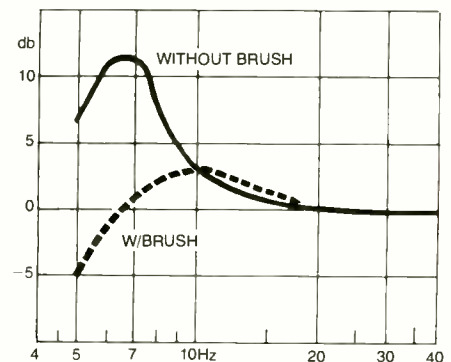
1959: Record Static Neutralizer The patented V-Guard Record Static Neutralizer has been a feature of all Pickering cartridges since 1959. It eliminates electrostatic dust attraction at the stylus and discharges record static harmlessly into the grounded playback system.



1. Technical drawing of the Stereohedron shape.



2. Typical frequency response and channel separation curves of the XSV/3000.



3. Damping effect on tonearm resonance.

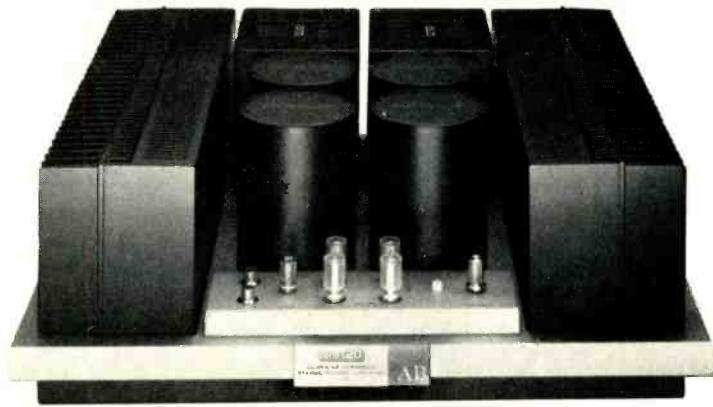
4. V-Guard Static Neutralizer, "Where the Stylus meets the groove."



For further information write to Pickering & Co., Inc., Dept. A, 101 Sunnyside Blvd., Plainview, N.Y. 11803

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McIntosh might be considered an expensive extravagance by the average high fidelity consumer. However the true audiophile perceives reliability, proven engineering and classic styling as necessities rather than luxuries.

The true audiophile also appreciates outstanding specs and the state of the art technology that distinguishes Series 20 from the field.

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Consider the Series 20 F-26 FM Tuner's parallel balanced linear detector that delivers the lowest distortion available.

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Please send me the specs for the following circled Series 20 components.

M-22 Class A-Stereo Power Amplifier	D-23 Multi-AMP Elec. Crossover Netwk.	C-21 Stereo Preamplifier
F-26 Advanced Quartz FM Tuner	A-27 Class AB Integrated Stereo Amplifier	M-25 Class AB Stereo Power Amplifier
PL C-590 Quartz PLL Servo- Controlled Turntable	PA-1000 Carbon Fiber Tone Arm	F-28 Quartz FM Tuner
		U-24 Program Source Selector

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Appletree	Champaign, IL	Listen-Up	Evergreen, CO
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Appletree	Mapleville, IL	Pro Audio	Sioux Falls, IA
Appletree	DeKalb, IL	Sights & Sounds	Chicago Heights, IL
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Back Door Stereo	Atlanta, GA	Team Electronics	Sioux City, IA

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Audio

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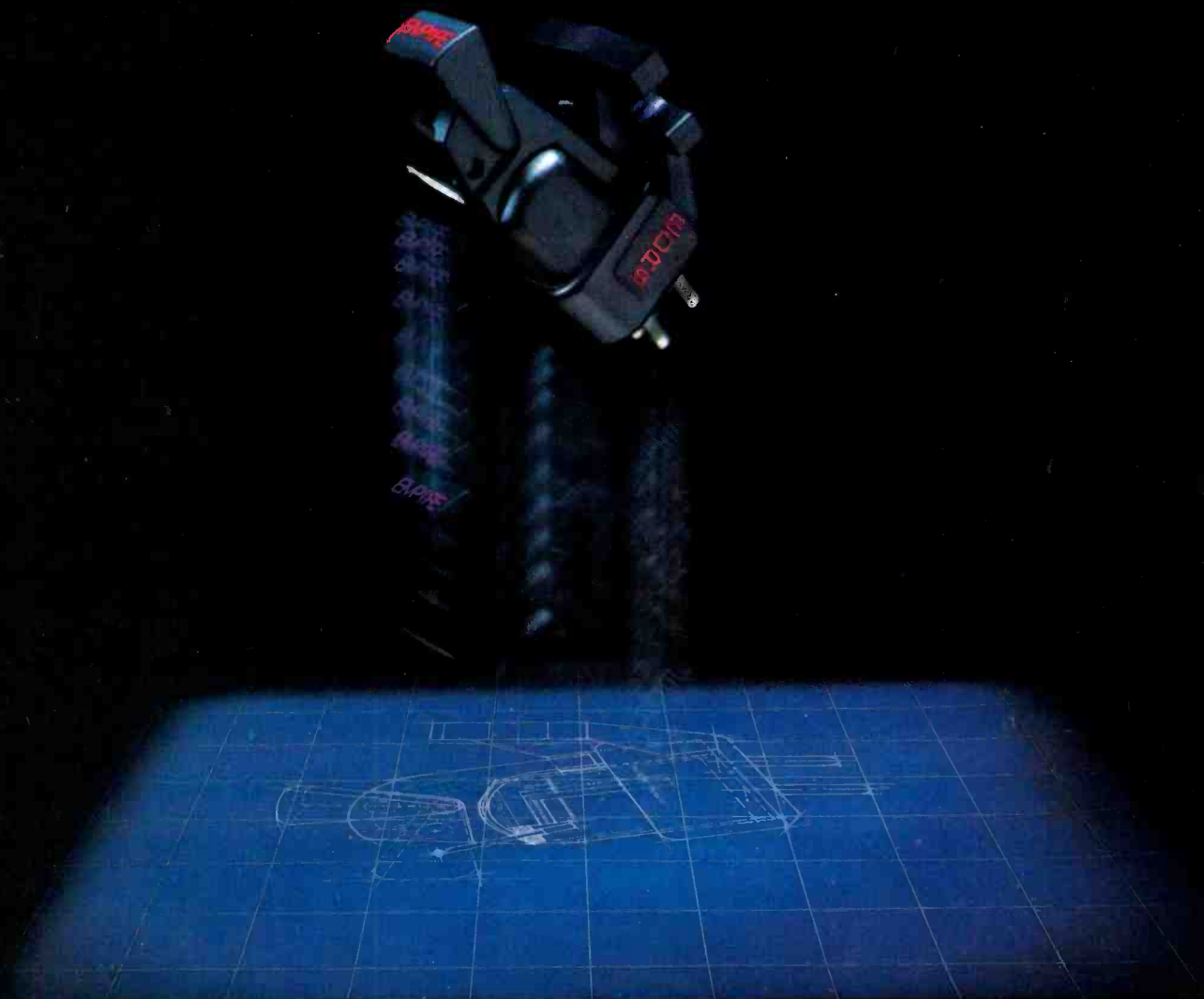
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INTRODUCING THE EMPIRE EDR.9 PHONO CARTRIDGE. IT SOUNDS AS GOOD ON A RECORD AS IT DOES ON PAPER.

It was inevitable . . .

With all the rapid developments being made in today's high fidelity technology, the tremendous advance in audible performance in Empire's new EDR.9 phono cartridge was bound to happen. And bound to come from Empire, as we have been designing and manufacturing the finest phono cartridges for over 18 years.

Until now, all phono cartridges were designed in the lab to achieve certain engineering characteristics and requirements. These lab characteristics and requirements took priority over actual listening tests because it was considered more important that the cartridges "measure right" or "test right"—so almost everyone was satisfied.

Empire's EDR.9 (for Extended Dynamic Response) has broken with this tradition, and is the first phono cartridge that not only meets the highest technological and design specifications—but also our

demanding listening tests—on an equal basis. In effect, it bridges the gap between the ideal blueprint and the actual sound.

The EDR.9 utilizes an L. A. C. (Large Area Contact) 0.9 stylus based upon—and named after—E. I. A. Standard RS-238B. This new design, resulting in a smaller radius and larger contact area, has a pressure index of 0.9, an improvement of almost six times the typical elliptical stylus and four times over the newest designs recently introduced by several other cartridge manufacturers. The result is that less pressure is applied to the vulnerable record groove, at the same time extending the bandwidth—including the important overtones and harmonic details.

In addition, Empire's exclusive, patented 3-Element Double Damped stylus assembly acts as an equalizer. This eliminates the high "Q" mechanical resonances typical of other stylus assemblies, producing a flatter response, and lessening wear and tear on the record groove.

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We could go into more technical detail, describing pole rods that are laminated, rather than just one piece, so as to reduce losses in the magnetic structure, resulting in flatter high frequency response with less distortion. Or how the EDR.9 weighs one gram less than previous Empire phono cartridges, making it a perfect match for today's advanced low mass tonearms.

But more important, as the EDR.9 cartridge represents a new approach to cartridge design, we ask that you consider it in a slightly different way as well. Send for our free technical brochure on the EDR.9, and then visit your audio dealer and listen. Don't go by specs alone.

That's because the new Empire EDR.9 is the first phono cartridge that not only meets the highest technological and design specifications—but also our demanding listening tests.

Empire Scientific Corp. **EMPIRE**
Garden City, N.Y. 11530

Audioclinic

Joseph Giovanelli



We build
a speaker
that sounds
like music

Interface: D™

It can accurately reproduce the 120+ dB peaks that are found in some live music. That's more than just being able to play music loud. It can accurately reproduce the music bandwidth—from below 25Hz to 20kHz. And the Interface:D's vented midrange speaker reproduces midrange sounds with the clarity and purity that allows precise localization of sound sources—both lateral and front-to-back.

The Interface:D is the only commercially available speaker we know of that can meet these criteria. Audition them at your Interface dealer.



Electro-Voice®

a gulton company

600 Cecil Street
Buchanan, Michigan 49107

Increased Treble

Q. I recently purchased an outboard Dolby FM unit and a 25 μ S de-emphasis switch, all to be used in the tape loop of my receiver. I returned the Dolby unit and, out of curiosity, connected the de-emphasis switch to the tape jacks. I was delighted with the FM results, the highs were much more distinct and the background noise increased only slightly. The fact that the switch alone produces such an improvement, is this to be expected?
—Douglas D. Short, Raleigh, N.C.

A. The increase in highs you hear is to be expected when you use the de-emphasis switch. FM broadcast practice calls for a 75- μ S de-emphasis to produce a flat frequency response from an FM tuner. The 25- μ S de-emphasis produced by your switch means that there is now more treble than in the standard FM broadcast. This means that you have boosted the highs by about 10 dB, so you are not listening to a flat signal.

Cable Systems

Q. I recently hooked up my cable TV antenna to my receiver which allows me to pick up Washington D.C. FM stations quite well, but only in mono as the background hiss is intolerable in stereo. My high filter switch doesn't help; what can I do to reduce the stereo noise?

—Name Withheld
A. Part of your problem may be that the cable TV system does not intentionally supply the FM band, so it may be that to the extent your cable acts as an external antenna, you are picking up Washington stations. Connecting your cable system to the receiver with a 300-ohm twin lead, rather than a coaxial cable and a transformer, can cause the receiver to pick up signals directly and not necessarily via the cable. Furthermore such installations can cause radiation from the cable system which is undesirable. I recommend that you check with your cable company to see if they do indeed import Washington signals which would tell you if you have any hope of receiving these signals properly over the cable, rather than using some other kind of antenna.

See if, perhaps, a simple dipole antenna will bring about an improvement in FM reception over what is

available to you via your cable system. Actually it is always best to use an outside antenna where permitted, rather than the simple dipole often supplied with the receiver.

No noise reduction system will work without adversely affecting the quality of the programming being received. However, if one or more of the Washington stations use the Dolby N/R system for their transmissions, you can use that means to provide less background noise on such stations.

It is possible that a really good signal-booster amplifier can be helpful. However, this booster would have to have a better signal-to-noise ratio than the tuner with which it is being used. If the cable is involved, though, there may be noise from this source riding on the signals which would negate the effects of the booster.

Tuning Meter Drift

Q. My problem is that when I listen to my speakers my tuning meter drifts, however, when I listen to my headphones the meter stays centered. What is the problem?—David R. Barr, Wyandotte, Wis.

A. Perhaps the vibration of the speaker system is causing misalignment of some circuit elements resulting in a change of oscillator frequency. Play the system softly and notice if the drift still occurs. It shouldn't. If it still occurs, check once more to see if it happens when you wear your headphones.

The most likely possibility is that operating your speakers requires more power to be taken from the output stage of your receiver. This means that more heating of the electronics within your equipment takes place which will cause changes in capacitance of the oscillator circuit leading to a gradual center-of-tuning drift.

Another possibility is that if you start out using the loudspeakers and then switch to the headphones, it could be that the tuner has been stabilized by this time so that no further drift occurs. *A*

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 • February 1979

Up to now you had to choose between the turntable you wanted and the turntable you could afford.



Technics MKII Series. The SL-1300 MK I automatic, the SL-1400 MKII semi-automatic and the SL-1500 MKII manual.

You expect a quartz turntable to give unparalleled speed accuracy. And these do. What you didn't expect were all the other advantages Technics totally quartz-controlled direct-drive system gives you.

Like torque that cuts buildup time to an incredible 0.7 seconds. And at the same time maintains 0% speed fluctuations with loads up to 300 gms. That's equivalent to 150 tonearms tracking at 2 gms. each.

And that's not all. Technics MKII Series adds quartz accuracy to whatever pitch variation you desire. In exact 0.1% increments. At the touch of a button. And instantaneously

displayed by the front-panel LEDs.

And to take advantage of all that accuracy, Technics has a low-mass S-shaped universal tonearm that's so accurate, friction is down to 7 mg. (vertical and horizontal).

Technics MKII Series. Compare specifications. Compare quartz. And you'll realize there's really no comparison.

MOTOR: Brushless DC motor, quartz-controlled phase-locked servo circuit. SPEED: 33 $\frac{1}{3}$ and 45 RPM. STARTING TORQUE: 1.5 kg · cm. BUILDUP TIME: 0.7 seconds ($\approx 90^\circ$ rotation) to 33 $\frac{1}{3}$ RPM. SPEED DRIFT: Within $\pm 0.002\%$. WOW & FLUTTER: 0.025% WRMS. RUMBLE: -78 dB. PITCH VARIATION: $\pm 9.9\%$.

Technics MKII Series. A rare combination of audio technology. A new standard of audio excellence.

Technics
Professional Series

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What's New

Kenwood Receiver

The KR-6030 receiver utilizes "current mirror" type differential amplifier circuitry in the power stage to bring out the full wattage potential without loss of stability. THD is 0.1 percent, 80



watts per channel minimum rms, measured into 8 ohms from 20 to 20,000 Hz. The power supply feeds separately through individual rectifiers into the pre-driver stages and the power stage to improve dynamic range and assure clarity of reproduction. The unit can handle up to 250 millivolts maximum phono input before distortion, and features bass and treble tone controls, subsonic filter, loudness compensation, FM muting, an A-B speaker provision, accommodation for two tape decks with A-to-B dubbing and A and B monitoring, and 25- μ S de-emphasis for an onboard Dolby FM decoder. Price: \$500.00.

Enter No. 80 on Reader Service Card

db Systems Kit

The Model DBP-6 is a complete phono equalization kit which corrects the frequency response of any moving-magnet cartridge by the proper



matching of its capacitance load requirement. The kit includes 10 color-coded plugs for added capacitance, two 100-ohm loads for moving-coil cartridges, two spare plugs, two "Y" cable adaptors, and complete instructions. Price: \$24.95.

Enter No. 81 on Reader Service Card

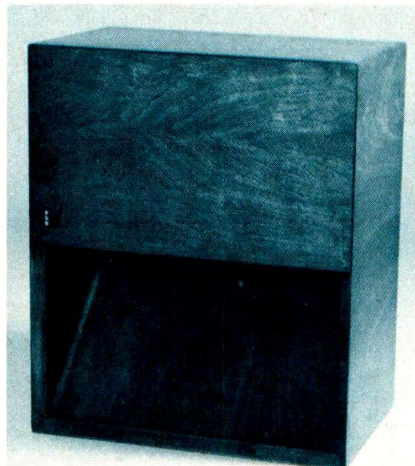
Sansui Turntable

The Model SR-5090 is a two-speed, direct-drive turntable with a single control knob for completely automatic operation and a repeat control for up to five plays. The electronically controlled drive system uses a high-torque, 20-pole, 30-slot d.c. servo motor with specs of wow and flutter at 0.038 percent, rumble better than 67 dB, and a signal-to-noise ratio of 57 dB. The built-in strobe light permits a visual check of turntable speed, plus the pair of fine speed controls allow adjustment by as much as ± 3.5 percent. Price: \$280.00.

Enter No. 82 on Reader Service Card

Precision Sound Sub Woofer/Bass Enhancer

The PSU Sub Woofer/Bass Enhancer is designed for use with conventional speaker systems to extend the frequency response into the very low bass region where sound is not only heard but felt. Since sound below 100 Hz is heard as non-directional, only one unit is required and placement is not critical. Utilizing a two-position crossover switch, the frequency response in the *Sub Woofer* position is 15 to 82 Hz, ± 2 dB, and the *Bass En-*

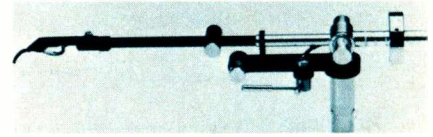


hancer position response extends from 15 to 2000 Hz, ± 2 dB. Driven by a 10-in. long-throw woofer with a 2-in., all aluminum voice coil, the power handling capacity is 80 watts continuous input, with a 6.4 to 12.2 ohm impedance. Price: \$395.00.

Enter No. 83 on Reader Service Card

Micro Seiki Tonearm

The MA-707 tonearm can be varied to achieve ideal resonance between the tonearm and any cartridge by using a torsion-bar system for dynamic



balance and a tiny weight positioned on the tonearm which can change the resonant frequency of the arm/cartridge combination when moved back and forth manually. It has an effective length of 237mm and a 15mm overhang; maximum tracking error is less than 1.5 degrees per inch, tracking force adjustment is 0-3 grams (0.1 g step graduation), and recommended cartridge weight is from 4 to 12 grams. Price \$200.00

Enter No. 84 on Reader Service Card

Wharfedale Speaker

The Dovedale is a three-way, bass-reflex system incorporating two 7-in. woofers, a 4-in. midrange, and an isodynamic tweeter that utilizes a thin, lightweight diaphragm suspended between two barium ferrite magnets. The mass of the tweeter diaphragm is only one-fifth that of a conventional dome tweeter, and the printed-circuit pattern on the diaphragm serves as the voice coil. The frequency response extends from 35 Hz to 26 kHz, ± 3 dB, with crossover frequencies at 800 Hz and 5 kHz, and an SPL of 88 dB for one watt at one meter. Weighing 55 lbs., the unit measure 25x15 $\frac{1}{2}$ x12 $\frac{1}{2}$ in. Price: \$355.00.

Enter No. 85 on Reader Service Card

Sony Cassette Tape Recorder

The 15-ounce palm-size TCM-600 tape recorder features one-touch recording and quick review, instant edit, an air-core motor providing noise-free performance, and a recording capability of 8 hours with 2 AA-alkaline batteries. Accessories include an a.c. adaptor, carrying case, and earphones. Price: \$249.95.

Enter No. 86 on Reader Service Card



While the others were catching up, TDK was moving ahead.

Shortly after it was introduced in 1975, TDK SA, the world's first non-chrome high bias cassette, was accepted by most quality deck manufacturers as their high bias reference standard. This advanced, new cassette enabled their decks to perform to the limit of their capabilities. And because the decks are set in the factory to sound their best with SA, music-loving consumers made SA the number one selling high bias cassette.

The other tape makers set out in pursuit of SA, hoping someday to equal the performance of its Super Avilyn particle formulation and the reliability of its super precision mechanism.

But making the world's most advanced cassette was nothing new for TDK's engineers. They pioneered the high fidelity cassette back in 1968 and for more than a decade they've led the way in cassette tape technology. Over the last three years, they've refined SA and made

it clearly superior to the '75 version.*

That makes the music lovers happy; it means more music with less distortion. It makes the deck makers happy; they've been improving their decks and SA makes them sound better than ever. But for the competition, unhappily, it means a whole new standard to catch up to.

So if you'd like to raise your own recording standards, step up to TDK SA, the high bias reference tape backed by high fidelity's original full lifetime warranty.**

TDK Electronics
Corporation,
Garden City,
New York 11530

TDK[®]
The machine for your machine.™



*Today's SA has a maximum output level (MOL) more than 3dB better than that of 1975 SA at the critical high frequencies, and improved sensitivity across the entire frequency range. **In the unlikely event that any TDK audio cassette ever fails to perform due to a defect in materials or workmanship, return it to your local dealer or to TDK for a free replacement. ©1978 TDK Electronics Corp.

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The Audio Critic issue with over 150 reviews.

The cumulative reference issue (Vol. 1, No. 6) of The Audio Critic summarizes and updates just about every review previously published, in addition to reviewing more new items than any other issue so far.

And these are not your typical "underground" reviews. The Audio Critic is guided by the laws of physics and mathematics, not by untutored hi-fi cults; it tests all equipment in a highly sophisticated in-house laboratory facility; and for listening evaluations it inserts the component under test into a \$20,000-plus reference system that tells it all. What's more, it carries no advertising of any kind and can therefore afford to be unkind to manufacturers and their dealers whenever necessary.

The 150-review reference issue is perfect for starting a 6-issue subscription by first-class mail. Send \$30 today (no Canadian dollars, \$6 extra for overseas airmail) to The Audio Critic, Box 392, Bronxville, New York 10708.

12

INTRODUCING THE SUPEREX MULTI-DECK TAPE SWITCHER



The Superex TSB-3 Tape Switcher is the obvious creative answer to the audiophile who has more than one tape deck. You can finally duplicate recordings or broadcasts on up to three decks with this "passive" switching console. Mixing music sources and adding voice-over to create a final recording is just one of the professional engineering features.

The Superex TSB-3 provides access to and from external equipment through identified phone jacks. Along with full tape monitoring, the switcher allows flexibility not normally found in many of today's amplifiers.

Write for more details, or see your Superex dealer. Made in USA.

SUPEREX

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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.

Guilt Rewarded

Dear Sir:

Amazing, just as I was beginning to feel guilty for becoming a video freak an old friend reaffirms the effectiveness of this pursuit — by introducing a column in *Audio* devoted to same, namely the Videoscenes column.

I recently acquired a VTR (VHS format) as a tool in my lifetime goal of improving the state of commercial broadcasting. However, with the new VTR unit, I was dismayed at the lack of technical information which accompanied the booklet of instructions. I am extremely happy to see your new column — now I won't have to subscribe to yet another magazine — and I look forward to such features as "how to clean the heads," "which tapes are best for your unit (brands, not types),"

and "the effects of cascading units for editing."

Incidentally, owners of VTRs who have not already done so may find it fun to experiment with the TV sound by patching the VTR into their audio system.

Jeffrey Rocchio
Boulder, Colo.

Records for Rehab

Dear Sir:

My wife and I do volunteer work at a home for retarded adults, and we have found that it is an excellent place for donating used records. Many of these people have a real love for music and many even have their own turntables.

I thought, perhaps, your readers might be interested in this use for their old records. To locate a home for retarded adults in your area, you only need to contact the local social services office and they will be glad to give the information to you.

Virg Friebe
Ball Aerospace Systems
Boulder, Colo.

Editorial Error

Dear Sir:

We'd like to point out an error on page 137 in the November, 1978 issue of *Audio*, in the Classical music section of your magazine. In Edward Tannall Canby's most welcome review of **Michael Murray Playing the Great Organ in Methuen Music Hall** and the Telarc direct-to-disc recording, the disc is available through Audio-Technica dealers, not Discwasher. Audio-Technica has been handling all Telarc audiophile discs starting with the Michael Murray release.

Nathan J. Silverman
Chicago, Ill.

Errata

In the December, 1978, issue of *Audio* there were two mistakes in the Equipment Profiles:

For the AKG P8ES phono cartridge, the correct separation figure at 1 kHz is 28.5 dB, not 21.5 dB as stated.

For the Satin M-188X moving-coil phono cartridge, Fig. 2, the S-W response was turned 180°.

AUDIO • February 1979

In a class by itself.



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There are few stereophones of any kind that can match the full-bandwidth performance of the Koss Pro/4 AAA. That's because the Triple A's oversized voice coil and extra large diaphragm reproduce recorded material with a lifelike intensity and minimal distortion never before available in dynamic stereophones.

With a frequency response from 10 Hz to 22 kHz, a highly efficient element and a perfect seal for low bass response to below audibility, the Triple A lets every note blossom to its fullest harmonic growth. You'll hear so much more of your favorite music, you'll think you're listening to a whole new recording.

Unlike other stereophones, the earcushions developed for the Pro/4 Triple A represent a breakthrough in both comfort and acoustical engineering. Through extensive studies on how stereophones are actually worn, Koss engineers were able to reduce lateral pressure with a direct contour Pneumalite® earcushion that not only offers soft pliable comfort, but also creates an ideal environment for minimizing the linear excursion of the driver. Thus, the driver is able to produce any volume level without distortion. So you'll hear all the fundamental and harmonic frequencies exactly as they were recorded.

In addition, Koss has designed a

special Pneumalite® dual suspension headband that creates a feeling of almost weightlessness even over periods of extended listening. It makes wearing the Triple A's as pleasurable as listening to them.

Why not stop in at your audio specialist and see why the Koss Pro/4 Triple A belongs in a class by itself. Or write for our free, full-color catalog c/o Virginia Lamm. Better still, listen to a live demonstration of the incredible Sound of Koss with your favorite record or tape. We think you'll agree that when it comes to the Pro/4 AAA and other Koss Stereophones and CM loudspeakers: hearing is believing.

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Audio etc.

Edward Tatnall Canby

If you read me last month on the super disc vs. the LP, you could tell that I was writing before the AES Convention in New York. Inevitably, there was at that Convention still another new digital super disc system, this one from Sony. If I am right, that makes four systems which use the ever-burgeoning digital micro-pits in place of the old mechanical groove. It's a fertile field for new crops of super sound, and super pictures too.

Each of these new prototype super discs actually works, for audio, for pictures without sound, or both. Each has been carried through to prototype according to its particular choice of parameters, different trial jugglings out of the enormous mass of new possibilities arising from digital techniques. Sony's disc runs at 450 rpm to JVC's 900 and Teac/Mitsubishi's 1800 — don't think that this double/half syndrome means twice as good or half as good; it's all part of the preliminary juggling and surely no company is yet committed to every last detail of its own system (though it would be nice if . . .). We can assume that all of these outfits, pride notwithstanding, have learnt what happens when there is no eventual agreement. So — no impasse. Just some marvelous test driving . . .

Amid the welter of specs we can conclude that by this time anybody, or almost anybody, can turn out an astonishing digital disc. Amen. What comes next, of course, is not yet in hand — the public. What is really crucial now is an altogether different set of parameters, external. But just as

basic. These are the parameters of usage. Usage past, usage now, and usage as forecast for the future. Some mighty hefty outfits have floundered because they misjudged these outside forces in their zeal to perfect their own engineering.

Let's set the perspective. There are three basic types of consumer usage in our broad field of reproduced entertainment/information for the consumer — I include here both audio and video, home movies, Polaroids, tapes, discs, the works, and for the home, the car, the moto and skimobile, and highway cruiser, not to mention office, bar, club, even the school and library, not counting the pro educational stuff . . . everything. Still — three basic types of usage. What is important is that they come in mixtures as well as in the pure state. It's the proportion of the mix that we have to evaluate . . . or forecast (which is a lot harder). Just like fertiliz-

Forecast Fundamentals

Get me? The stuff that you put on your crops and flowers and house plants is rated everywhere by three numbers, standing for the three basic elements of plant nourishment — I can never remember which is which, nor the proper order, but let that be. You can have a 10-8-10 mix or a 20-20-20 (concentrated) or even a 4-4-0, entirely minus the third element. You'll find these numbers right on the bags

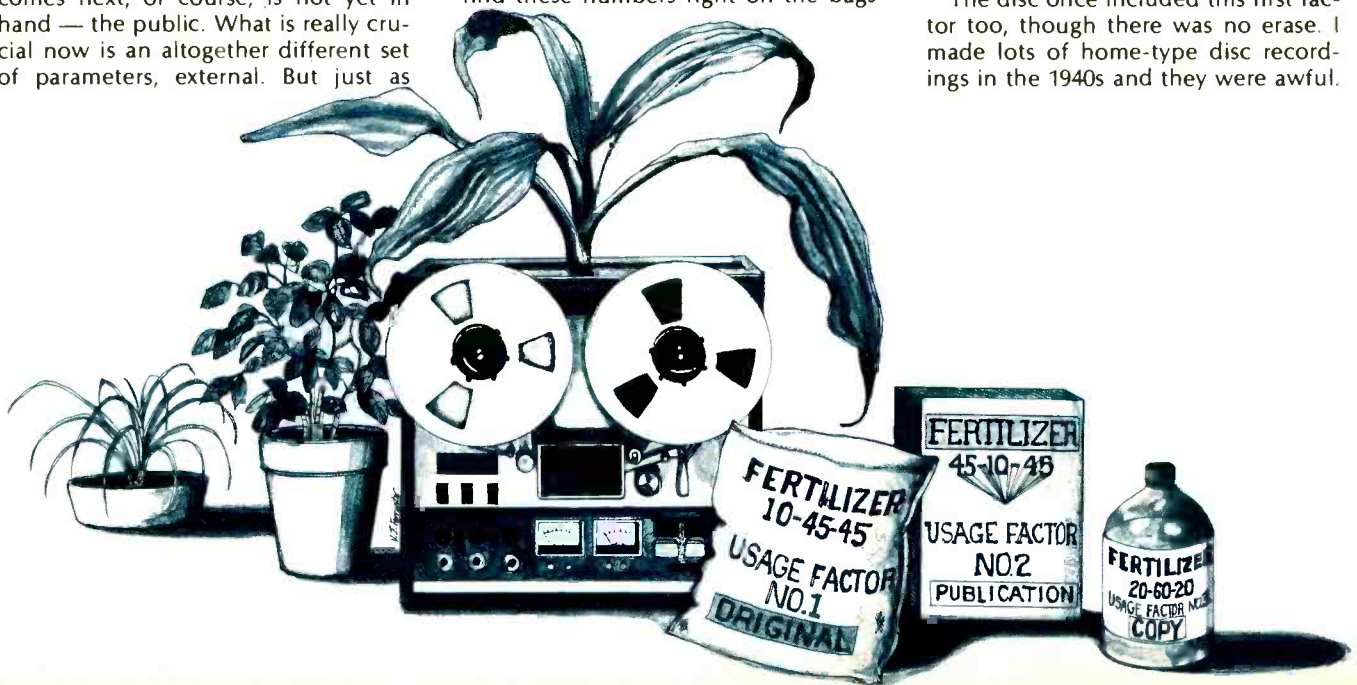
and boxes and bottles and they do help evaluate, if they don't tell all. So why not apply some of the same to consumer usage in our own bag?

Our three kinds of usage, you see, are just as permanent and inevitable as fertilizer, whether they apply to a digital disc or an Edison cylinder, an LP, or a super-8 movie . . . or a VTR. Past, future, it's all the same. The thing we need to do is to formulize the mix, the proportional usage, so we can read it like fertilizer, if a bit less precisely. So here goes. . . and keep in mind that I am talking about the whole spectrum, audio and video, the sonic and the visible in all the combinations. My usage factors run right across the boundaries.

Factor No. 1. Hard to find a good general term for it. Let's say, *immediate recording*, live, primary, original, on the spot. Making your own, with mike and/or camera. Home movies fall into this category and those new instant Polaroids on a tube. Also the home tape recorder. This category includes the original Edison tinfoil audio, recorded live on the spot, and the later wax cylinders — that could be shaved off and recorded again. Erase feature. The VTR with its mike and camera options offers Factor No. 1 in its special mix — also a lot else. Do it yourself . . . baby's first drool. Similarly the audio cassette, taking down interviews and anything else that's live sound.

The disc once included this first factor too, though there was no erase. I made lots of home-type disc recordings in the 1940s and they were awful.

14



THE JVC QUARTZ-LOCKED TURNTABLE.

First we invented it. Now we've made it more precise than ever.

The turntable evolution comes full swing with the introduction of the new Quartz turntable series. We introduced the first quartz-controlled turntable in 1974, and we've been improving our designs ever since. Including:

Super Servo Frequency Generator

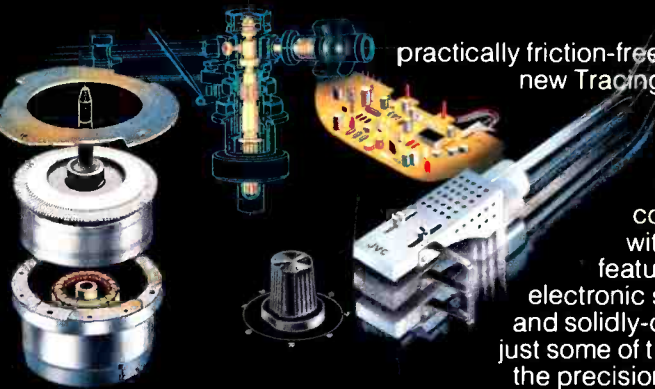
To detect minute variations in platter speed, and send corrective information to the electronic circuit controlling turntable rotation, it provides near-perfect speed accuracy. And, our Super Servo is factory-set for years of accurate, dependable use.

Direct Drive DC Servomotor

For quick-start/stop and high-torque operation. Our powerful motor drive system and its companion speed-monitoring circuits reduce wow-and-flutter and speed drift nearly to the vanishing point.

Gimbal Support and TH Tone Arm

Our exclusive unipivot gimbal support holds the tone arm firmly, yet is



practically friction-free. We also developed a new Tracing Hold (TH) tone arm to provide stability and tracing accuracy needed for a cartridge to follow even the most complex record grooves without error. These, plus features like digital readout, electronic switching mechanisms and solidly-constructed bases, are just some of the reasons to consider the precision of JVC's Quartz-Lock series for your music system.

And you can choose from manual, semi-automatic or totally-automatic models—JVC's most comprehensive turntable line ever.

See them at your JVC dealer soon. JVC America Company, Div. of US JVC Corp., 58-75 Queens Midtown Expwy., Maspeth, N.Y. 11378. Canada: JVC Electronics of Canada, Ltd., Ont.

JVC



QL-A7



QL-F4

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But the distinction between these and the playback-only disc was always clear. They weren't even the same. You did not record on a regular disc. You don't now. You won't tomorrow.

Factor No. 2. The opposite. Best to call this *publication*, though it includes broadcasting, which is a form of publication. The message comes to you prerecorded, prefilmed, preprinted, in a professional package. You play it, you show it, you read it. The book, of course, is the ancient original example. The disc is a bit newer. Both are published, and nothing else. The only

book that offers home recording is the child's copy book. The erase isn't very good.

In my fertilizer type rating, then, books and discs, being all-out publications, stress one factor only, Factor No. 2. I put down three numbers (I'll get to the third category) and in this case the formula has two zeros, 0-100-0. Only one factor involved. However, most of our media are of the mix sort, and many offer some form of the published message as one of their options — in varying degrees of usage. Sometimes quite insignificant. You can buy



prepackaged home movies for your projector (and do the porn people know all about that!) but publishing has never been more than a minor factor in home movies, which features Factor No. 1, home recording, live and on-the-spot. So how do I rate a home super-8 system? Give it this formula: 90-10-0. A few prepackaged films, but most of them you make yourself. (This is just a guess in the numbers, in case you happen to sell super-8 travelogues and the like, and no offense intended towards the biz.)

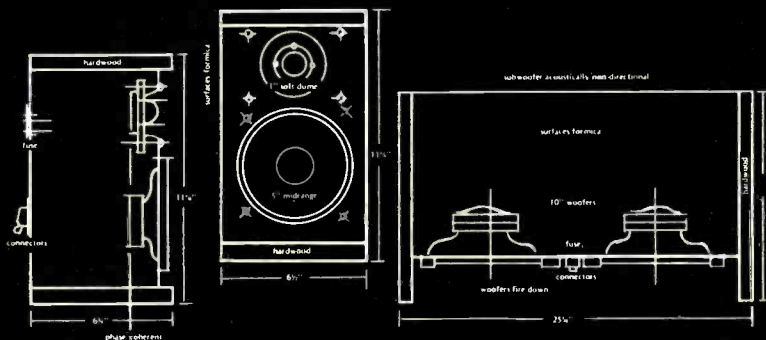
How about TV? it is almost entirely publishing, in the larger sense of my usage factors, a making-public in mass form via multiple duplications, professionally packaged. It's much like a book, a mag, or a disc. That is, if you keep away from the VTR. So TV rates the same as the disc, a flat 0-100-0. Great success story, just the same.

Tape Transposition

Look at the home reel-to-reel tape recorder. A real and variable mix here, varying, too, from user to user. Yes, you can buy published open-reel tapes, prerecorded, but this factor has never been very large, and the audio cassette has gone a lot further, I'd say. Reel-to-reel in the home is used for a lot of direct recording, obviously. That's Factor No. 1. But also for the third category, as we shall see. So give reel-to-reel in the home an averaged 45-10-45. Low on the publication side, that middle number. Now contrast that with the LP disc, a pure publication with a rating of 0-100-0! Even without my third category, via only the first two, you can see how useful this number thinking can be in highlighting the differences between media in terms of usage. Not only what is "available" as a facility but, more important, how it works out (or might or should work out, if a forecast) in actual practice. The technical potential must be weighed against practicalities concerning real people.

You have probably figured out my Factor No. 3. It is self evident and combines the other two, felicitously and, often, illegally. Well, not *all* of the

It takes \$700 – \$800 to put together a good satellite-subwoofer system.



It takes \$395 to buy one.

A TRUE 2-CHANNEL 3-WAY SYSTEM:

- Satellites are phase coherent; house a 1" soft dome tweeter and 5" midrange.
- Subwoofer has two 10" down-firing drivers with response down to 20 Hz (± 3 db). Subwoofer has formica top and sides; doubles as an end or coffee table.
- Min. power required 25 watts; max. 200 watts. Maximum SPL is 110 db; frequency response is a true 20 Hz-20 kHz.

point 3 systems



ANOTHER GREAT WHITE WHALE PRODUCT

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Again we turn the world around.

The world's first pure power DC receivers, the Sansui G-line, redefined the limits of musical fidelity. Sansui's capacitor-free DC amplifier design (patent pending) with super-high slew rate, ultra-fast rise time, and full transient response, makes music sound much more true-to-life.

Now Sansui does it again. With the new G-7500 and G-5500. Using the same exclusive DC circuitry all others are trying to imitate, these new models offer more watts per dollar than ever before.

The **G-7500** delivers 90 watts per channel, min. RMS, both channels into 8 ohms from 20 to 20,000Hz with no more than 0.025% total harmonic distortion, at a suggested retail price of only \$620.

The **G-5500**, at a suggested retail price of only \$465, offers 60 watts per channel with no more than 0.03% THD under the same conditions.

From their macro-designed power supplies, for rich, full sound over the widest frequency range, to their micro-sensitive double speaker-protection circuitry, the G-7500 and G-5500 are unbeatable.

The FM sections further enhance Sansui's reputation for tuner excellence. Pinpoint selectivity and ultra-sensitivity to even the weakest signals guarantee pure and clean reception, always. And always with maximum stereo separation.

Let your franchised Sansui dealer demonstrate the comprehensive, human engineered features and controls. There's nothing in the world with quite the same feel as the Sansui click-stop attenuator and ultra-smooth tuning knob.



Now look carefully at the graceful styling, with elegant rosewood veneer cabinet. It is setting the trend for all other receivers.

For the best receiver values, the world is now turning to the newest DC by Sansui, the G-7500 and G-5500. Shouldn't you turn to Sansui, too?



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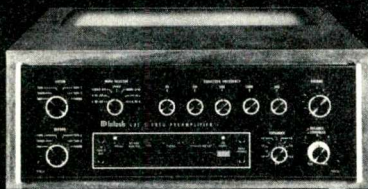
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"A Technological Masterpiece..."



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"More Than a Preamplifier"

McIntosh has received peerless acclaim from prominent product testing laboratories and outstanding international recognition! You can learn why the "more than a preamplifier" C 32 has been selected for these unique honors.

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time, just some of the time. But it LIVES — does it live. There's one good word for it... COPYING.

You home record your published material, whatever, whether broadcast, discs, tapes, audio, and video alike. Even a ball game is a publication when it comes over TV and so is every talk show and fun program and horror movie. You take them down, you are copying.

There is no copying of home movies, or practically none, and those copies have to be done outside, professionally. So super 8 gets a zero, or maybe a 2, for the third factor. But elsewhere, as we all know, this is the fastest growing business of all, legally or no. Copying covers a lot of ground and we'll have to skip Xerox and Kodak, about which I know plenty. Not in the home, in any case. In our area, audio copying has been the main factor until recently, and it was the big reason behind the rise of the audio cassette (bigger, I regret to say, than the improved fi). Also the very bane of the record company, which sells one disc and suffers a dozen or a hundred copies at no profit! Let us not talk ethics and legalities here. Copying is now an irreversible fact of our life, like the mechanical reaper in the 19th century, later, the mechanized cotton picker, and still more recently the automated newsprint system. Fundamental changes, dislocating, whether legal or not, and somehow we always must learn to live with them. We are going to be living with better and better copying of *everything*, one way or another, and that is that. (And let's say not a thing about digital copying!)

Conservative Comparison

The implications of my third factor, this copying, are immense. Look at the VTR. Like the audio cassette the VTR is multiple-use. It fits everywhere. It can (1) record, (2) play published material and (3) it can COPY, in full color and sound. Phew, can it copy! The ads tell you which factor is now the big selling point. Right now I would rate this system, for all three factors, as maybe 5-10-85. Get that! Five percent for actual home VTR recording with the optional mike and camera. Ten percent, maybe, for the playing of published, prerecorded video cassettes (and at what a cost!) And a whopping 85 percent for COPYING, complete with all those computerized automatic on-off timers.

Come to think of it, I'm being too conservative. Make it 3-3-94. Is anybody buying a VTR for other than taping the Yankees and the Dodgers and a thousand other good air shows? That's the name of the game.

Now you can see how nicely my formulas present the picture (and the sound), even as so many guesses. Compare the audio disc with the audio cassette. Should we compare them at all? They are so different. The disc rates a flat 0-100-0. The cassette, on the other hand, is remarkably balanced in its all-over mix of functions. Lots of audio copying, the third factor. Plenty of direct "live" recording, the first factor, if you include all the battery cassettes with portable mikes. Also, a sizeable and growing publication factor, the prerecorded cassettes that are a respectable market these days. So give the cassette a pleasant (at a guess) 40-20-40 or even a 33-33-33. Real nice medium and utterly unlike the equally useful disc's 0-100-0. Sharply different.

Really Not Comparable.

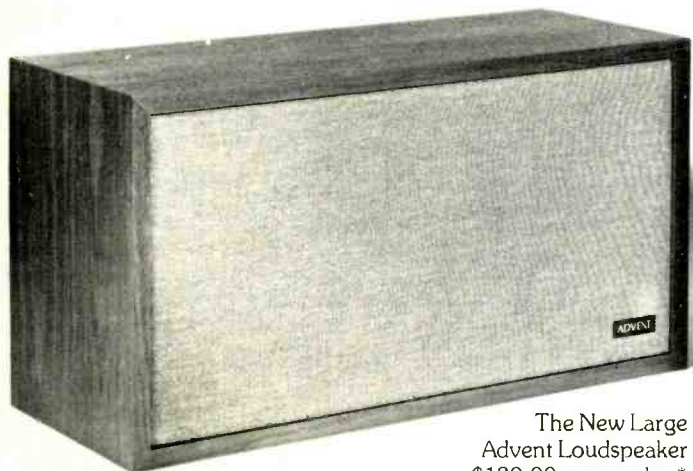
Go further. Take the VTR and compare it with its coming rivals (?) the picture super discs now in prototype. So you've been thinking there mostly in digital terms, sampling rates, bits, rpms, and so on, and technical quality of sound and picture, bulkiness, cost of playback and so on. Engineering. If you compare super disc and VTR on these terms, the disc, potentially, is likely to win hands down. It will be much less expensive (when it is available), far less bulky, more convenient, and probably better in quality. All the pictures you want on two sides of a slim 12-inch platter. So throw out the clumsy, expensive VTR and bring in the super disc to replace it. BUT, BUT, BUT!

Just take a look at my ratings. The big, versatile, expensive VTR, tape in a big box, rates that incredible 3-3-94, as my best current guess. The last factor, COPYING, is what now sells it, though it can do the other things too. Now look at its supposed coming rival, the technically superior, cheaper, and much more compact super-disc system with pictures. That disc gets the same old universal disc rating, 0-100-0, even so, and the copy factor is a whopping zero. How can we even try to compare these two? They simply are not comparable.

You may count on it that the super-disc developers, at least some of them, are soberly aware of this enormous difference. The disc, any disc, is a one-purpose publication and nothing else. Please note that Dr. Goldmark's ingenious EVR "cartridge" for CBS of a few years back was also a publication system and would have gotten the very same 0-100-0 rating. It didn't fly. Plenty of \$\$ ploughed under for that little miscalculation.

AUDIO • February 1979

A best seller. Versus the best.



The New Large
Advent Loudspeaker
\$139.00 per speaker*



Micro-Acoustics
FRM-2ax
\$180.00 per speaker**

	The New Large Advent Loudspeaker	Micro-Acoustics FRM-2ax
Tweeter	One, positioned on-axis.	Two, symmetrically positioned off-axis.
Super-tweeter	No.	Yes.
High-frequency transducer mounting	Directly on baffle.	Forward-mounted in separate compartment.
High-frequency overload circuit	No.	Yes.
Front-mounted control	No.	Yes.
Control	Three position tweeter level control.	Continuously-variable tweeter/super-tweeter level control.
Woofer	Acoustic suspension, with single-arc polyurethane surround	Acoustic suspension, with treated cloth multiple-sinusoidal annulus surround.
Woofer mounting	Four screws, direct to baffle.	Eight screws with sealant gasket, direct to baffle.
Diffraction-free cabinet design	No.	Yes.
Full 3/4" cabinet construction	No.	Yes.
Warranty	5 years, limited.	10 years, full.
Mfr's. sugg. list	\$139.00*	\$180.00**



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 highs. The FRM-2ax uses *two* dispersion tweeters for room-filling, lifelike highs. Then adds a *super-tweeter* for true reproduction of overtones to 20 KHz. All high-frequency transducers are precision-mounted in a diffraction-free Tri-Axis™ array.

Compare bass. The new FRM-2ax employs a 10" acoustic-suspension woofer with treated multiple-sinusoidal annulus surround, for long excursions. The woofer is tightly secured in a ruggedly-constructed enclosure, providing rich, full bass.

Compare warranties. The FRM-2ax is warranted *twice* as long.

The Micro-Acoustics FRM-2ax. When you compare, there's really no comparison.

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

ma[®]
Micro-Acoustics
Quality worth a 10-year warranty.™

*Price for utility version shown. Also available in walnut veneer at increased cost. All prices slightly higher in Western region.

**Slightly higher west of Mississippi.

All side-by-side comparison photos are unretouched.

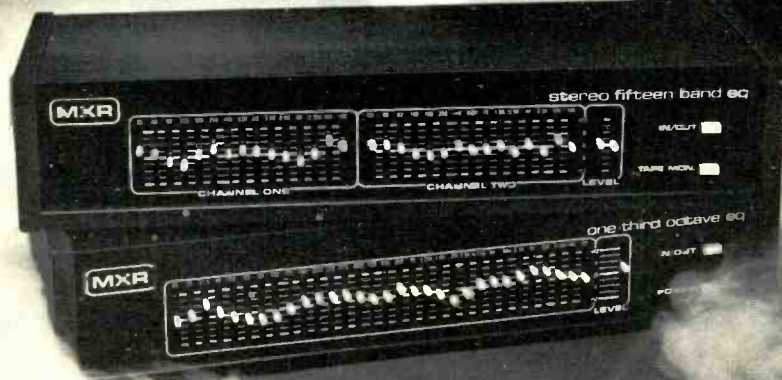
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Complete FRM-2ax specifications are available in Micro-Acoustics literature No. L-2113.

Enter No. 28 on Reader Service Card

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 Eq. With two channels each having fifteen bands spaced $2/3$ of an octave apart, you have even more creative power for bending, 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.

Hear 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 Electronic Development Corporation, Ontario.

MXR Consumer Products Group

Historical Habits

What you need, it seems, is a human base. An established habit, an existing market. Television, again, is also a publication, 0-100-0 — but so was radio before it, and the radio audience was there for TV to take over handily. (And didn't radio borrow from the phonograph?)

The trouble with any form of moving picture publication in these new TV orientated and TV-played formats is that there really isn't any established base for them at all. Those numerous and ingenious prerecorded "cartridges," including EVR, seemed a sure bet but they turned out to be the biggest bust in history. All except the one that was outwardly the most conservative, the lowly tape VTR from Sony! That was the sleeper and, we can now see, it was because this one rated something other than 0-100-0. It could do more. It's doing it now.

Indeed, the VTR and the television set together make a new system combined. The VTR fills in TV's two zeros, recording live (optional) and copying; TV itself takes care of the publication bit. The VTR, if you wish, converts non-repeatable broadcast publications into repeatable ones.

I would rate the VTR-TV combination system, on the average, as maybe 5-55-40. The measly 5 represents home recording, not for most of us via VTR. Let the home sound movies and maybe Polaroid fight that one out.

So before you go out for that bag of fertilizer, think one more step. Still, today, nobody has the slightest idea whether a market will appear for a TV-type publication, prerecorded and minus anything else. The idea flopped dimly the last time. And here comes our valiant super-disc people, looking for that very same market, if with better and cheaper goods to sell and, hopefully, better compatibility, too. Published video color pictures, strictly on a 0-100-0 basis. It's all or nothing and a terrible risk. Also a challenge. No wonder an audio super disc may come first, to fit our tidy nice little hi-fi market.

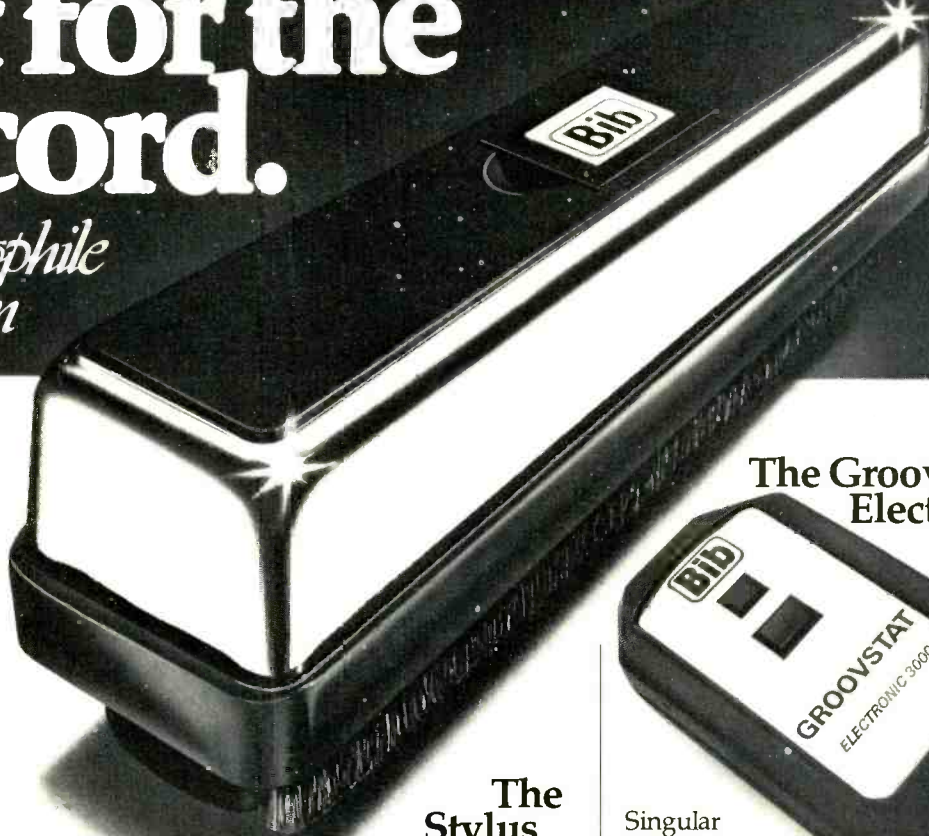
I think I see what these foreign optimists have in mind, in Japan and Europe. Maybe WE don't like the idea of packaged video. But in the other well-developed countries, it could be different. I think these people count on the rest of the world to snap up those nice pictures, enough to get things going and to heck with the U.S.

Then, they're hopeful of the big breakthrough, as America comes around, at last, and throws in the heavy cash. Well, better last than never, I say. **A**

AUDIO • February 1979

Just for the record.

Audiophile Edition



Just for the record, may we introduce you to the Audiophile Edition from Bib Hi-Fi Accessories, Inc. Already sought in more than 60 countries, the Audiophile Edition comes from England, with the technical and esthetic superiority that have made Bib's a preminent name for more than 25 years.

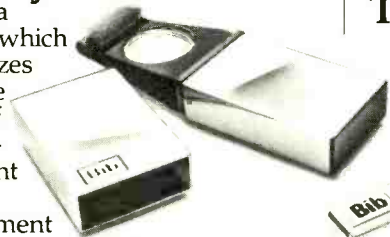
And, just for those records with which you are most concerned, consider this sampling:

The Record Valet

The elegant, effective remover of damaging substances, pictured above. Note the exclusive reservoir for Bib's anti-static cleaner, to merely humidify the pad rather than coat and smear debris. Note, too, the pad's tensiled edge of bristles.

The Stylus Cleaner

Here is a cleaner which recognizes both the value of your investment and the requirement that it be protected. It removes destructive agents without harm to the stylus tip, while accompanying mildly formulated lotion softens grit and removes glaze, with no danger to cantilevers.



The Stylus Balance and Deck Level

Calibrated for accuracy within 0.25 gram's sensitivity and engineered for just sufficient pressure to prevent excessive stylus and record wear, to say nothing of distortion levels.

The Parallel Tracking Groov Kleen

the unit's roller cleaning brush is augmented by a camel-hair trailer which tracks across grooves in linear fashion.



The Groov-Stat Electronic 3000



Singular among instruments of its kind, this releases only positive ions and is, therefore, vastly more effective than conventional static guns which also emit negative ions even though all records are negatively charged. While not for the record, here is one more offering from the Edition:

The Tape Head Cleaner



A unique multi-angled tool, for use on every tape recorder made. Plus our inspection mirror, a fluffy brush and the extraordinary cleaning lotion from our own chemists. Consider finally, the Edition's handsome case... Just for the Record. And the tape recorder.

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Herman Burstein

I-AD

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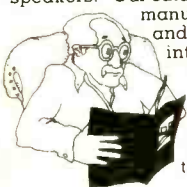
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Tape Bias

Q. *What is optimum tape bias? — Frederick Vasquez, Regina, Sask., Canada.*

A. Optimum bias is that which, together with optimum equalization and drive level (amount of signal fed to the record head at 0 VU reading), results in the most satisfactory combination of low distortion, extended treble response, and high signal-to-noise ratio. Optimum conditions vary with the tape speed and the type of tape.

Particularly at the slower speeds, one cannot merely set the bias for minimum distortion as this would, usually, result in excessive bias erase (inadequate treble). One could compensate for such treble loss by increasing the treble boost, but this increases the chance of tape saturation at high frequencies. Therefore, compromises are in order: One compromise is to reduce the bias somewhat, without an excessive increase in distortion. Another compromise is to increase treble boost somewhat, without an excessive risk of tape saturation. Still another compromise is to reduce the drive signal somewhat, which results in less distortion and less risk of tape saturation, yet without excessive reduction in the signal-to-noise ratio.

Accordingly, the manufacturer of a tape deck must, for a given tape and a given speed, juggle the three factors of bias, equalization, and drive level to arrive at what he considers to be optimum performance in respect to distortion, extended treble response, and noise.

Two-Part Taping

Q. *I play piano and would like to record the bass part of a song on Track A, then go back to the beginning and fill in the rest of the song on Track B. How can this be done? — Bruce LaRocca, Chelsea, Mass.*

A. The solution to your problem is in the use of a tape deck which permits *synchronized sound-with-sound* recording (known by various trade names such as Sel-Sync, Simul-Sync, etc.). With such a tape deck there is a switching system that temporarily allows the upper section of the tape record head to be used as a playback

head. Thus, the left (upper) channel of the record head plays Track A at the same time that the right (lower) channel records Track B. Since both channels are in the same head, one thus obtains exact synchronization.

Taping Mike


Q. *I need advice in choosing a microphone for recording live instrumental music, anything from a flute duet to a 60-piece concert band. Should it be omnidirectional or cardioid? Should it be dynamic or condenser? I am willing to spend up to \$200.00. — Joseph Corvo, Woodland, Cal.*

A. You might be happy with a top-quality dynamic microphone, with an omnidirectional pattern. An omnidirectional mike tends to give a wider and flatter response than a cardioid. On the other hand, \$200 can buy quite a good condenser mike. Your best course of action is to go to a dealer and listen to several mikes by recording your voice or a solo instrument on tape. Perhaps, you can even find a dealer who is willing to let you try out two or three different mikes at a recording site.

One other way to go is to buy a mike with interchangeable capsules, which will give you different directional characteristics, though the operating principle will, of course, remain the same.

Tape Longevity

Q. *If I play a cassette 150 to 200 times, will the cassette hold up better than a phonograph record? — Steve Leder, Mt. Vernon, N.Y.*

A. On the whole, I believe the answer is yes. Initially, there might be a slight loss in the highest frequencies during the first few plays — perhaps as much as 2 to 5 dB in the range of 10 to 15 kHz — but after that you should be able to get many hundreds of plays without noticeable change. The initial loss to which I refer will vary with the type and brand of cassette tape used. 

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

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Behind the scenes

With the continuing dynamic growth of the professional audio industry, it has become something of a cliché to report that every Audio Engineering Society convention is "bigger than ever." This certainly was the case with the 61st AES convention at the Waldorf in New York, November 3-6. As usual, the Waldorf's ballroom was filled to capacity with exhibits, and this year the stage area and all the boxes in the upper balconies of the ballroom were also pressed into service. Along with the demonstration rooms on the 12th floor, the conventioneer was confronted with a truly mind-boggling array of audio equipment.

Needless to say, as has been the case for the past few AES conventions, digital technology was the dominant theme. However, even the anticipation of this situation did not prepare us for the onslaught of activity in this field. Any visitor to this 61st AES convention, after having been exposed to all the glittering new digital recording equipment on display and listening to the many papers on digital technology, would have to conclude that the digital revolution isn't coming . . . it is here! Thus, I make no apology for this AES convention report being mainly oriented to the "digital domain."

It had been widely anticipated that at this 61st AES convention, the standards for digital recording would be established, or at the very least, close to resolution. Unfortunately, some unforeseen complications and procedural problems, not necessarily technical in nature, have put the standards deliberations on "hold" for the present. However, a "Technical Committee for Digital Audio Engineering" has been formed to ensure an ongoing exchange of data on digital technology which, it is hoped, will make a significant contribution to the resolution of the standards problem.

Of course, digital technology has been evolving for some time now, and except for certain proprietary aspects of the technology within various companies, most digital information is on a "shared access" basis among audio engineers. Thus, by happenstance and coincidence, the digital recorders which have appeared share many common features. For example, among the so-called "professional" station-

ary-head digital recorders, they all use 16-bit systems. The 3M, Soundstream, and the proposed Ampex digital recorder all have opted for a 50K per second sampling rate. They all give very cogent, but remarkably similar reasons for the rationale in their choice of sampling rate. The Japanese, on the other hand, whether their digital recorders are the ubiquitous helical scan variety or the few stationary head models that have appeared, still cling to their 44.056K sampling rate and its tie-in with the NTSC TV signal. Up until quite recently, all the helical-scan PCM recorders based on the various VCR formats have used a 13-bit, with 1 parity bit, nonlinear encoding setup. Now, in the interests of better signal-to-noise ratio and less distortion, the new Japanese "standard" appears to be a 14-bit linear encoding system. It would probably be correct to all these 14 bit/44.056K sampling rate PCM recorders as digital machines for the consumer market.

tape mastering recorder and the 2/4 channel on half-inch mix-down machine. The four systems promised to recording studios by the end of 1978 are said to be on schedule. Most importantly, 3M unveiled its electronic editing facility for the digital recorders.

The 3M programmable electronic digital editing system was engineered jointly with Inter-technology Exchange (ITX), Ltd. of Hollywood. The editing console consists of a video screen, teletypewriter keyboard augmented with special function keys, and remote controls for the 32-channel master and 2/4 channel mixdown recorders. In use, the editor selects the rough edit point by listening, then looks at enlarged visual representations of the sound amplitude on the video screen. The display first shows 40 samples on either side of the tentative edit point and then the point is refined further by a so-called "zoom" function. With time-code control of edit points and microprocessor control of execution accuracy to within 20 microseconds (!), elaborate inserts and assembly edits are possible. There is also the great advantage of being able to "preview" hear the intended edits before their actual execution.

The 3M commitment to a complete digital mastering system was further evidenced by their announcement of a disc lathe preview unit. Using a random access memory, time generator, and digital-to-analog converters with a signal delay adjustable up to 1.3 seconds, the device delays a set of digital signals from the master recorder while analog signals proceed to a conventional computer lathe controller that optimizes groove pitch and depth. The important thing here is that the delayed signals remain in the digital domain, maintaining their integrity until the end of the delay, thus with no degradation of quality.

Dr. Tom Stockham's Soundstream digital recorder was the pioneering unit in the field. It still is a 2/4 channel unit using 1-inch tape and in its latest embodiment is a 16-bit/50K sampling rate system. Editing is done at Soundstream's Salt Lake City headquarters. The system is in frequent use by a number of record companies, as a specific record session service under direct control of Soundstream. Sound-

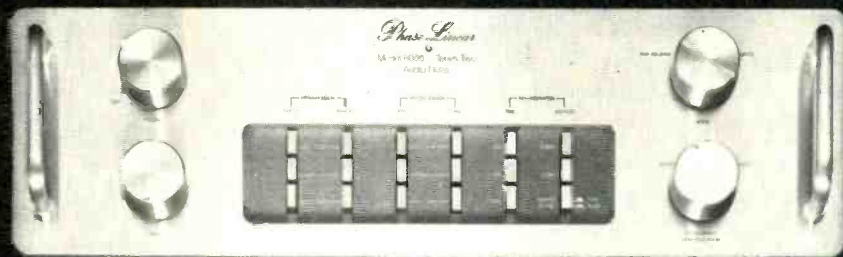


**3M Digital
Editing System**

Digital Evolution

Now let us take a detailed look at the digital recording equipment on display at the Waldorf. The 3M digital recording system has been described previously in these pages. It is a 16-bit/50K sampling rate system. At the Waldorf they were showing updated versions of the 32 channel on one-inch

YOU'LL PROBABLY ENJOY YOUR HIGH FIDELITY SYSTEM WITHOUT THE PHASE LINEAR 6000. THE QUESTION IS, HOW WELL?



Every listening environment has its own unique "acoustical signature" resulting from a combination of physical characteristics and factors. The size and shape of the area, materials used in construction, the "baffling effect" of objects within the area, and even the sound absorbing qualities of the audience, help provide the spatial and sonic experience of a live performance, whether that performance is in the spaciousness of Madison Square Garden or the intimacy of a piano bar.

Have you ever brought home the recording of a performance you particularly enjoyed, only to feel on playback, that it just was not the same as it was in the flesh? You didn't feel as "involved" as you did when you were there?

You were right. It's not the same.

In fact, much of the sonic and spatial "experience" that made you a part of that live performance was lost in the recording process.

So where does this leave you?

Would you like to regain that "involvement," and in the process, experience La Scala, the Sydney Opera House, Carnegie Hall, the Los Angeles Coliseum, or just your favorite disco?

The Phase Linear 6000 Analogue Delay can program your stereo system so your living room thinks it's the Met, or your den thinks it's the Astrodome. You can enjoy Hancel's "Messiah" as Handel originally intended, and not be limited by the parameters of the recording process.

With its innovative circuitry, the Phase Linear 6000 recreates the information necessary to reproduce various acoustical environments. Experience in your own home this world of depth and spaciousness that was once unique only to an actual live performance.

In a single page, we cannot begin to describe the Phase Linear 6000 Audio Delay and the technology behind it. For detailed explanation of its operation, please send \$2.00 to: PHASE LINEAR, Dept. (A-6), 20121 - 48th Ave. W., Lynnwood, WA 98036, USA.

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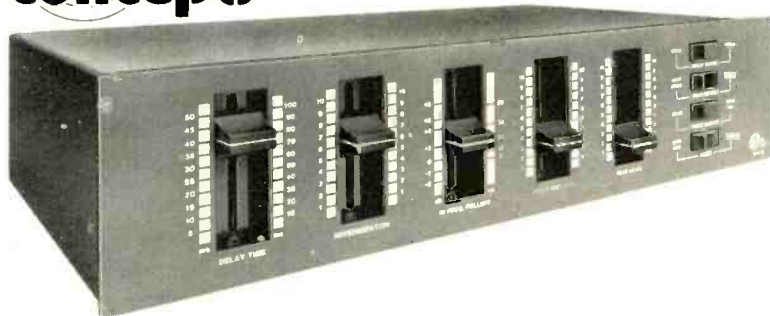
The SD-550 Ambience Restoration System recreates the environmental envelope of music performed live by recovering the natural ambience and distributing

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To hear ambience restoration for yourself, take your favorite record to your Sound Concepts dealer and ask for a demonstration. For complete information and the name of your dealer, please write to us.



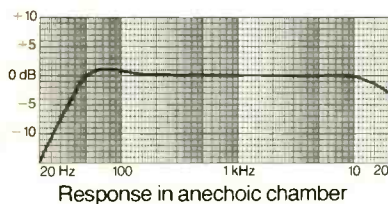
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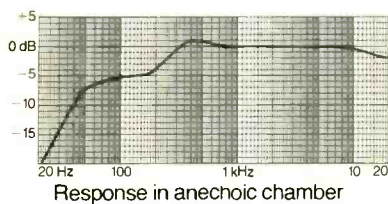
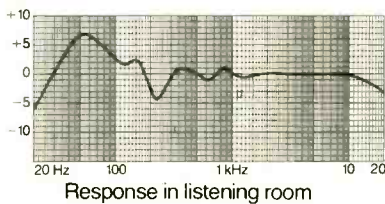
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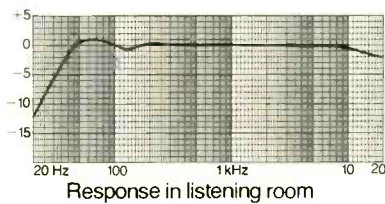
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stream did not have a demonstration room at this convention, no doubt feeling that by now the system is quite well known, and some records made with it are already on the market.

Sony Surprises

One of the big surprises of the convention was the high degree of involvement by Sony in digital recording. Of course, they have pioneered in the consumer-type helical scan VCR recording with their PCM-1 digital encoder/decoder. I have recently used one of these units with considerable success. At the convention they were demonstrating their "big league" PCM unit, the Sony 1600. The 77-pound PCM-1600 is a 16-bit linear quantization system with, however, the familiar Japanese 44.056K sampling rate. The PCM-1600 is used with the Sony BVU-200A helical scan 3/4-inch U-matic VCR. Electronic editing can be performed using the Sony BVE-500A videotape editing console. By using two of the VCR units with the video editor and the PCM-1600, pitch and depth control are possible with disc cutting laths.

The significant thing about all this is that the PCM-1600 and associated equipment is a system now in production, not a prototype. Price of the system is said to be around \$46 thousand. Not content with this, on the stage of the Waldorf ballroom Sony had set up their imposing new 24-channel prototype PCM-3200 stationary head digital recorder. Actually this is one of a series of recorders in which 2/4 channel versions on 1/4-inch tape, 8 channels on 1/2-inch tape, 16 and 24 channels on 1-inch tape, and 32 and 48 (my gawd) channels on 2-inch tape will be available. All are 16-bit linear quantization systems, but a real surprise is that there is a switch-selected choice of a 44.056 or 50.35K sampling rate. Sony is covering all bases! The number of tracks on these recorders is greater than the number of channels, as they use two tracks per channel to allow phase modulation and proper redundancy, plus two analog audio tracks and one SMPTE time code track. The SMPTE track will aid in electronic editing on the deck and multi-deck synchronization. A tape speed of 15 ips is said to provide up to 120 minutes of recording.

As if all this activity in digital recorders wasn't impressive enough, Sony capped this by introducing a digital audio mixer. Initially it is an eight-input, two-output small unit, but Sony plans larger units all the way up to 48 channels! It is designed to mix 16-bit linear quantized digital signals with no analog process involved. It has the usual slider fader controls, echo send and receive facilities, and analog plas-

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though, need no decoding. They include a normal and narrow FM IF bandwidth selector. It makes life simple for people in areas where their signals are crowded together elbow to elbow.

In our preamp section, the V7 comes equipped with a special phono EQ circuitry. Thanks to Sony's high IQ, it allows for direct connection of a low-output, moving-coil cartridge phono source. Without calling for an external step-up transformer or pre-preamp.

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Other manufacturers may have the power to bring you power. But only Sony has the power to bring you more than just power.

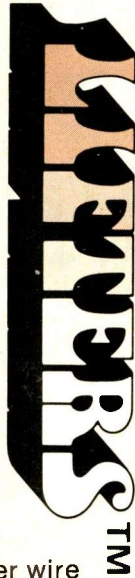
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ma bar-graph displays for level. Here again, sampling rate is selectable between 44.056K and 50.35K with, however, a maximum clock rate of 56K. The reason for the echo send and receive is that Sony has also introduced a digital reverberation system. The DRX-1000 has a built in micro-computer that allows programming of four different reverberation modes. The unit accepts digital signals directly and adds reverb directly. It has initial delays up to 100 milliseconds, with reverb times as long as 20 seconds. The mixer will interface with digital equipment with sampling rates up to 55K. It will interface with analog equipment and Sony's new A-to-D and D-to-A ADA-1601 two-channel converter also introduced at the convention. It is obvious that Sony is aiming for the total digital recording facility and, at this convention, they have shown that they are really serious about digital technology.



Sony DAD-1X
Digital Disc Player

One further bolstering of this idea was provided by the introduction of their DAD-1X digital audio disc. The system uses a one-sided reflective disc revolving at 450 rpm and is scanned by a low-power, helium-neon laser. The disc system is 16-bit linear-encoded PCM, with 95-dB dynamic range, and less than 0.03 percent distortion. Because of a new high density “run length limited code” system, the disc can play for an astounding 2½ hours on one side.

Ampex has been keeping a low profile on digital recording, although good reason told you that they must be working on a system. Ed Engberg, Ampex engineer, gave a paper on a so-called “Proposed Digital Recording Format,” which, not unexpectedly, opted for 16-bit linear quantization and a 50K sampling rate. Indications are that the ATR-100 might be modified as a digital mastering machine. Plans for any multi-channel digital recorder are unknown at this time.

JVC was demonstrating its new 14-bit PCM unit with its Vidstar VCR, and it was very clean-sounding with some pop-type music. They are reportedly going to be demonstrating their capacitance-type digital disc system at the Winter CES in Las Vegas.

Digital Discs

Along with a prototype model of their RS-1800 30-ips automatic bias and equalization adjusting tape recorder, Technics was demonstrating their SH-P1 PCM digital encoder/decoder with the Panasonic VHS/VCR deck. Yours truly recorded the digital tape for them, the Marlboro Festival players in Stravinsky's *L'Histoire de Soldat*, and I am pleased that it elicited much favorable comment. I am hopeful it will be heard at the Winter CES via their VISC digital disc.

Pioneer and MCA/Universal were demonstrating their digital disc version of the video disc Pioneer manufactures in Japan for industrial users. Not much info on it, other than it's another laser-scan system with 30 minute playing time per side and dynamic range 85-90 dB. Finally on the digital frontier was a paper by Philips on its compact laser-scan disc affording 90-dB dynamic range and a playing time of one hour per side. Oddly enough, it is not supposed to be compatible with their laser-optical video disc.

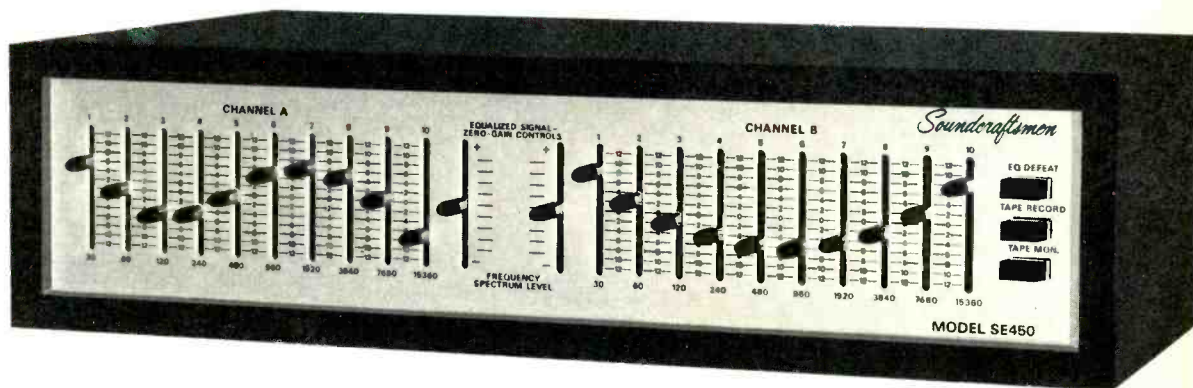
When I was in London recently recording the London Philharmonic Orchestra, Arthur Haddy, the Technical Director of Decca Records, was kind enough to invite me and Mrs. Whyte to a private demonstration of Decca's new digital tape mastering system made in their own laboratories at Finchley. Bill Bayliff, general manger of the Decca recording studios, and Tony Griffiths project manager at Finchley, were in attendance to explain matters and, in fact, were to attend the AES convention as well. I have been asked not to reveal certain details, but I can tell you it is a 16-bit linear quantization system, and the sampling rate is confidential. It uses a professional one-inch helical scan transport, has the ability to monitor off the tape, has, it is claimed, “100 percent dropout correction” (!), and very importantly for a record company ... complete “on session” electronic editing facilities. We heard some Ashkenazy Mozart from Kingsway Hall, plus an operatic recital from Walthamstow, and both were absolutely superb in terms of clarity, cleanness, and wide dynamic range. Furthermore, edits were performed right before our eyes and ears, to perfection I might add. With it taking sometimes a couple of years to assemble operatic casts, the on-session editing ability is vital to such projects. Obviously, our British cousins are very much into the digital scheme of things.

Yes, Virginia, there is a thing called analog audio, and there were some interesting new items at the AES convention which we will discuss next month.



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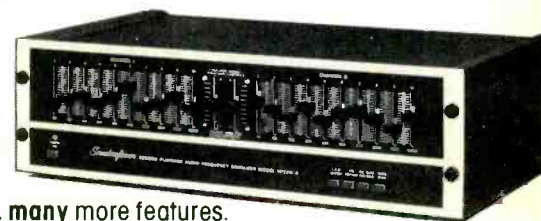
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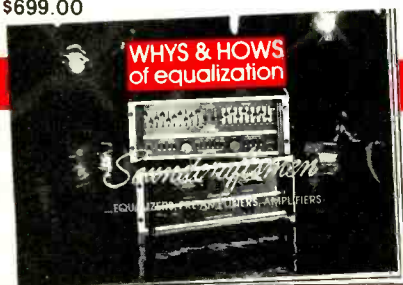
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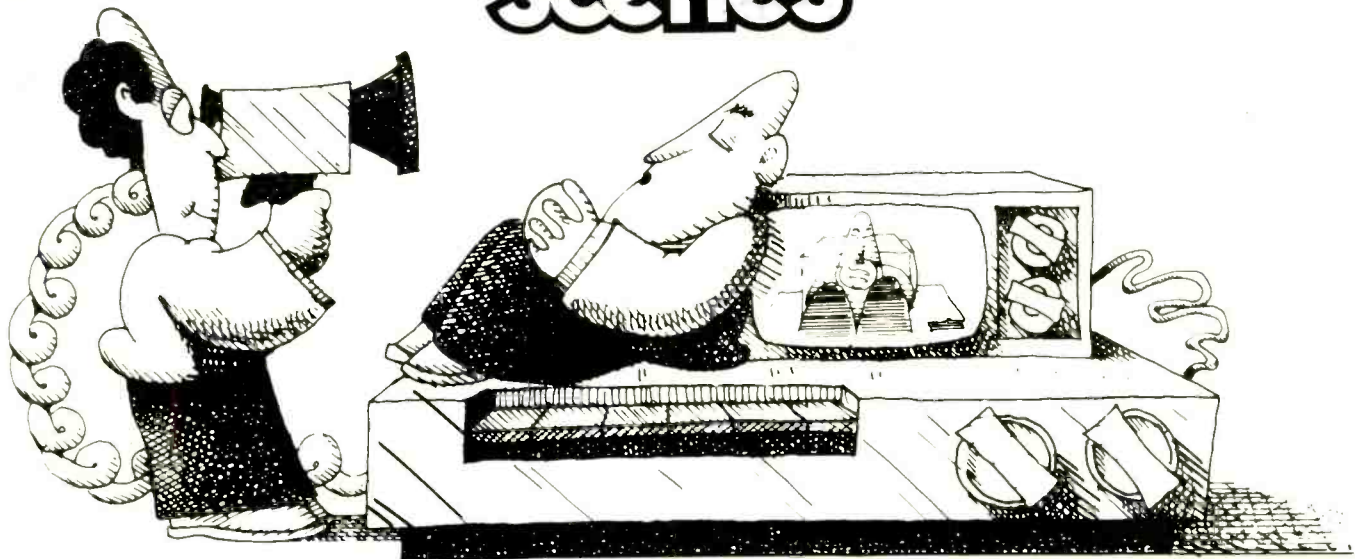
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Video Scenes

Bert Whyte



30

In the last Videoscenes column (December, 1978) I reviewed the Sony SL8600 Betamax, a third-generation VCR in that format. While the Betamax was the pioneering consumer VCR, this was too tempting a market to remain the exclusive province of Sony for any extended period of time. Thus, JVC entered the market with its Video Home System (VHS) video cassette recorder they called the "Vidstar."

Naturally, JVC wanted to offer a VCR system that was at least equal (if not better) in quality than the Betamax, with certain special features that would have a strong appeal for VCR customers. In the Vidstar, one of the major attractions was its ability to record for two hours, as compared to one hour for the original Betamax. Other points in its favor were the ease of unattended recording with its easy to operate built-in digital timer, low energy consumption, and small size.

The VHS system was soon licensed to JVC's parent company, Matsushita. In remarkably short time, JVC was supplying OEM units for other electronic firms, while Matsushita was halving the tape speed of the VHS system, thus permitting up to four hours of recording. These extended play VHS recorders are sold by Matsushita under its own Panasonic brand and also supplied as OEM units to various other companies including RCA in this country, who call their version of this VCR "Selectavision." Currently, the JVC VHS format has been adopted by more companies than those who opted for Betamax.

Recently, JVC introduced its second generation VHS unit, the Vidstar HR3600AU, with substantial refinements and innovations. Physically, it is a 17 $\frac{7}{8}$ in. wide, by 5-13/16 in. high, by 12 $\frac{3}{8}$ in. deep package, weighing in at 31 pounds, and attractively finished in a metallic tan color with simulated rosewood end panels.

As in most VCR machines, tape transport functions are activated by "piano key" mechanical controls, and there are separate UHF and VHF rotary channel selectors. These machines have push-in fine tuning knobs and an AFT (automatic fine tuning) button to "lock-in" the program after manual fine-tuning adjustment. The front panel also has toggle switches for record select and cassette or TV select, digital timer read-out and adjustment controls, microphone input, tracking control, tape counter, and search function button, plus several other special function controls we will get to shortly. The rear panel has the usual UHF and VHF terminals, video and audio inputs and outputs, and a special remote control facility.

The JVC Vidstar uses the rotary slant-azimuth two-head helical scan recording drum system to record a standard NTSC color signal at a linear tape speed of 1.31 ips. JVC claims the 62-mm wide head drum is the smallest in any VCR and that the record/play head gap is only 0.3 micrometers wide, less than half that of most current VCR units. This narrow gap, coupled with JVC's technique of removing the guard bands which normally separate adja-

cent tracks in azimuth recording, is claimed to be responsible for the high signal-to-noise ratio of more than 45 dB and achievement of high density recording on half-inch tape without degradation of the color quality. The high signal-to-noise ratio and high density recording is also due to a number of inter-related technological advances in VCR circuitry. One is what JVC terms "Double Limiter Frequency Modulation," somewhat similar to their Super ANRS (automatic noise reduction system) and the Dolby system in audio, which improves the signal-to-noise ratio of the black and white video signal by boosting the picture's brightness over the inherent noise signal. Another part of this is the "Burst Level Up" system, which is similar in function to the DL-FM system, but is used to ensure the proper color hue and saturation for the color video signal.

The final part of this special circuitry is the PSC (Phase Shift Color) system. When JVC removed the guard bands from the tape to enable high density recording, it created the problem of "crosstalk" at low frequencies (color information). By using the phase-shifter circuitry of a TV receiver and adding a control circuit which attenuates the crosstalk of signals drifting from one video track to another, proper hue is maintained and image degradation avoided.

Another feature of the Vidstar is a built-in thermal heating system, which is activated when room temperature falls below 50° F, thus preventing



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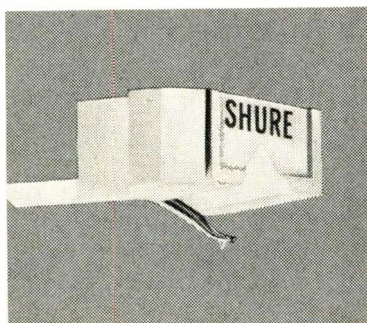


Needle in the hi-fi haystack

32

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.

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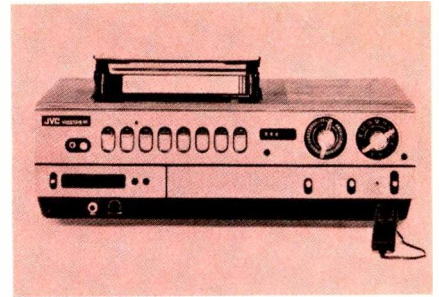
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harmful moisture condensation on head drum and tape. Most other VCR units merely have a light to warn of this condition, with no corrective heating circuitry.

New on this HR3600 model of the Vidstar and, for that matter, any other VCR is the ability to operate in other playback speed modes beyond the normal real-time viewing at the 1.31 ips tape speed. On the front panel is that special control I mentioned earlier, *Speed Play*. When this button is depressed, the tape speed is doubled. Of course, the action is speeded up in a sort of "Keystone Cops" fashion, but although the audio track is also doubled in speed, through the use of clever digital voice compression techniques, there is no pitch change or "monkey chatter" effects, and speech remains perfectly intelligible. Obviously this can be useful for rapid location of a segment of the program, far more precisely than the usual "fast forward" mode. One can also envision that having recorded several episodes of a serial or multi-part program, it is viewed at double speed to reduce running time and "catch up" with current episodes. There is a jack on the front panel and a remote control, which is supplied as standard equipment with every HR3600 Vidstar, plugs into it to enable switching between normal and double speed viewing.

The HR3600 Vidstar has a *Pause* control, which it is also labeled *Still*. This is a stop-action feature, which permits "still picture" viewing of any scene in the playback mode. Bands of noise may be visible on the screen in this mode, which are correctable via the tracking control. A quasi "slow-motion" effect is also possible through use of the tracking control. A rear panel "Pause/Remote/Still" jack accepts a supplied remote control switch. This allows remote control of starting and stopping of the tape during recording . . . in other words a "commercial killer," as well as controlling the "freeze frame" function. The JVC GC3300AU color video camera can also be plugged into this jack, in which case the camera's "stop/start" button controls the starting and stopping of the video tape transport during recording.

The new HR3600 Vidstar is obviously a versatile unit, with the interesting special features adding to its appeal. More to the point is that it is an excellent unit in terms of its normal VCR functions. I found all the controls easy to use, and they worked with commendable smoothness. A definite plus for people with small living rooms is that noise from the scanning drum and



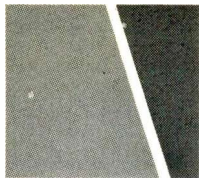
JVC HR3600 Vidstar

tape transport was exceptionally low, making this Vidstar the quietest VCR I have used thus far. The Vidstar accepts 30-, 60-, and 120-minute video cassettes, with a three-hour cassette to become available early this year. I used video cassettes supplied with the Vidstar, as well as VHS cassettes from TDK, who are just getting into the VCR market with both the VHS and Betamax formats. I didn't find any quality differences in the cassettes, probably because the Vidstar OEM cassettes are made by TDK. In any case, the pictures produced by the cassettes were first class. Dropout glitches were rarely encountered, and jitter was quite low. Picture distortions and anomalies usually attributed to poor tape packing within the cassette were nonexistent. Repeated use of a single cassette did not produce noticeable frilling of the tape edges, and there was no image deformity.

With the high 45-dB signal-to-noise ratio of the Vidstar, the resolution of the image quality was very good indeed. Horizontal resolution in the color mode is specified at 240 lines, which is quite high for half-inch tape, but believable in view of the perceived picture quality. Images were quite stable, and brightness and contrast ratios were well averaged, with no "hot spot" extremes. Color hue and intensity were exceptionally stable. As in the Betamax, longer playing times are the result of using progressively thinner tapes, at the one tape speed. As far as I could see, there was no perceptible degradation of image quality, when using a 120-minute cassette, as compared to a 30-minute cassette. Audio quality of the Vidstar, although specified as 50 Hz to 10 kHz, is no better than the Betamax, and this remains the weak spot for all the VCR units I have used thus far.

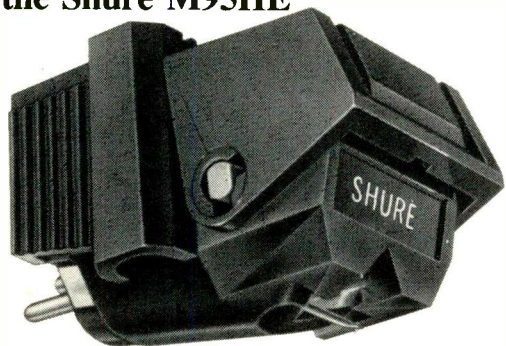
All in all, the new HR3600 Vidstar must be judged a "star" performer. As a straightforward VCR recorder, it functions both well and dependably. Add to this the special "frills" and features of this Vidstar, and VCR recording becomes even more interesting . . . and more fun, too!

A



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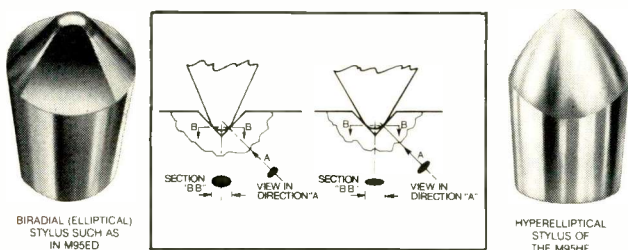
the Shure M95HE



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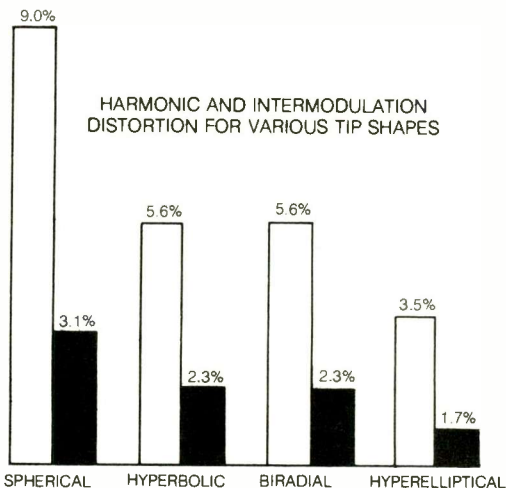
One of the critically acclaimed advances introduced in Shure's incomparable V15 Type IV pickup is its revolutionary and unique distortion-reducing Hyperelliptical stylus. Now, you can enjoy this standard of sound purity in a new, ultra-flat frequency response, light tracking, high trackability cartridge that will not tax your budget: the new Shure Model M95HE.

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M95HE cartridge & N95HE stylus



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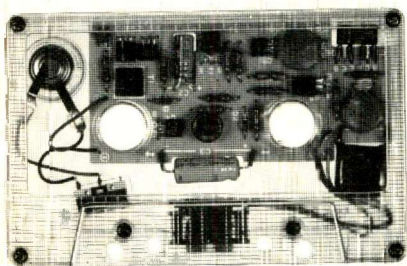
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The bookshelf

Music, Speech & High Fidelity by William J. Strong & George R. Plitnik. Brigham Young University Press, 1977, \$9.95.

This large format (8½ x 11) soft-cover book is subtitled, "A Descriptive Acoustics Worktext." At the end of each chapter are a number of exercises, lists of references and available audio-visual material, and demonstrations for classrooms. The first chapter of 40 pages covers some fundamentals of vibration. The second chapter of about the same length discusses the characteristics of sound waves.

The broad subject of the ear and hearing is handled fairly well within the 50-page space allotted. Tone timbre and spectrum, formants, critical bandwidth, and temperament are among the important topics presented. A short chapter on acoustical environments gives a non-detailed look at insulation, reverb time and absorption, properties of materials, and auditorium design. The 54-page chapter on the acoustics of speech is one of the stronger sections of this text. Speech production, phoneme classification, and the vocal tract are among the subjects not too familiar to many audio engineers that are covered in detail.

A 106-page chapter on musical acoustics amounts to a book itself on the subject. Spectral envelopes, dynamic ranges, impedance curves — good figures abound. All instrument types are covered in detail; for example, there are 16 pages just on the pipe organ. A 28-page chapter on electronic reproduction is really much too short to cover the area adequately.

There are a few short, non-detailed appendices which are elementary in nature. The book lacks an index, but there is some detail in the table of contents. At times, the approaches in the text are simple, and there are some of the most atrocious puns to ever appear in print. On the other hand, a great deal of material is presented lucidly with many excellent line drawings. The exercises are well thought out to aid the student (including the reader) in understanding fundamental

relationships. This is an excellent text for introductory coverage of the acoustics of speech and music, and it provides helpful material in other areas as well. *Howard A. Roberson*

Active-Filter Cookbook by Don Lancaster. Howard W. Sams, 1975, \$14.95.

Don Lancaster has written enough "cookbooks" to qualify for some sort of award in the culinary arts. This particular work starts with a discussion of the advantages and disadvantages of active filters and a section on terms and concepts. The following chapter on op amps gives a general background including a design-examples page which has an eye-catching flag for immediate identification. The third chapter introduces the reader to first- and second-order networks. The author has flag-identified sections on "The Math Behind" which helps the general text flow more smoothly and, at the same time, gives the information essential to some. Amplitude and phase responses are shown for LP (low-pass), HP (high-pass) and BP (band-pass) filters.

The next two chapters cover filter responses, guiding the reader on order, selecting shapes, design criteria, and methods. There is an excellent, albeit brief, discussion of Bessel, Chebyshev, Butterworth and other filter types. The following three chapters cover specific LP, BP and HP filter circuits. Sallen-Key and state-variable filters are among those included. As in the previous chapters, there are the helpful math-background and design-example sections. There are also design-guide block schematics with instructive call-outs.

The final two chapters are on tuning, voltage control, special types and applications. There is a short list of reference articles and texts. The six-page index is quite good, but there are some omissions. Overall, Lancaster's book is very well organized and presented with numerous helpful figures. It should be of value to those who would learn and do.

Howard A. Roberson

AUDIO • February 1979

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second hundred years**



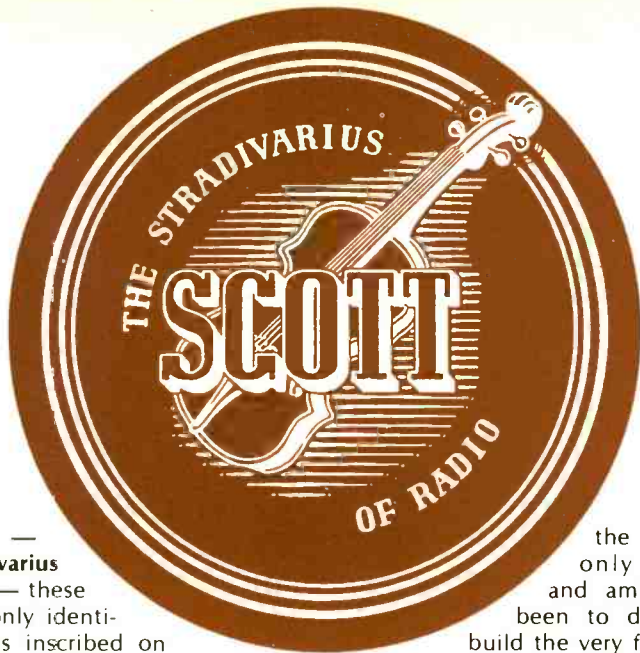
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The new ReVox B790 looks and performs better than any turntable you've ever seen or heard. To give it the ultimate test, bring your favorite record to your ReVox dealer for a demonstration. For complete information and the name of your nearest ReVox dealer, circle reader service number or write to us.

REVOX



36 "Scott — The Stradivarius of Radio" — these were the only identifying words inscribed on the dial of the Scott Philharmonic, the world's finest radio receiver. From 1924 to 1945, E.H. Scott custom built instruments for reproducing radio and recorded music. His customers represented the most discriminating radio market in existence — world famous musicians, critical laymen listeners, engineers, and distinguished scientists. Although nearly half a century old, many Scott receivers are still treasured by their *original* owners.

In 1933, Mr. Scott wrote, "Right from

the start, my only interest and ambition has been to design and build the very finest radio receiver possible." For more than 10 years, he repeatedly challenged the whole world of radio to any kind of competitive tone or distance reception test, but not a single manufacturer was willing to accept the challenge.

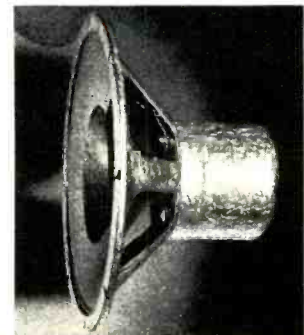
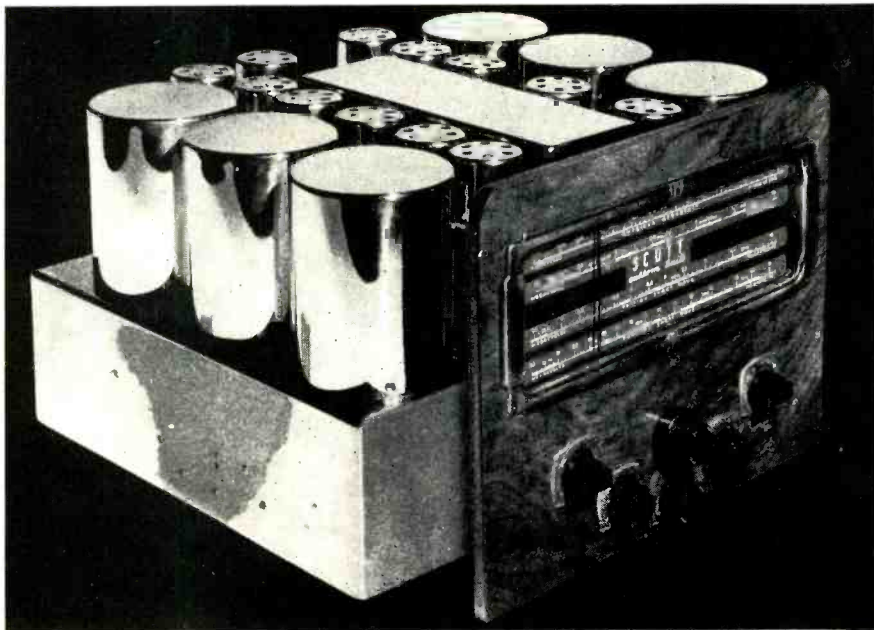
Scott not only kept up with the state-of-the-art designs, he often surged far ahead of his time. He designed the first receiver to successfully use more than one r.f. amplifier stage. Scott manufactured the first receiver

which successfully employed the screen-grid tube and later the first set which successfully utilized the "triple-grid super-control" type 57 and 58 tubes. He was first with a 500 to 15 meter allwave set with band switching instead of plug-in coils. His receivers were first to provide 10-kHz selectivity at a field strength of 600 to 1. In the realm of high fidelity, a Scott receiver was the first with the capability of reproducing "the entire audio range" from 30 Hz to 16 kHz.

E.H. Scott was probably the first radio manufacturer to employ reliability testing. He designed and utilized electric rotators to test moving parts, electro-mechanical shaking tables to test the permanence of adjustable components, and a special refrigeration cabinet to simulate humid conditions in tropical climates. All Scott receivers were thoroughly tested, both mechanically and electrically before delivery to the customer.

The shielding in Scott radios was superb. At the "Century of Progress" (1933 Chicago World's Fair), a Scott Allwave Deluxe receiver was installed in the elevator control room at the top of the Observation Tower of the Sky Ride. Each day, eight to twelve thousand people visited the control room. They heard music and news coming

J.W.F. Puett



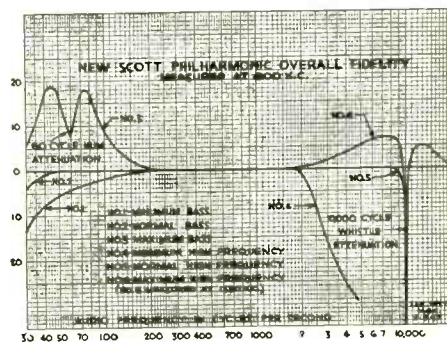
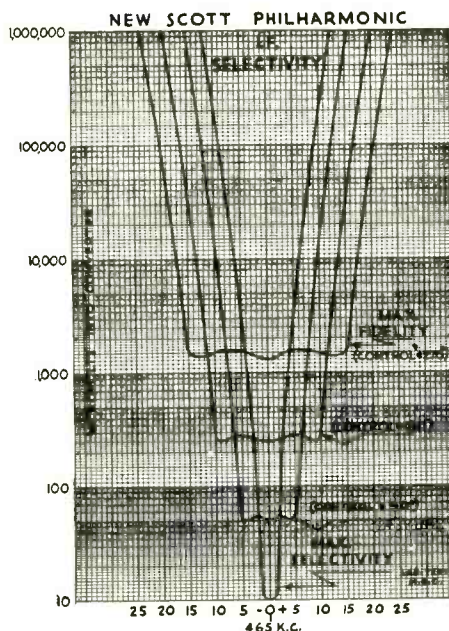
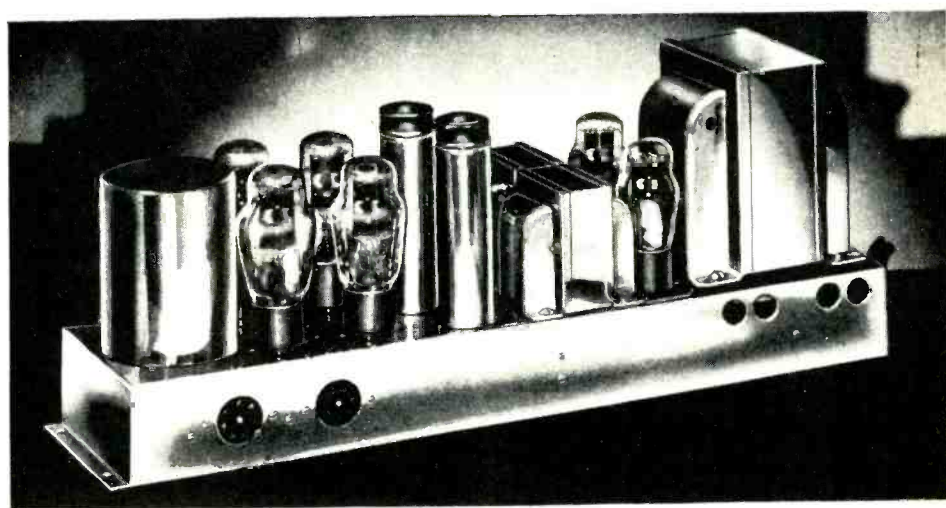
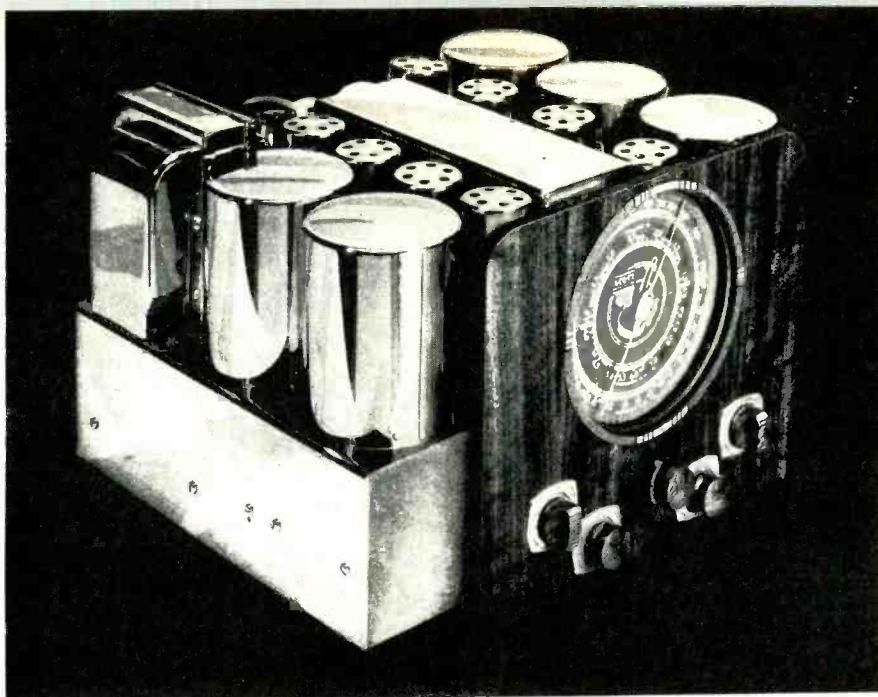
from the radio without the slightest trace of electrical interference, yet the set was situated in the center of a mass of motors, dynamos, and control contactors. Very few receivers manufactured today could match that performance.

Reliable Reception

In 1935, Scott ads heralded the 23-tube Allwave Imperial. This set utilized four type 2A3 triode tubes in a class-A, push-pull-parallel audio amplifier rated at 35-watts.

Four of Chicago's largest theaters were slated to use receivers manufactured by two very well-known companies to pick up the Joe Louis vs. Max Baer fight which was only available from a distant station. The program material was to be connected from the receivers to the \$20,000.00 theater sound system. It was found that neither of the receivers was capable of bringing a sufficiently clear signal into the theaters. The theater owner asked Mr. Scott if he thought his new Allwave Imperial might do the job. Scott replied, "It is not only capable of bringing in the signal, but of delivering the volume required without using the theater sound systems!" The next day, an Allwave Imperial was installed in the Drake theater. To the owner's amazement, it brought in the desired station without even a crackle from the ambient downtown electrical noise and filled every corner of the theater with the volume turned only one-third up. With a standing-room-only audience, the volume was turned one-half up.

Each piece of lumber used for construction of a Scott console was first stacked in the open air where it was allowed to dry from one to three years, depending upon its thickness. Following the air drying, the wood was placed in a dry kiln and steamed from 24 to 36 hours to remove all acids. After steaming, it was left in the dry kiln at a temperature of 140 degrees from three to six weeks, depending upon the thickness and kind of lumber. When the moisture content was reduced to between six and ten percent, the lumber was placed in a cooling shed for several days. It was then placed back in the kiln where dry heat was applied until the moisture content was further reduced to between four and six percent. The wood was finally given a secret-process treatment which made it practically impervious to moisture. Only then was it ready to be built into Scott consoles by men who had devoted their lives to building fine furniture.



Build An Amp Strapping Circuit

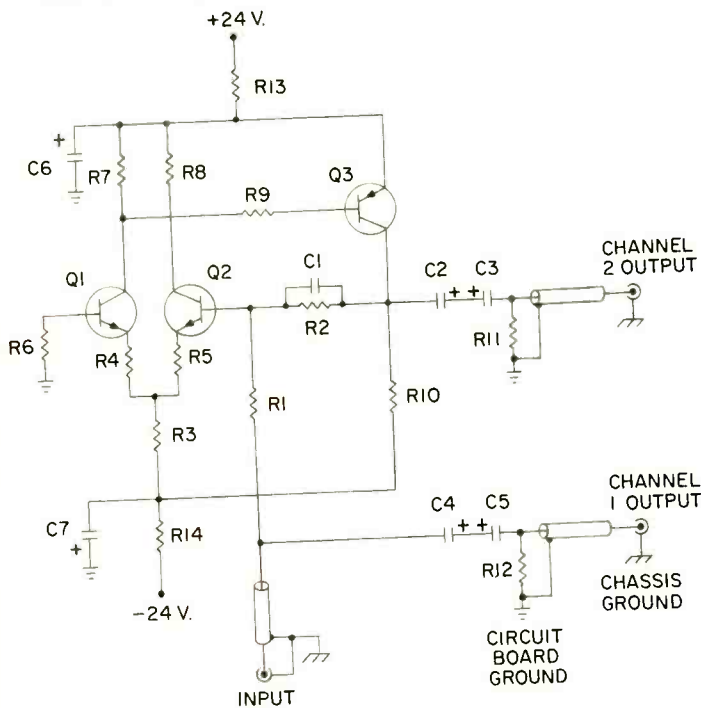
W. Marshall Leach

The maximum output power that a power amplifier can supply is limited by the peak voltage swing that it can produce with a given load impedance. With a sine wave signal, the relation between the output power P , the peak output voltage swing V_p , and the load impedance R_L is given by the equation

$$P = \frac{V_p^2}{2R_L} \quad (1)$$

40 For a fixed load impedance, it can be seen from this equation that the maximum power is determined by the maximum

Fig. 1 — Circuit diagram of the strapping circuit. Input and output jacks are grounded to the chassis at their mounting holes.



Assistant Professor,
Georgia Institute of Technology,
School of Electrical Engineering,
Atlanta, GA 30332

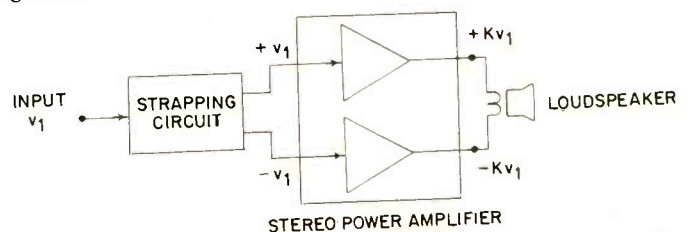
peak voltage swing the amplifier is capable of. If this maximum peak voltage swing could be doubled, the power output from the amplifier would be quadrupled. This may seem academic, however, for the peak voltage swing that a given power amplifier is capable of cannot exceed the d.c. voltage on its power supply. (This assumes a direct-coupled amplifier for which positive and negative power supplies are used. In the case of a capacitively coupled amplifier with a single power supply, the peak voltage swing is limited to one-half the power supply voltage.)

A simple technique for theoretically doubling the peak voltage-swing capability and thus quadrupling the power output of an amplifier is called strapping. There is one catch, however. A strapped stereo amplifier becomes a mono amplifier. Thus two stereo amplifiers are required if a strapped stereo system is desired. This article describes a simple strapping circuit which can be used to strap any stereo amplifier for mono operation. The circuit has extremely low distortion and will in no way effect the sound quality that an amplifier is capable of.

Circuit Description

The diagram for the strapping circuit is given in Fig. 1. The circuit is a three transistor discrete operational amplifier which is operated in a unity gain inverting mode. The input signal is split into two paths, one which feeds the channel one output and one which feeds the channel two output. The channel one output is identical to the input signal with the exception that it is fed through the d.c. blocking capacitors C4 and C5. The channel two output is derived from the

Fig. 2 — Block diagram of the strapping circuit connected to a stereo power amplifier. The loudspeaker is connected between the "hot" or positive outputs of the amplifier. The loudspeaker ground connections for the amplifier are not used.



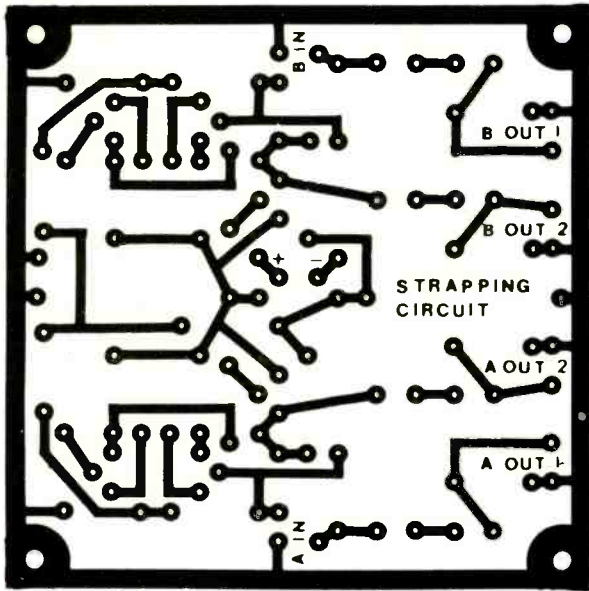
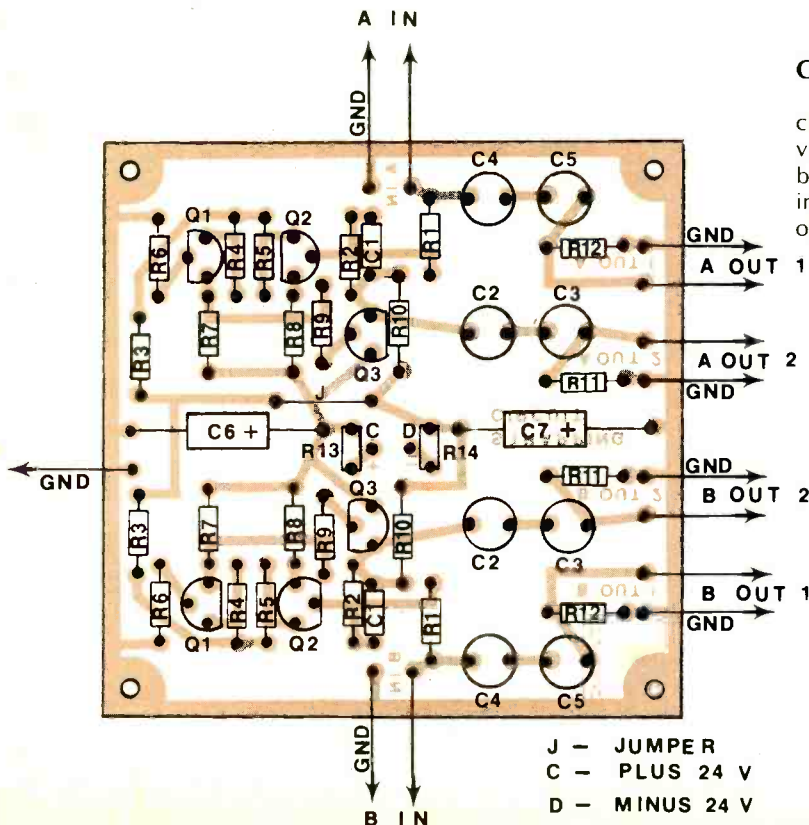


Fig. 3 — Circuit board foil patterns for a two-channel version of the strapping circuit. The view is from the copper side of the board.

input signal by the operational amplifier. The amplifier is connected so that its gain is unity, but it reverses the polarity of the input signal. Thus the channel two output is an inverted replica of the channel one output.

Let the strapping circuit be connected to a stereo amplifier as shown in the block diagram of Fig. 2. The speaker load impedance R_L is connected between the two "hot" or positive outputs of the amplifier. It does not connect to the ground or negative outputs. Suppose a signal v_i is applied to the input of the strapping circuit. The power amplifier would

Fig. 4 — Parts layout for the recommended foil patterns. The view is from the side opposite the copper side of the board.



J - JUMPER
C - PLUS 24 V
D - MINUS 24 V

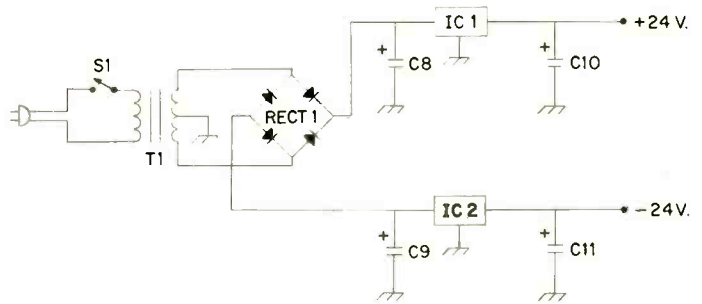


Fig. 5 — Regulated power supply circuit diagram for the strapping circuit. See text for proper grounding instructions.

then have a signal $+v_i$ applied to its channel one input and a signal $-v_i$ applied to its channel two input. If the gain of each channel of the amplifier is K , it follows that the voltage across the speaker load is given by

$$v_L = Kv_i - K(-v_i) = 2Kv_i \quad (2)$$

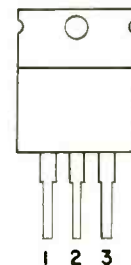
which is exactly twice what it would be if the amplifier were operated conventionally. Since the speaker voltage is doubled, the power is quadrupled. However, is the maximum power output capability also quadrupled? The answer is yes because the maximum peak voltage swing capability across the load is doubled.

The preceding discussion assumes the amplifier has a perfectly regulated power supply so that the d.c. supply voltage does not change when the amplifier load is changed. Since this is not true in practice, the maximum power output of a strapped amplifier will not equal four times its rated power into an 8-ohm load. However, it can be shown that a strapped amplifier will deliver to an 8-ohm load a power that is twice its rated per channel power into a 4-ohm load. For example, an amplifier may be rated at 100 watts per channel into 8 ohms and 175 watts per channel into 4 ohms. When strapped it will deliver 350 watts into 8 ohms. A strapped amplifier should not be used with a 4-ohm load, since this presents an equivalent per channel impedance of 2 ohms which may damage the amplifier or cause the protection circuit to trigger.

Construction Details

The recommended circuit board foil pattern for a two-channel version of the strapping circuit is given in Fig. 3. The view in this figure is from the copper side of the circuit board. The corresponding parts layout for the circuit is given in Fig. 4. The view in this figure is from the side of the board opposite the copper foil pattern. To insure good continuity

Fig. 6 — Pin configurations for IC1 and IC2.



PIN NUMBER	1	2	3
LM340T-24	INPUT	GROUND	+24 VOLTS OUTPUT
LM320T-24	GROUND	INPUT	-24 VOLTS OUTPUT

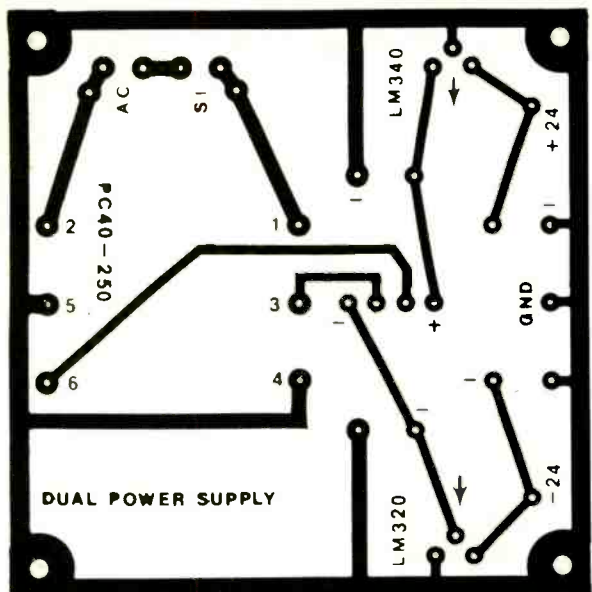


Fig. 7 — Circuit board foil patterns for the regulated power supply. The view is from the copper side of the board. The primary of transformer T1 solders to terminals 1 and 2 on the circuit board. The d.c. resistance of this winding is approximately 70 ohms. The arrows point in the direction that the tabs on IC1 and IC2 face.

42 between circuit board ground and chassis ground, the circuit board should be mounted on metal standoffs with inside star lockwashers installed on each end. The mounting screws should be tightened securely so that the lockwashers make good electrical contact. To prevent ground loops, the input and output coaxial cables are grounded at only one end as

shown in Fig. 1. Thus the signal ground connections are made through chassis ground.

The power supply for the strapping circuit is shown in Fig. 5. It can be used to power both the strapping circuit and the wide bandwidth preamplifier, which was the subject of a construction article in Feb., 1977, PROVIDED D1 through D4 are removed from the preamp and R31 through 34 are changed to 100 ohm, ½ watt resistors. Other recommended changes in the wide bandwidth preamplifier are R3 = 82 ohms, R9 = 3.9 Megohms, R21 = 3.3 Kiloohms, C1 = 0.0022 microfarads, C8 = 220 picofarads, C9 = 5 picofarads, and C20 = 5 picofarads. These changes improve both the RIAA equalization and the transient response of the circuits.

The recommended circuit board foil pattern for the power supply is given in Fig. 7. The view in this figure is from the copper side of the circuit board. Figure 8 gives the corresponding parts layout. The view in this figure is from the side opposite the copper side of the board. The circuit board should be mounted on metal standoffs with inside star lockwashers installed on each end. This will insure good continuity between circuit board ground and chassis ground. The mounting screws should be tightened securely so that the lockwashers make good electrical contact. IC1 and IC2 are installed vertically on the power supply PC board. It is not necessary to heat sink these if the power supply is used to power only the strapping circuit alone. However, if the power supply is used for other circuits requiring a ±24 volt regulated supply, the IC regulators may have to be heat sunk. If the regulator metal tabs become too hot to continuously hold the little finger against, a metal heat sink of the spring clip-on variety or a screw-on type should be installed on both IC1 and IC2.

Final Checkout and Turn-On Procedure

After the circuit is constructed, it should be checked out before using it with a power amplifier. First turn on the power and measure the d.c. voltages on C10 and C11. These should be plus and minus 24 volts, respectively. Next mea-

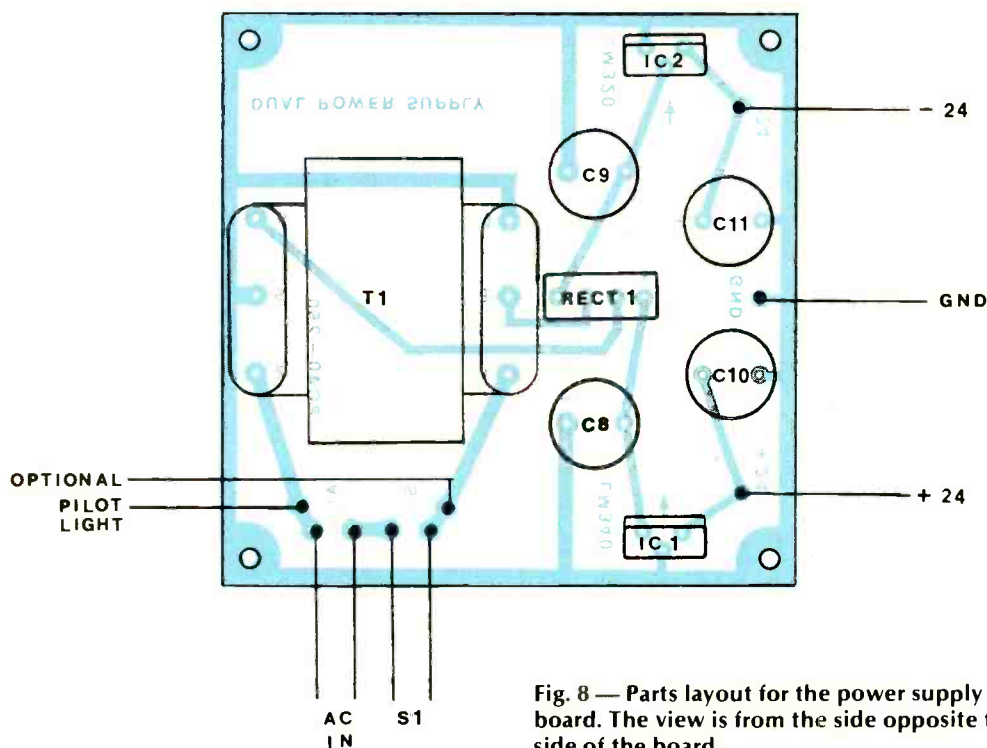


Fig. 8 — Parts layout for the power supply circuit board. The view is from the side opposite the copper side of the board.

sure the d.c. voltage at the collector of Q3 on each channel. This should be less than one volt. If these tests are positive, the circuit is operational and can be connected to the power amplifiers to be strapped. However, it is preferable that the unit be checked out with a signal generator and oscilloscope if these are available. A 1000-Hz signal connected to the input should produce equal signal levels at the channel one and channel two outputs. With a dual trace oscilloscope, the inversion of the channel two output can be verified.

The strapping circuit should ALWAYS be turned on before the power amplifier in order to prevent any turn-on thumps

from reaching the speakers. Similarly the power amp should be turned off before the strapping circuit. If desired, the strapping circuit can be left on at all times to prevent both turn-on and turn-off thumps. As a final precaution, do not strap a power amplifier that cannot drive the rated loudspeaker impedance. Low impedance loudspeakers should not be used with strapped amplifiers. **A**

References

1. W. M. Leach, "Construct a Wide Bandwidth Preamplifier," *Audio*, Vol. 61, No. 2, Feb., 1977, pp. 38-48.

Parts List

Parts listed here are for a single strapping circuit and the regulated power supply. Resistors should be ¼ watt carbon film units unless otherwise noted.

Q1, Q2	2N5210 transistors
Q3	2N5087 transistor
R1, R2	30 kilohm resistors
R3	62 kilohm resistor
R4, R5, R9	1.5 kilohm resistors
R6	220 ohm resistors
R7 R8	3.3 kilohm resistors
R10	5.6 kilohm, ½ watt, resistor
R11, R12	100 kilohm resistors
R13, R14	100 ohm, ½ watt resistors
C1	2 picofarad, silver-mica capacitor
C2, C3, C4, C5	100 microfarad, 25 volt radial lead electrolytic capacitors
C6, C7	100 microfarad, 25 volt axial lead electrolytic capacitors

C8, C9, C10, C11 1000 microfarad, 35 volt radial lead electrolytic

	capacitors
IC1	LM340T-24, +24 volt regulator
IC2	LM320T-24, -24 volt regulator
S1	SPST, 1A switch
Rect.	1 100 volt, 1A bridge rectifier
T1	Transformer, Signal Model PC40-250, available by mail from Signal Transformer Co., 500 Bayview Ave., Inwood, N.Y. 11696.

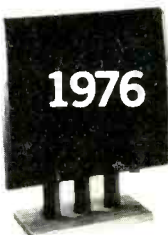
Drilled and solder-plated glass-epoxy circuit boards for the stereo strapping circuit or for the power supply are available for \$5.00 each plus \$1.50 for shipping. Prices for a complete kit, minus chassis and hardware, are \$20.00 for the strapping circuit and \$30.00 for the regulated power supply plus \$2.50 shipping per order. Order from Custom Components, P.O. Box 33193, Decatur, GA 30033.



1974

"The definition is the best I have heard from any dynamic loudspeaker... one of the finest loudspeakers I have ever listened to, giving a precise stereo image without instrument wander.

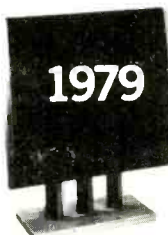
ELECTRONIC ENGINEERING TIMES



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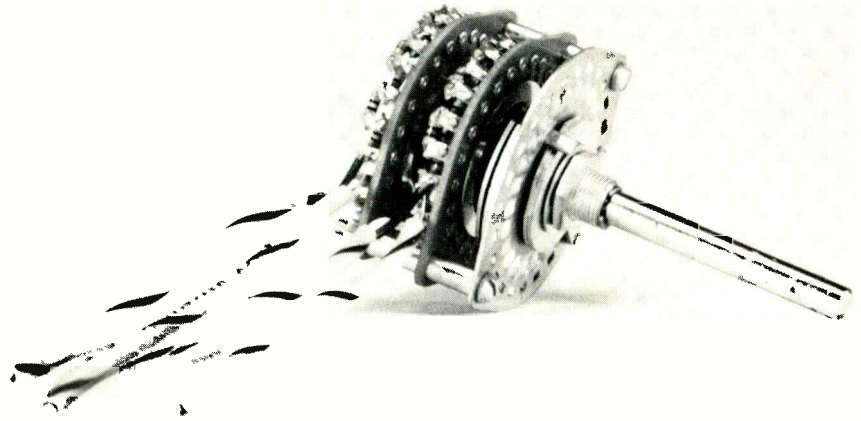
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Build A Stepped Volume Control

W. Marshall Leach, Jr.



44

One of the many problems that often plague those who like to build their own audio gear is obtaining a high-quality volume control. Most potentiometers on sale in electronics stores either are not the correct value, have an incorrect taper, or are so cheaply made that they make a "scratchy" sound when the volume is changed. If a dual or ganged control for stereo is sought, the problems are even worse. Provided one can be found, almost inevitably the two sections mistrack severely, often by more than 10 dB at low volume settings. Good volume controls can be found if one has the patience to locate them and the money to pay for them. However, there is an inexpensive alternative . . . constructing one with an easy-to-obtain multi-position switch. Although the control may not have the slick feel of more expensive ones, its attenuation can be designed for precise volume control and the tracking of the two stereo channels will be virtually perfect with 5 percent carbon-film resistors for the attenuator elements.

The switch which has been selected for this project is a Centralab Model PA-4002 two-pole, 24-position shorting switch. With one position for the input, one for the output, and one for the ground connection, it is possible to connect a total of 22 resistors to form a 23-position stepped attenuator that varies from zero to infinite attenuation in predetermined

steps. The procedure which will be described for calculating the resistor values is straightforward so that with the aid of a scientific calculator, the resistor values can be easily calculated for an arbitrary number of steps, an arbitrary taper, and any value of total resistance. A simple program, which has been written for the Texas Instruments TI-59 programmable calculator, will also be given.

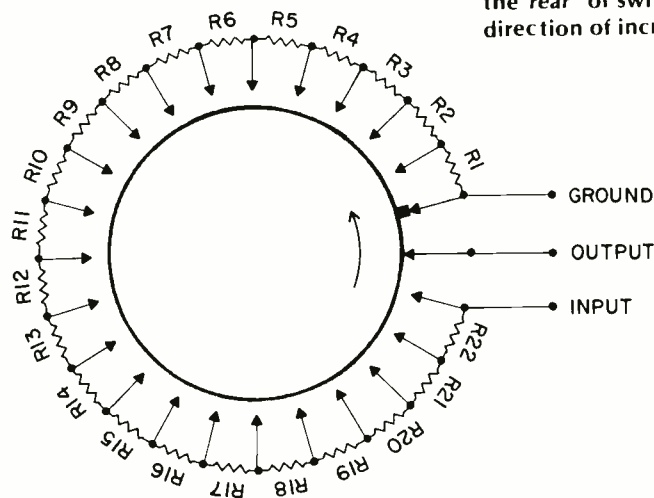
The circuit diagram of the stepped attenuator is given in Fig. 1. This shows the resistor network in a circular array as it would appear on the Centralab switch when viewed from the rear. Let the position of the wiper be denoted by the integer n , where n varies from 0 to 22. At position 22, the wiper is connected to the input and the attenuation is zero. At position 0, the wiper is connected to ground, and the attenuation is infinite. For any intermediate position, the attenuation in decibels is given by the equation:

$$a_n = -20 \log \left| \frac{R_1 + R_2 + R_3 + \dots + R_n}{R} \right| \text{ dB} \quad (1)$$

where R is the total desired resistance of the attenuator and n is the position of the wiper. Given the value of R and the value of a_n for each position, this equation can be solved for each resistor in the array.

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Fig. 1—Circuit diagram of one channel of the volume control. View is from the rear of switch. Arrow indicates direction of increasing volume.

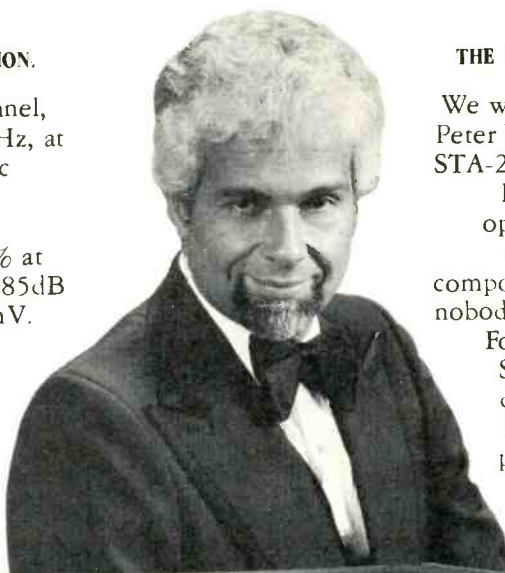


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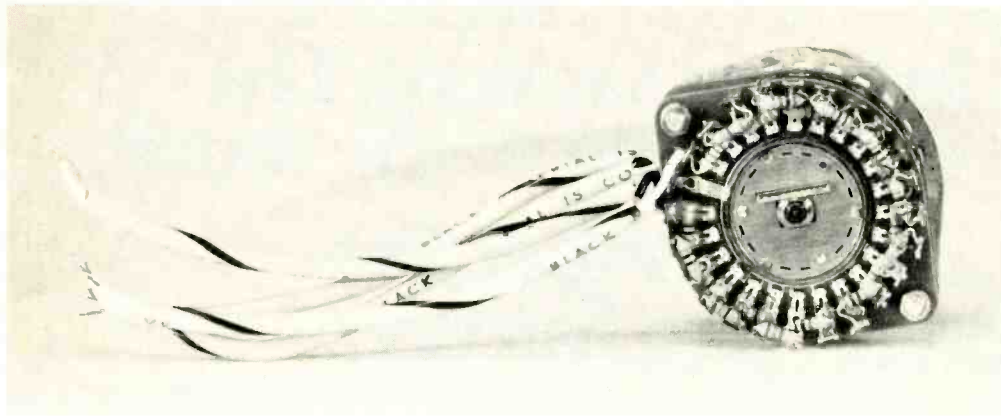
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View from behind the control shows that care is required to keep the resistors from shorting either against one another or against other terminals.

The first step in solving Equation (1) is to divide by 20, take the antilog, and then multiply by R. This gives

$$R_1 + R_2 + R_3 + \dots + R_n = R \times 10^{-(a_n/20)} \quad (2)$$

To determine each resistor value, R₁ is first solved for by letting n = 1. This gives

$$R_1 = R \times 10^{-(a_1/20)} \quad (3)$$

To find R₂, Equation (1) is evaluated for n = 2 and the value of R₁ determined from Equation (3) is subtracted to give

$$R_2 = R \times 10^{-(a_2/20)} - R_1 \quad (4)$$

This procedure can then be repeated to solve for the remainder of the resistor values in the network.

The TI-59 calculator can be easily programmed to perform the resistor calculations. One possible program to do this is as follows:

±	÷	20	=	INV	2nd	log	×	RCL
00	-	RCL	01	=	STO	02	+	RCL
01	=	STO	01	RCL	02	R/S	GTO	000

Table I
Calculated Resistor Values For a 20 kilohm Volume Control

Resistor	Calculated Value	5% Standard Value
R1	20.00	20
R2	19.91	20
R3	39.72	39
R4	79.24	82
R5	92.92	91
R6	147.27	150
R7	233.40	240
R8	163.76	160
R9	206.16	200
R10	259.54	270
R11	326.74	330
R12	411.34	430
R13	517.85	510
R14	651.94	680
R15	820.74	820
R16	1033.25	1000
R17	1300.78	1300
R18	1637.59	1600
R19	2061.60	2000
R20	2595.40	2700
R21	3267.42	3300
R22	4113.44	4300

In register 00, the total resistance of the attenuator is stored before running the program. The numerical value 0 should be in registers 01 and 02. To calculate the resistor values beginning with R₁, the desired attenuation in dB for each step on the switch is entered and the R/S key is depressed. For the last resistor value, 0 dB is entered and R/S is depressed.

The program has been used to calculate the 22 resistors which can be accommodated on the Centralab switch for the recommended 20 kilohm volume control for the wide bandwidth preamplifier described in [1]. The taper was chosen to be 6 dB per step for the first three positions, 4 dB per step for the next three positions, and 2 dB per step for all others. This gives a total attenuation of 60 dB for the first position, 54 dB for the second, 48 dB for the third, 42 dB for the fourth, 38 dB for the fifth, 34 dB for the sixth, 30 dB for the seventh, 28 dB for the eighth, etc. The calculated values of the resistors are given in Table 1. They can be easily converted to any desired total resistance without the aid of a scientific calculator by dividing each resistor value by 20 and then multiplying by the desired resistance in kilohms. Should a different taper or total number of steps be desired, the equations must be solved for the resistor values.

In constructing the stereo volume control, care should be taken to prevent any one of the 44 resistors from shorting against one another or against a switch terminal to which it is not soldered. Because the switch terminals may be slightly corroded, it may be difficult to get a good solder joint without using excessive heat which could damage the resistors. To prevent this, a suede brush can be used to clean the terminals and the solder dipped into soldering paste before soldering each terminal. A good solder joint is one for which the solder has flowed onto the terminal and which is shiny after the solder cools.

Before soldering the first resistor, it is best to double check and verify that the switch is being wired so that clockwise rotation of the shaft increases the volume. In addition, the two switch stops must be set so that when the shaft is fully counterclockwise, the wiper output terminal is connected to the ground terminal. When the shaft is fully clockwise, the wiper should be connected to the input terminal. Directions for setting these stops come with the switch. Because the switch is stiff when new, a drop of oil on each of the ball bearings that ride in the switch detents may loosen things up. However, in time the switch will loosen up and be easy to rotate. One word of caution, the phenolic wafers in the switch are fragile! If the switch is dropped, one of these wafers can shatter... this advice comes from experience. If this occurs, the damage can be repaired with epoxy glue. Δ

Reference

1. W.M. Leach, "Construct a Wide Bandwidth Preamplifier," *Audio*, Vol. 61, No. 2, Feb., 1977, pp. 38-48.

IT TOOK TOSHIBA TO BUILD THE WORLD'S FIRST DIGITAL-SYNTHESIZED RECEIVER.



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Open Reel: The format

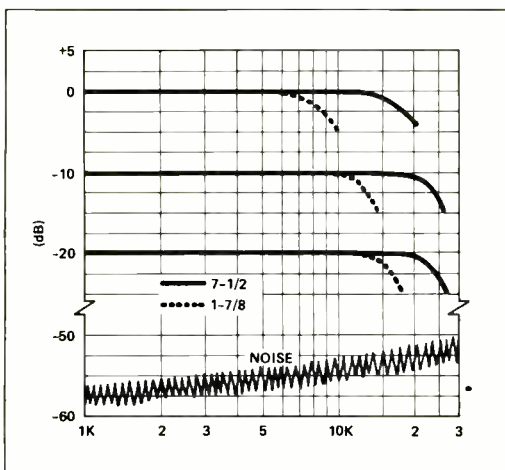
You're looking for a tape recorder. You've heard from friends and salesmen that cassette is the answer. At TEAC we make both cassette and reel-to-reel tape recorders. Because we make each for a specific person and application, you should depend on fact, not hearsay, before spending your money.

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There are immutable reasons why cassettes can't match open reel fidelity.

Take tape speed. Open reel tape running at 7½ ips is running four times faster than a cassette. And speed has more to do with the relationship between frequency response and signal-to-noise than anything else by far.

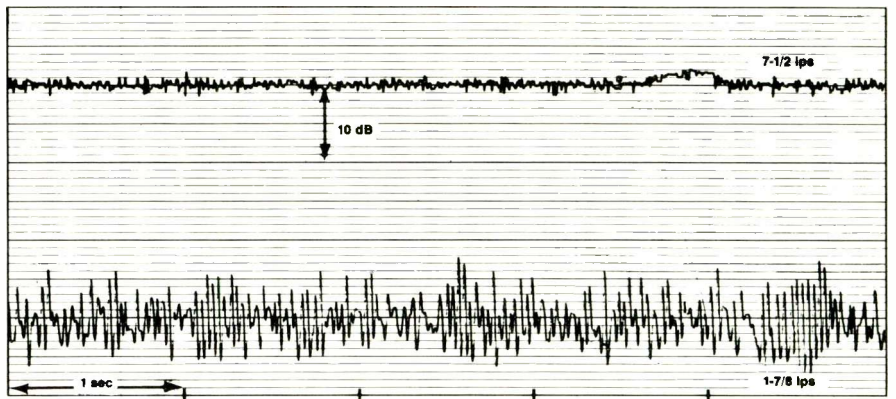
At 7½ ips all audio frequencies can be recorded at full level



Tape saturation vs. level at 7½ ips and 1⅞ ips.

without tape saturation. Recording at 1⅞ ips forces you to make drastic compromises in record levels. The more you have to back off on recording levels, the more you hurt the ratio of signal-to-noise.

In short, with a cassette deck you cannot have high frequency response and good signal-to-noise. So a cassette deck is always operating on the ragged edge of disaster. It's so much easier to get into trouble than out of it because there's a difficulty for every solution.



Comparative dropouts between 7½ ips and 1⅞ ips at 15kHz.

MORE IS MORE

The faster the speed the longer the wavelength, the longer the wavelength the more protection you have against dropouts. You also have an easier job of editing.

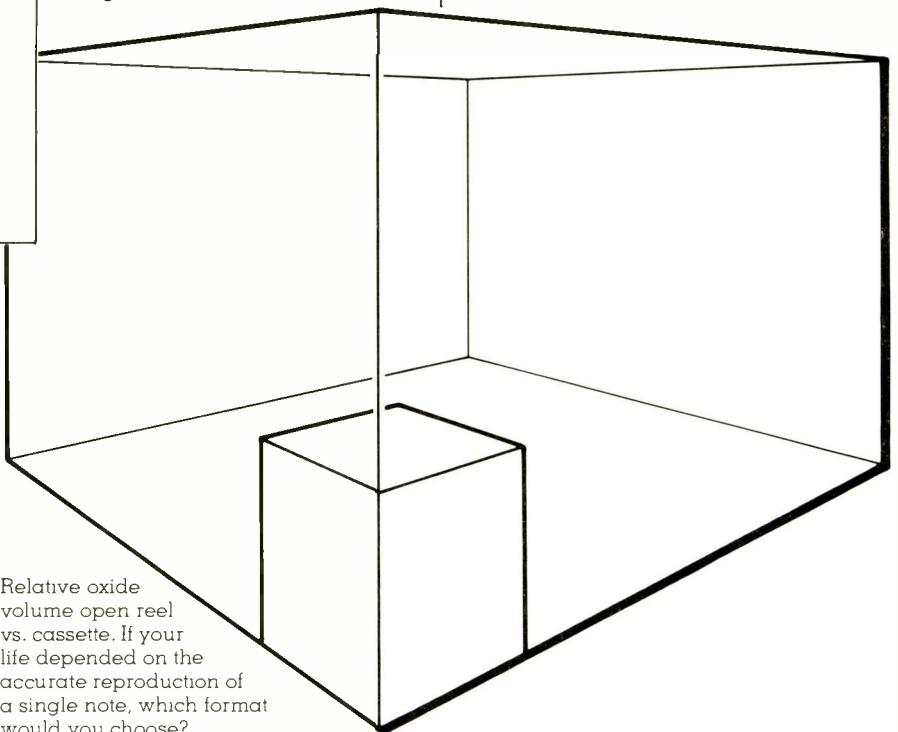
Now take track width. Open reel gives you twice the track width of cassettes. The wider

the track width the higher the output, the higher the output the better the signal-to-noise ratio. A wider track is also less sensitive to dropouts and, obviously, a wider track retains more magnetism.

And while we're on the subject of magnetism, an open reel tape has twice the oxide coating of a cassette.

Upshot: A total tape volume 16 times greater than a cassette, which means 16 times more magnetic particles to store and remember music.

If that sounds better to you, if we've convinced you the cassette format is a high price to pay for convenience, then you ought to look at the TEAC lineup of open reel tape recorders.



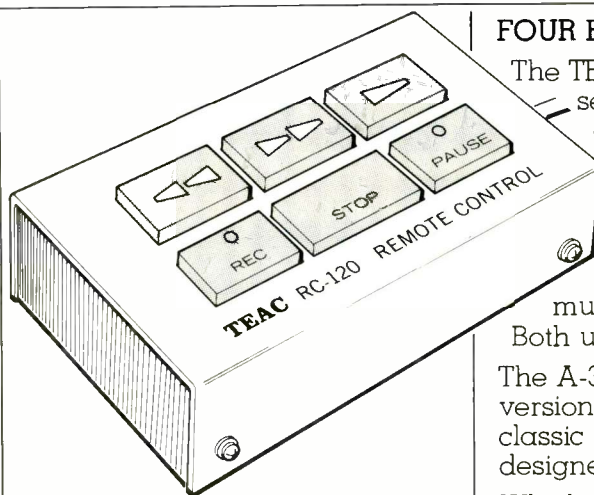
for the informed.

INSIDE INFORMATION

TEAC is a leading designer and manufacturer of computer and instrumentation recorders. In medical centers, for example, physicians depend on special TEAC units to record vital data in life-or-death situations; in remote wilderness areas, scientists depend on TEAC to monitor now-or-never phenomena like earthquakes.

From that experience we've learned that the quality of the transport mechanism is the single most important consideration in a tape recorder. For the computer industry, and for you. That's why many of the same engineers have designed the tape recorders we make for both.

Our entire reel-to-reel line has three motors and micro-switched solenoid operated transport systems, a blend of computer age sophistication and brute strength that nothing else can equal. Ask anyone whose opinion you respect.



OPTIONAL REMOTE CONTROL

Unlike some reel-to-reel machines, TEAC decks have full-function remote capability. Our optional remote units are the perfect answer for recording sessions where you can't be next to the recorder, or for operational access to a recorder in a custom installation.

TEAC®

First. Because they last.

FOUR EXAMPLES

The TEAC A-2300SX is the best selling, most successful open reel machine ever. Over 300,000 have been sold. The SR version of the A-2300 features an auto-reverse function so you can play music in two directions. Both use 7" reels.

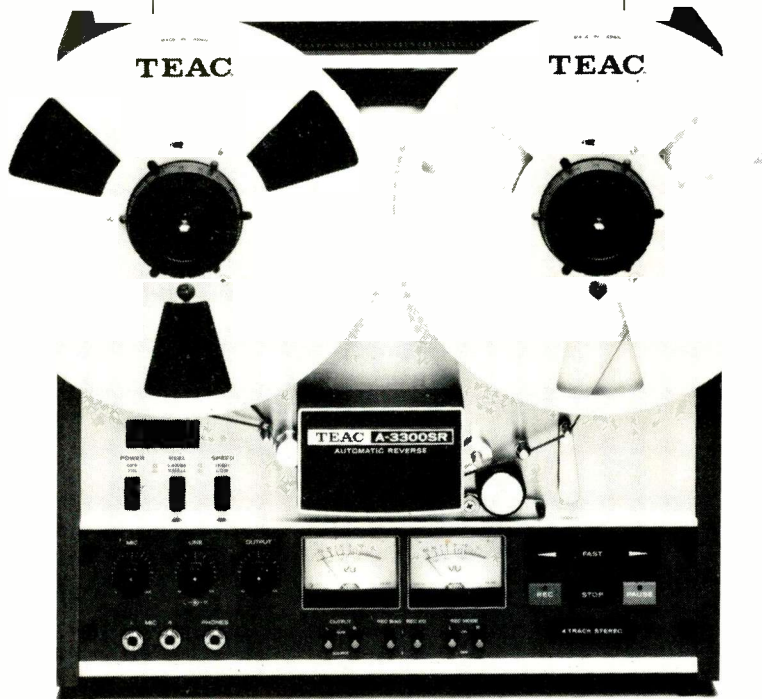
The A-3300SX and its reversing version, the A-3300SR, are classic heavy-duty machines designed for 10" reels.

Whichever TEAC open reel recorder you choose, you can be sure it will last a long, long time. It was designed and built that way.

FACE IT

In the end, the cassette recorder is for those who are fonder of convenience than fidelity. If you want fidelity you can't ignore open reel.

In all crucial specifications, open reel tape recorders are better than cassette decks. And that message comes from the people who make the best of both. TEAC.



TEAC Corporation of America • 7733 Telegraph Road • Montebello, CA 90640

Build A Microphone Preamp

W. J. J. Hoge

Some of the Gentle Readers of *Audio* who remember my previous articles may be wondering what a loudspeaker engineer is doing writing about microphone preamplifiers. After all, the two devices are at just about the opposite ends of an audio system. Long before I worked with loudspeakers, I worked in the recording industry here in Nashville. Part of my background includes experience as a circuit designer, and I have also worked as a recording engineer. When I decided to move back home to Nashville, I decided to combine those two parts of my background so I am now working with a company which builds large, sophisticated recording consoles.

50 The quality of recording equipment has been significantly improved over the past few years. When I first started mixing records (back in the '60s), the equipment did not perform especially well by today's standards. For example, it was not uncommon for equipment with rated distortion of 0.5 per-

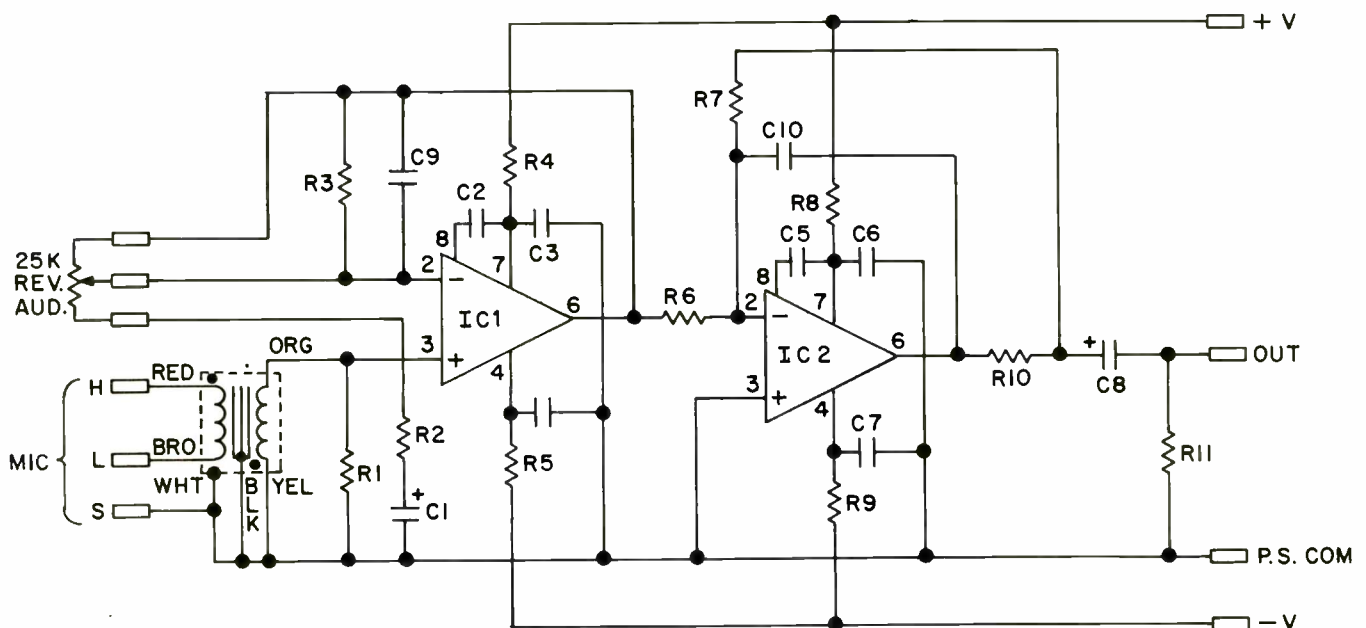
cent to be considered not only acceptable but pretty damn good. The state of the art has advanced well beyond that.

Today every record you listen to has at least one thing in common with all others. Whether it's from a modern, multi-track studio recording or one made on location using simple techniques, the signals from the microphones had to be amplified before they could be used to drive the tape recorder or (in the case of the music business' most recent giant step backward) the disc cutter-head amplifier directly. The serious amateur recordist does not have much available to him in the way of microphone preamplifiers which meet the standards of those in modern studio equipment. In this article I'll describe one which you can build. It is suitable for use with all common types of microphones with low impedance outputs.

In amplifying the microphone's signal, the preamplifier must not add any extraneous signals, such as noise or distortion. It also must have sufficient bandwidth to pass all the useful information which comes from the microphone, but it should also have a limited bandwidth to help prevent unwanted signals (such as radio frequency interference) from

Harrison Systems, Inc.,
Nashville, Tenn. 37202

Fig. 1—Schematic of microphone preamp.



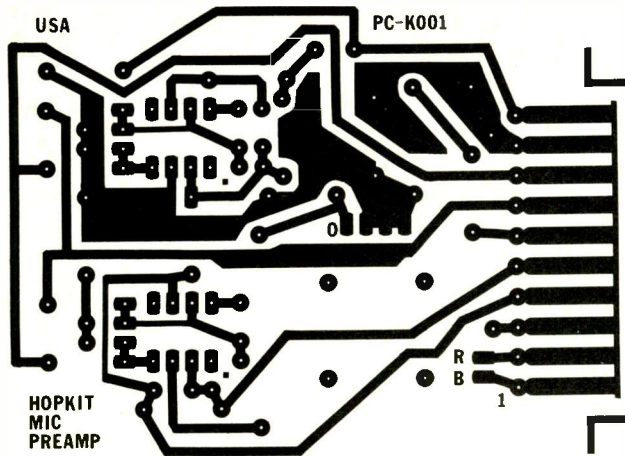


Fig. 2—Pattern, at one-to-one size, for circuit board.

entering the system. For naturally occurring musical signals, the lowest frequency commonly generated is about 41 Hz, however, the lowest tone which comes from a piano is 27.5 Hz. A professional-grade device should be able to pass that piano fundamental. The upper limit of the ear's spectrum is on the order of 20 kHz in young people with good hearing. Information theory tells us that if we try to transmit more information than the receiving end of a system can use, we are wasting our time. Thus, response to 20 kHz is adequate.

Professional-grade microphones of varying types provide output signals of widely varying nominal levels. Ribbon microphones often have sensitivities low enough to yield nominal levels on the order of -60 dB (re: 0.775 V). (Author's Note: 0.775 V is one of those quasi-magical numbers which pops up in audio from time to time. A signal with an rms potential of 0.775 V will cause a 600-ohm resistor to dissipate 1 mW of power.) Condenser microphones are commonly available with output levels on the order of -30 dB. Thus, it is obvious

to the most casual observer that a wide range of gain adjustment should be available in our preamplifier. Usually a gain of +60 dB is good with ribbon microphones; a gain of +20 is about what is required with condenser microphones placed near loud sources. We now have a set of design specifications for our preamplifier. The bandwidth should be from 27.5 Hz to 20 kHz, the gain from +20 to +60 dB, the distortion and noise held to minimum levels, and the input impedance should be compatible with low-impedance microphones. As an additional specification, we ought to specify the output signal level available and the minimum load impedance. Let us say that the preamplifier should be capable of delivering an rms signal of 6 V when operating into a 600-ohm load.

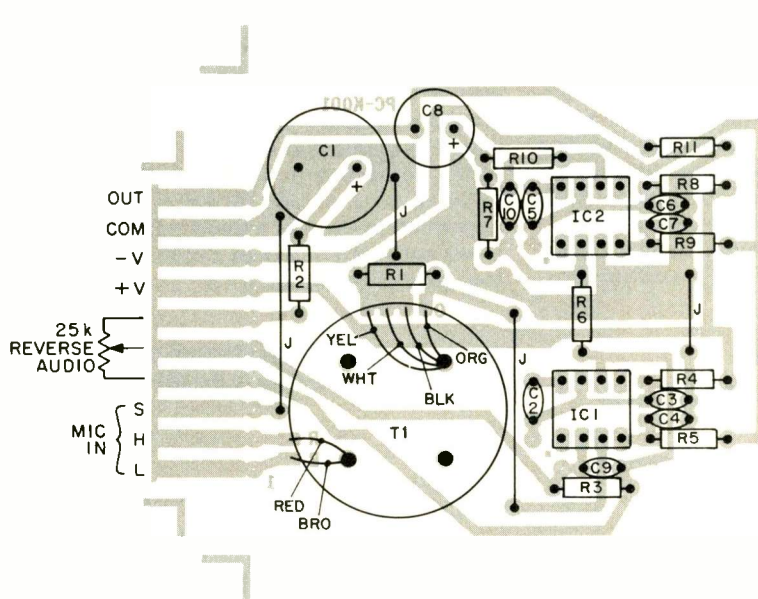
Most high-quality preamplifiers use input transformers. An input transformer which is properly designed can perform several useful functions. First, it can serve as an impedance-matching device between the microphone in the input stage of the amplifier. The purpose of this match is not to achieve maximum power transfer but rather to minimize noise generated in the input stage. There is an optimum range of source impedances for any particular amplifier for best signal-to-noise ratio. Low-impedance microphones have output impedances well below the optimum range for most devices.

A second function that the transformer can perform is limiting the bandwidth of the input signal. Transformers exhibit both low and high frequency roll-off. This can reduce low frequency disturbances from such sources as traffic rumble and high frequency disturbances from such sources as your local Citizens Band (CB).

Finally, a transformer can provide voltage gain. In fact, an input transformer that would properly match the output impedance of a microphone to the impedance of a typical input stage required for best noise performance, would be a step-up transformer.

The particular input transformer selected for this preamplifier is the JE-115K-E made by Jensen Transformers. It has extremely low leakage inductance. When its secondary is loaded with 10 times its characteristic impedance, it exhibits very

Fig. 3—Component placement on circuit board.



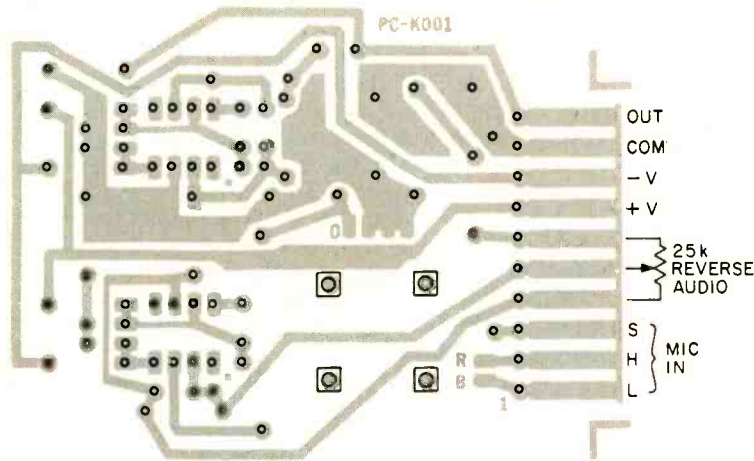


Fig. 4—All holes should be drilled with a #60 bit except the four transformer holes in the squares which should be made with an eighth-inch bit.

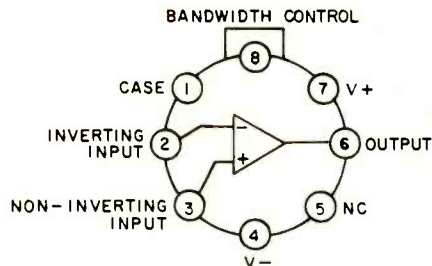


Fig. 5—Pin locations on the 911 op-amp. Caution should be used with these devices as they are sensitive to electrostatic charges.

low overshoot and does not require an RC resonance damping network when it is used with an amplifier with a two- μ S lead compensation network in its feedback. The input impedance of the primary is about 1400 ohms when the secondary is terminated with 150 kilohms. This provides a proper termination for low-impedance microphones. The secondary presents a source impedance of about 20 kilohms to the input stage of the amplifier. The rate of distortion increase for low-frequency, high-level signals is very low. The voltage gain is +20 dB.

Based on the characteristics of the input transformer, we can specify the rest of our circuit. We need an amplifier with gain adjustable from 0 to +40 dB, an input stage which operates with low noise when used with a 20-kilohm source, a high-frequency roll-off equivalent to that provided by a two- μ S phase lead network in its feedback loop, and the capability of delivering a 6-V signal to a 600-ohm load. It is, of course, possible to design an amplifier which uses discrete components which will meet our specifications. However, if we can find an integrated circuit which can be used, we can save a great deal of design time and, perhaps, some money.

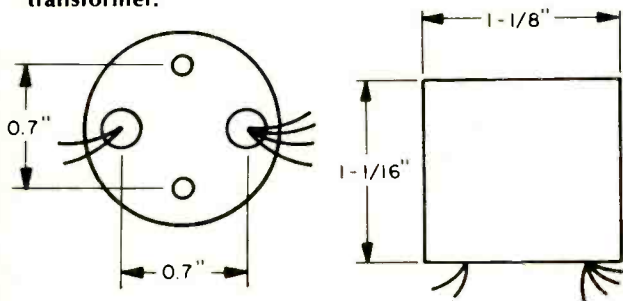
ICs have a bad name in the audio business. Some operational amplifiers which were designed for d.c. instrumenta-

tion use have been misapplied to audio purposes for which they were unsuited. There do exist a few monolithic op-amps which can be used (with care) in audio systems. One such amplifier is the Harris 911, which exhibits excellent noise characteristics. It is a wide bandwidth device and is capable of delivering a 7-V signal to a 500-ohm load. Figure 1 shows our microphone preamplifier using the 911.

Note that we have used two of the ICs. The first stage provides the voltage gain not provided by the transformer. The second stage provides the high-frequency response shaping for minimum overshoot.

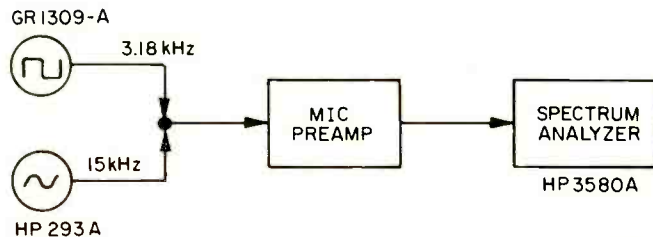
The first stage has its gain normally set by the 25-kilohm reverse audio-taper pot shown in the schematic. When the wiper of the pot is at the bottom, the stage's gain is set by the ratio of the total resistance of the pot to R2. This is 100 to 1 or +40 dB. When the wiper is at the top, the gain is unity. R3 provides feedback around the op-amp at all times. If the pot were not connected or if the wiper were to lift from element of the pot during rotation, the gain of the stage would drop to unity. In the case of the lifting wiper (a not untypical imperfection even in a good pot), the momentary gain drop is less ear shattering than a momentary gain rise to the open-loop gain of the op-amp.

Fig. 6—Shape and hole locations of Jensen transformer.



MOUNTING HOLES
CLEARANCE FOR #4 SCREW
LEAD HOLES
USE 0.35" HOLE TO CLEAR GROMMET

Fig. 7—Set up for DIM 100 test. The output of the square-wave generator is bandlimited at 100 kHz.





"EVERY RECORD WE PLAY ON WPLJ-FM OWES ITS LONGER LIFE TO SOUND GUARD.®"

Bob Deitsch, Assistant Chief Engineer, WABC-AM and WPLJ-FM, New York City

"Controlling the quality of sound on both WABC-AM and WPLJ-FM. That's my job.

"And on FM, all of our music is on records. And a record's life on the air is about a week. That is, it used to be.

"With Sound Guard, it can be months. Because the protection it gives against our normal wear is extraordinary. That's why, after making our own tests, we now preserve the fidelity of every record with Sound Guard."

As Sound Guard® preservative works for WPLJ-FM in New York, it can work for you. On your favorite LP's. Even 78's. And indefinitely, with repeated use. Just spray it on. Buff it in. And a microscopically thin, dry film protects the sound of your records against the dust and static that wear them out.

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Sound Guard® keeps your good sounds sounding good.



Sound Guard preservative—Sound Guard™ cleaner—
Sound Guard™ Total Record Care System.
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The second stage is a unity-gain inverting stage. C10 in the feedback loop provides the appropriate phase lead compensation. R10 is a 100-ohm resistor in series with the output of the op-amp but inside the feedback loop. It provides protection from the effects of capacitive loads.

Figure 2 is a foil pattern which may be used to build the

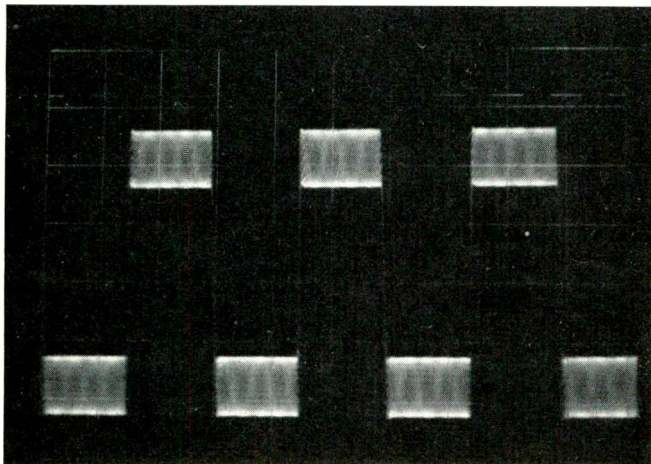


Fig. 8—DIM 100 test signal at the preamplifier output set for gain of 20 dB. Note the minimal overshoot. (Vertical scale is 5 V/div.)

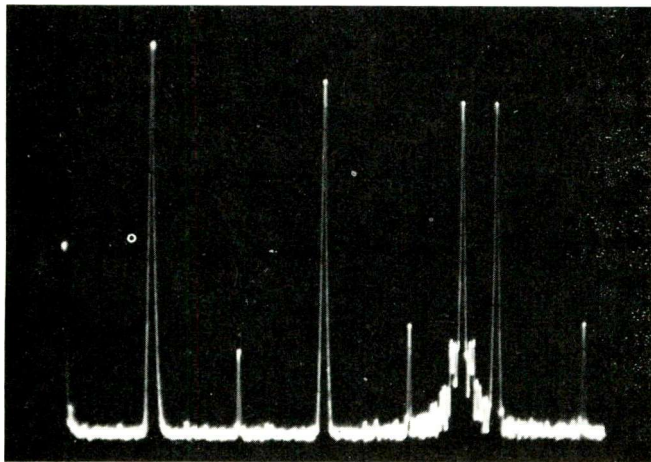


Fig. 9—Spectrum analyzer output for the DIM 100 test signal at the preamplifier's output. All extraneous signal components above -80 dB were present in the input signal.

TABLE I — Gain and distortion vs. frequency.

f, Hz	Gain, dB	Distortion, %
25	20	1.4
41	20	0.32
1 k	20	0.01
10 k	20	>0.01
15 k	20	>0.01
25	60	>0.025
41	60	>0.080
1 k	60	>0.01
10 k	60	>0.01
15 k	60	>0.01

preamplifier, while Fig. 3 shows the location of the parts on the component side of the board. A small dot marks pin 1 of the ICs. The transformer is mounted using two self-tapping screws (provided by Jensen with the transformer). The primary and secondary leads come through the board in the other two holes underneath the transformer. The red and brown primary leads should be connected to the pads labeled A and B respectively. The orange secondary lead should be connected to the pad labeled O. The other secondary leads may be connected to the other three pads next to the O pad in any order. These pads are not drilled; place the lead against the surface and tack them down with solder.

A mixture of 1 percent metal-film and 5 percent carbon-film resistors are specified. The metal-film units are specified where noise performance or accuracy is required. Note the four jumper wires on the board. Don't leave them out.

The preamplifier will work from supplies ranging from ± 15 to ± 24 V. All of the performance tests below were performed with a ± 18 V supply. I recommend using that particular value in this design.

The frequency response was measured at both full gain (+60 dB) and minimum gain (+20 dB). In both instances it was +0, -1 dB from 15 Hz to 35 kHz. The -3 dB points were 8 Hz and 50 kHz, which meets our bandwidth requirements. Rejection of r.f. was found to be excellent.

The harmonic distortion was measured at both gain levels when driving a 600-ohm load with a 6.2-V signal. Table 1 shows the results of the test.

The dynamic intermodulation distortion (transient IM, plus slew induced distortion, plus several other forms of nastiness we are only just starting to figure out) was measured using the DIM 100 method. The distortion was less than 0.01 percent; Figs. 8 and 9 show the signal at the output of the preamplifier and the spectrum analyzer readings. Happy building!

Parts List

C1	470 μ F, 35 V electrolytic
C2, C5	10 pF ceramic
C3, C4, C6, C7	10 nF ceramic
C8	100 μ F, 26 V electrolytic
C9	20 pF ceramic
C10	220 pF ceramic
R1	150 k, 1% metal film, RN55 or equiv.
R2	249 ohm, 1% metal film, RN55 or equiv.
R3	1 M, 5% carbon film, 1/4 W
R4, R5, R8, R9, R10	100 ohm, 5% carbon film, 1/4 W
R6, R7	9.09 k, 1% metal film, RN55 or equiv.
R11	100 k, 5% carbon film, 1/4 W
IC1, IC2	Harris HA2-911-5 op-amp

T1

Jensen transformer JE-115k-E

Misc.

8-pin DIP sockets, 10-pin PC edge connector, 25k reverse audio pot

Complete preamplifier kits, including all electronic parts, the PC board, IC sockets, a 10-pin PC edge connector, and input transformer, are available from Hopkit, P. O. Box 22964, Nashville, TN 37202. The price is \$79.50. Harris 911 op amps are available for \$4.00 each. PC boards with gold-plated contact fingers are available for \$15.00 each. The Jensen JE-115K-E is available from Jensen Transformers, 1617 N. Fuller Ave., Hollywood, CA 90046 for \$28.53 each.

Unboxed Sound

Introducing minimum diffraction loudspeakers™ by Avid.

In the quest for accuracy, cabinet loudspeakers, regardless of price, still generally suffer from a common failure—they still sound like loudspeakers, or more precisely their sound obviously comes from a box.

Your brain hears the box.

Without going too deeply into psycho-acoustics, cabinet speakers tell us their sound is emanating from a box because the brain has been conditioned to recognize the characteristics... size, shape, etc.... of any sound source.

What creates the boxy effect? Diffracted or reradiated sound waves, those that bounce off the sharp edges of the speaker and grille assembly, are the clues interpreted by the brain as "box-like."

No diffraction, no box.

The problem is graphically illustrated in the drawings. By eliminating sharp cabinet edges and grille panel obstructions, you reduce diffraction effects... which means you eliminate the boxiness of the sound. And that's exactly what we've done with our new line of Avid Minimum Diffraction Loudspeakers™

To open the box, we closed the cover.

The solution was deceptively simple.

By engineering the drivers, cabinet enclosure and, importantly, the grille assembly to create a totally integrated acoustic system, we eliminated cabinet diffraction and the boxy sound quality inherent in typical cabinet loudspeakers.

Our new tweeter and midrange drivers have specially engineered coupling devices (we call them Optimum Dispersion Couplers™) which transmit sound waves with minimum diffraction.

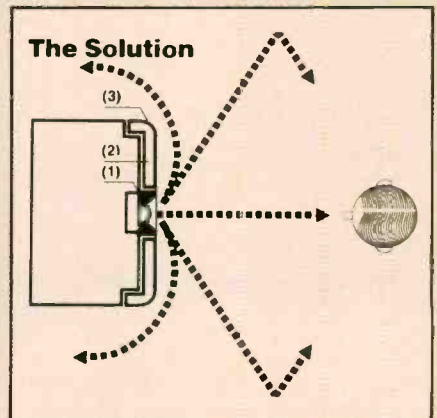
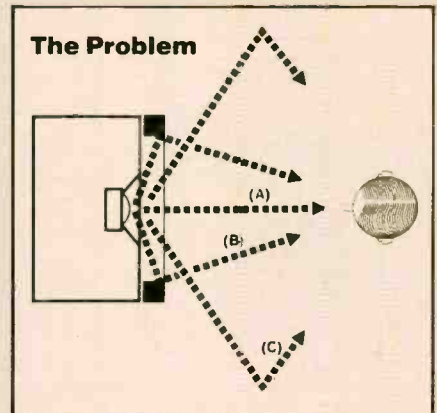
"Solid front" grille panels perfectly mate with each coupler eliminating grille panel diffraction. And, the grille panels have rounded edges creating a smooth, gradual transition from the grille to the cabinet, significantly reducing cabinet edge diffraction—a major cause of boxy sound.

These three simple, but audibly significant, features, coupled with Avid's critically acclaimed accuracy, assure you a new level of performance and sense of reality.

Of course there's a lot more to the Avid story—like our new drivers and Q-Span testing. Write us for literature and a full description. We invite your comparison.



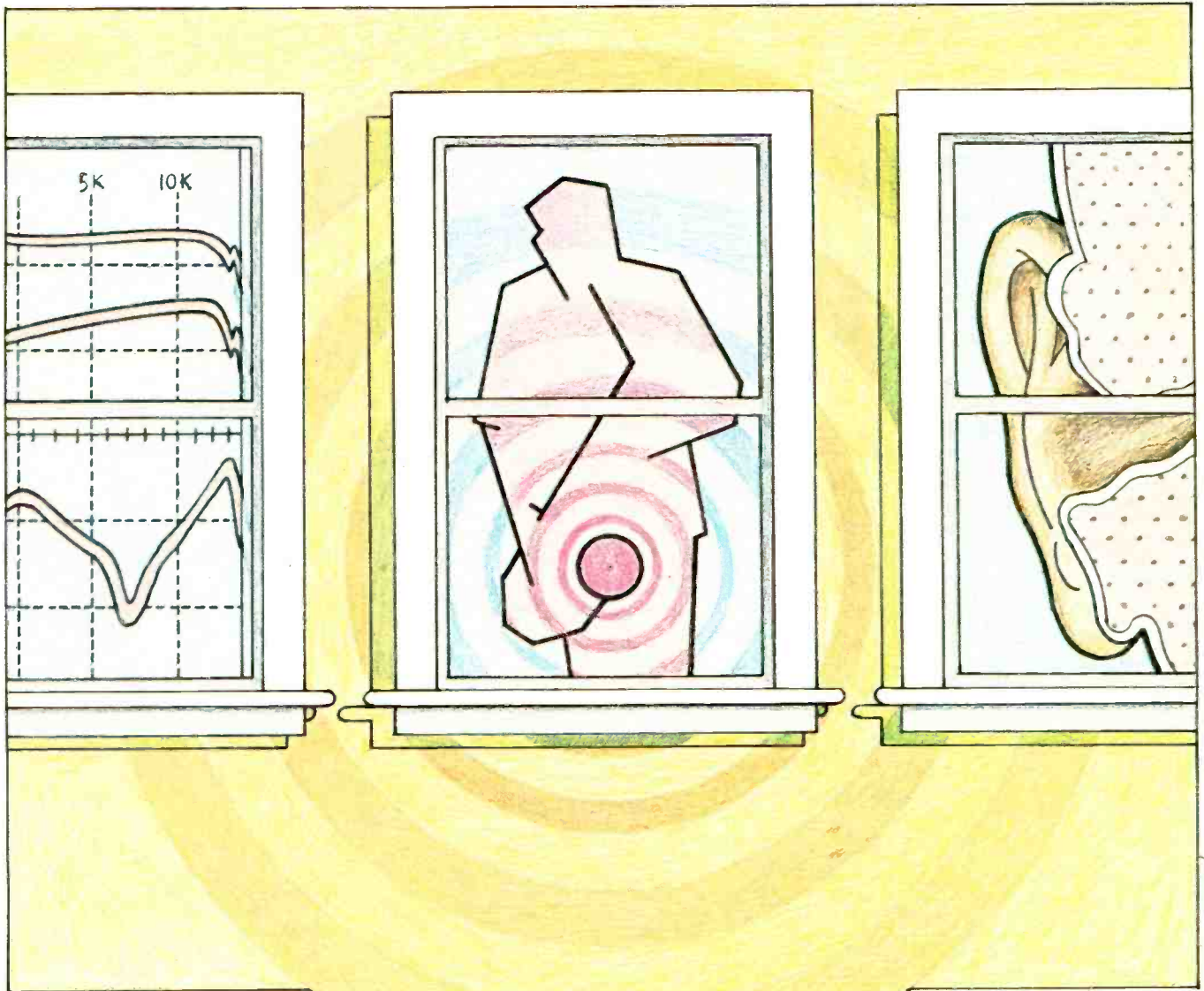
Unwanted cabinet/grille diffraction effects (B) give listener clue as to the size/shape of sound source—in this case a box. First arrival signals (A) locate source, while brain uses delayed room reflections (C) to identify listening environment.



The careful integration of special engineered Optimum Dispersion Couplers™ (1), and solid front grille panels (2) with rolled edge design (3), significantly reduces the unwanted cabinet diffraction effects—a principal contributor to "boxy" sound. These design principals are incorporated in all Avid Minimum Diffraction Loudspeakers™

AVID
10 Tripps Lane
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There have been many science fiction stories with plots involving worlds of differing dimensionality. My favorite among these is a perennial science-fiction classic called "Flatland, A Romance of Many Dimensions." Written in 1884 by E.A. Abbott, a schoolmaster, it is still available, in its seventh edition in paperback (1). What does that have to do with audio? Well, if you know the story, and accept some of the concepts I am about to present, you might come to agree with me that we now live in an audio flatland.

Written more than 20 years before Einstein's first paper on relativity, "Flatland" is pure fantasy and makes no pretense of application to human affairs. Yet in an abstract sense, the subject matter of Abbott's book anticipated some of the conceptual problems which three-dimensional humans might encounter in dealing with the four-dimensional universe of relativity. This has been pointed out by several

scientists in popular books discussing the space-time continuum. (2, 3). The central difficulty is in demonstrating to people, whose total conceptual structure is geared to one level of dimensionality, that higher dimensionality exists and is capable of being understood.

One Dimension, Two Dimension, Three Dimension, Four...

The allegories are numerous, and Abbott's "Flatland" is one of the better known of these. . . I will not spoil the story by telling the plot. It is a delightful little book and, like its subject matter, can be read at several levels of conceptualization.

But I will impose on you the following mind-expanding thought. We can quite easily grasp the idea of a two-dimensional subworld that is imbedded in our three-dimensional world. In mathematical language, a subspace is an easy thing to imagine because it is

A VIEW THROUGH DIFFERENT WINDOWS

RICHARD C. HEYSER

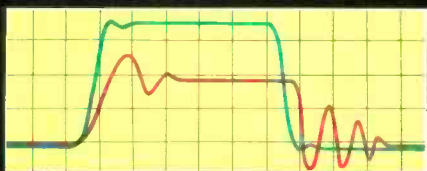
The Nikko Alpha III delivers exactly what you want to hear — no distortion, no noise, no crosstalk — just music.

Professional Approach

The Alpha III is a DC, power MOS-FET stereo amplifier. As with any amplifier designed for heavy-duty use, each channel has its own independent power supply and transformer for more power with less distortion.

The Alpha III delivers more than enough power for clean reproduction and full dynamic range with any loudspeakers you are likely to use. Total harmonic distortion is the lowest found anywhere.

Power bandwidth is an impressive 80 watts minimum per channel, both channels driven into 8 ohms, 20 to 20,000 Hz, with no more than .008% THD.



Compare the pulse wave reproduced by the Alpha III (above) with that of a typical amplifier. Note that the Alpha III produces a nearly perfect reproduction of a laboratory square wave.

DC Means Less Distortion, Wider Bandwidth

A direct coupled (DC) amplifier

eliminates the phase distortion and bass limitation imposed by the input and output capacitors of conventional amplifiers.

Direct coupling enables bass performance right down to the theoretical limit: 0 Hz, or dc (direct current).

Power MOS-FET's, Now

Power MOS-FETs are the most advanced transistors. Until now, none were rigorous enough to be used as power output devices.

No amplifier had them. Now, the Alpha III incorporates two pair for greater reliability, improved linearity, and smoother frequency response.

Power MOS-FETs and DC operation from input through output are responsible for stability and performance not obtainable from any other circuit design.



Loudspeaker Control

The damping factor of 80 indicates how well the Alpha III restrains speaker cone movement after the music signal has stopped. Some consider high damping factor a frivolous refinement — we believe it's crucial to undistorted loudspeaker performance.

LED Power Display

Nikko peak-holding LEDs display power output directly, in watts

and in decibels. Easy to read, LEDs are more accurate and operate at greater speed than any meter mechanism.



It's Your Move

High output. Low distortion. Maximum reliability. We've told you some of the facts. Now it's time to get the complete story and hear Alpha III for yourself.

Call our toll-free number (800) 423-2994 for the name of your nearest Nikko dealer. Find out why the Alpha III is known by the sound of its technology.

Finished in satin black, the Alpha III can be mounted in the new Nikko 19-inch professional rack mount cabinet.



For those who take their stereo seriously.

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In Canada: Superior Electronics, Inc. © Nikko Audio 1979

Nikko Alpha III: Known By The Sound of its Technology.



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usually generated by denying one or more of a higher dimensional set of attributes to the lower dimensional space.

As an example, this piece of paper on which these words are printed can be thought of as a two-dimensional subspace. Left-right and up-down are the dimensions of the printed page, but in-out is not.

The concept of in-out is denied to any being who "lived" in the two-dimensional world of this page. The third dimension, which we call height, is denied this being because he cannot stay completely within the confines of his space and touch all parts of our three-dimensional space, so long as his is a subspace. That is easy to understand.

But suppose his was not a subspace. Suppose his space was our space, but the difference was that he saw it as two-dimensional while we saw it as three-dimensional. In order to visualize, as a three-dimensional person, how this might come about, suppose the sheet of paper was enormously large and we began folding it back and forth to compress the paper to some reasonable volume in our space.

The math is sloppy, but it is the thought I want to get across. If all we did was fold and compress the paper, we would never alter the fact that it was a subspace, but we can begin to see that the property we call height would in fact begin appearing as an attribute within the two-dimensional subspace. Depending on the way we folded the paper, things that moved up, as we saw them, might appear to shift in lateral position in our two-dimensional friend's point of view.

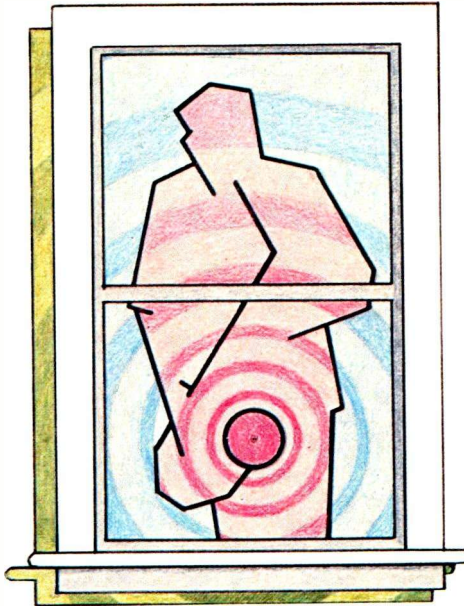
The being who lived on the paper would now see the third dimension. But he would not recognize it as a dimension unless we told him what it was. He would, instead, observe it as some weird property joining relationships in his two-dimensional existence.

Now, let's do it again. Only this time we "superior" three-dimensional beings see the plight of a one-dimensional being. He lives on a string and does not even know what up-down means. All he knows is what we call left-right.

But his string world is so very long that we begin rolling it up like a ball of twine to concentrate it in a small region of our space for observation. Finally, even though this one-dimensional space has no width, when it is so crammed together that no part of our three-dimensional space is farther than some previously agreed upon small distance from some part of the string, we can agree that he "touches"

everything we do. He actually sees three dimensions. But he does not observe the properties as a thing he might call "dimension." Instead he sees it as certain relationships among his one-dimensional observations. What to us is a vertical line might appear to him as an array of disjointed coordinate locations.

Now the mind expanding part . . . the part that is new. Two beings can observe and describe everything that happens, but do so from the viewpoints of different dimensionality.



I do not mean to imply that there are four-dimensional beings or two-dimensional beings among us. The point I wish to convey is that there is no preferred frame of reference for any observation, either for number of dimensions or units of measurement.

There is an additional consideration to this geometric concept of Alternatives, one that has far reaching consequences. Although the folding of the two-dimensional paper and twining of the one-dimensional string were allegorical, they do illustrate that the concepts of continuity and "betweenness" do not have to be preserved when we change dimensionality.

A trajectory of smoothly continuous values in a higher dimensional alternative, for example, might show up in a lower dimensional alternative as a discontinuous set which may disappear at certain places and reappear elsewhere without being found at intervening locations.

A being who is accustomed to sensations perceived in a particular dimensionality and frame of reference might form certain concepts about that situation which "make sense."

Any attempt to convey to such a being the possibility of a higher dimensional version of his universe will be a most difficult chore because it cannot make sense if one tries to explain it in terms of the coordinates of that lower dimensional space.

This was the conceptual problem in Abbott's "Flatland," except that now we are not talking about a lower dimensional subspace imbedded in a higher dimensional space. We are confronting the problem of a lower dimensional Alternative to a higher dimensional space. Things can disappear from a subspace and not be found anywhere in it, but that is not the case with Alternatives. Things do not disappear in Alternatives, they show up as other geometric configurations.

The point I wish to convey is that if we discover some seemingly bizarre behavior that does not seem to make sense in our otherwise orderly view, we might be able to reconcile such behavior by converting to an alternative system of coordinates — possibly at a different level of dimensionality.

These are new ideas and take getting used to. And yes, by George, they do have application to audio and subjective perception. But allow me to continue with some of the fundamental concepts before swinging into sound.

Windows

Suppose we have a good technical description of something. We have a mathematical description nailed down. There are no hidden variables. Our description will involve certain cause and effect relationships among parameters. If we now set up a physical observation in those parameters and if we have not left anything out, then nature will oblige us by operating in consonance with those parameters. This does not mean that nature prefers these parameters. Nature does not give a darn what parameters we choose. All it means is that we were consistent in setting up a model.

Suppose that we wish to take another view using other parameters. We wish to see the world through a different window. How many windows are available? As many as we care to find. That is what I call the Principle of Alternatives.

We already discussed two of the windows in previous articles. One window is measured in units called time, while the other window is measured in units called frequency. It makes no difference whether we look through the time window or the frequency window, we see all there is to see of the same thing. Only the way it appears is different.

HIGH SPEED AMPLIFIERS: FASTER TRANSIENT RESPONSE THAN ANYBODY.

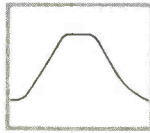
Today, it's not enough to select an amplifier simply by power specs and THD.

That's why Kenwood first introduced DC amplification and dual power supplies in integrated amplifiers to improve low frequencies and eliminate crosstalk distortion.

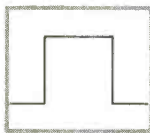
Now comes the next significant breakthrough: Hi-Speed. It allows the amplifier to react more quickly to a change in the input signal than ever before. So what comes out of the amplifier matches precisely what went in.

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On test equipment, an accurate output signal will show a square wave. And the more rapid both the rise and decay time, the more square the wave. It's an easy way to see the difference Hi-Speed makes. Compare it with any of the competition.



Pulse waveform response of a conventional amplifier.



Pulse waveform response of Hi-Speed amplifier.

To hear the difference, listen to a familiar record through a Hi-Speed amp. You'll notice depth and definition that will amaze you. Like each violin individually heard in a string section. Even separate handclaps in recorded applause. Until recently, Hi-Speed was available only in our limited production Audio Purist Group. But now, the next chapter of high fidelity is available to anybody with the ear to appreciate it.

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Model KA-907: \$1000. Model KA-601: \$600. Model KA-701: \$450. Nationally advertised value. Actual prices are established by Kenwood dealers.



A Five-Space

Now let's see what relevance this *technofreak* talk has in sound reproduction.

Did you ever hook an oscilloscope onto the output terminals of a power amplifier and watch the voltage waveform while listening to the sound coming out of the loudspeaker connected to the same terminals? Or hook a 'scope to the output of a microphone while you listened? What you see on the oscilloscope is a representation of a one-dimensional signal. It is volts as a function of time. But when you listened to that signal, what did you perceive in the way of dimensions? More than one, I will wager, if you aligned that perception with prior experience of the way things sound.

Sound has a "where." That is, it is located in physical space with respect to us. That is at least three dimensions right there. Sound also has a property which I will simply call "tone." Pitch, timbre, and the things we measure in units of pitch are expressions of tone. "Where" a sound source originates and what "tone" that source has are independent properties. Whether a clarinet is stage left, stage center, or stage right does not dictate what musical notes are going to be playable on that clarinet. So "tone" is somehow in-

dependent of "where" and can rank as at least an additional dimension.

Then there is "when" a sound occurs. Think about it a bit. That is another possible dimension. Then, there is a "how much," or intensity, which is not a property precisely dependent on the other things which I call dimension.

All in all, if we add up those properties generally agreed to be independent attributes, we find that the *least* number of dimensions we can get away with in a *subjective* description of sound is *five*.

And where is all (or most) of that higher dimensional information in that silly one-dimensional waveform we view on an oscilloscope? It is there. But just as the three dimensions of space viewed from a one-dimensional ball of twine, the higher dimensionality of perception is encoded as the relationships existing between properties in the one-dimensional waveform.

Yes, yes, I know about two channels for stereo, four for quadraphonic, and all that. But right now we are on the ground floor and trying to tie certain properties of subjective perception with other properties we now measure in objective analysis. I imagine many of us at one time or another have had the experience of finding that due to a

technical error we had been listening to a two-channel mono feed when we thought we were hearing stereo. And like the optical illusion which, once recognized, never looks the same again, we find the subjective dimensionality collapsed to an "obvious" mono program when the deception is discovered. But we had been fooled... that one-dimensional program had supported a whole stereo illusion.

Back To Flatland

The audio technologist who measures things in the frequency domain resides in a linear world of one dimension. He is a Flatlander. There is nothing wrong with that. So long as the device is linear, or essentially linear, the audio Flatlander sees everything there is to see. His window happens to look out onto a one-dimensional universe.

The prime audio problem ("how can we measure what we hear?") arises when this Flatlander tries to convey measures of fidelity to the being who sees things through a higher dimensional window. Neither one sees something the other does not.

But that which appears essentially perfect to a Flatlander, may or may not be essentially perfect when viewed in a higher dimension. The reason for



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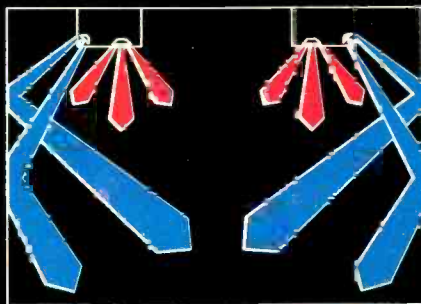
impossible from such a compact enclosure.

As a matter of fact, the Model 301 delivers a level of performance which simply astounds first-time listeners.

It could happen to you. Ask your Bose dealer to demonstrate the Model 301 against any bookshelf speaker, regardless of price.

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The new Model 301.

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C-4 We were determined that the performance of the C-4 should put you in touch with the outermost limits of the audio art. So it has the most advanced circuitry imaginable to give you sound so real and true, you'll swear it's live. State-of-the-art DC circuitry in the phono preamp section reduces distortion to a miniscule 0.0035% at 2V output. Signal-to-noise ratio has been tamed to the virtually inaudible level of 97dB at 10mV. Plus we've added an exclusive Current Noise Reduction Circuit to maintain this high S/N ratio regardless of varying impedances caused by using different cartridges. But the sound of the C-4 goes beyond super specs and state-of-the-art circuitry. You have to hear the sound to believe such pure, musical tonality could pass through a piece of electronics.

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0.005% THD

of 120W per channel into 8 ohms, 20Hz to 20kHz. Signal-to-noise ratio is, (please hold the ap-

plause) an utterly silent 118dB.

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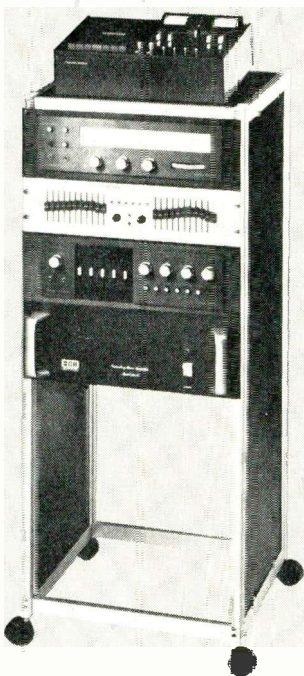
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this, as we have discussed, lies in the fact that if these are genuine Alternatives (different ways of describing the same thing), then the map between them is a geometric transformation. Distributions are mapped into distributions. A simple, elemental place in one Alternative will appear as some geometric distribution (or configuration) in the other Alternative.

As an aside, I must point out that the concept of "place" is perhaps better understood in terms of this idea of geometric distribution, or configuration, or figure. The concept of "point," or the concept of "line," or of any special type of "figure" is not fundamental to the establishment of a valid geometry. That is a very difficult thing to recognize, accustomed as we are to the strong arm methods of teaching mathematics to generations who couldn't care less about mathematics. Only recently have we begun to explore distributions as a Theory of Generalized Functions, in order to bring light to a badly illuminated part of our understanding. The Dirac delta is the prime example of a distribution that can begin giving meaning to the "place" where something can be found. Unfortunately, some popular discussions about the so-called delta "function" as applied to audio have fallen into the trap of trying to explain it in heuristic terms, such as ... "existing only at a point but having unit area." Such an explanation is no explanation at all, because generalized functions cannot be assigned values at isolated points.

The audio Flatlander, viewing the frequency response of a loudspeaker, amplifier, cartridge, or whatever, cannot possibly make "sense" out of the protestations of a higher dimensional being that the Flatland ranking of distortion does not always correlate with that being's ranking of distortion. It does not make sense to the Flatlander as long as he uses his own coordinate system.

Unless it is disclosed to him, the Flatlander has no way of knowing that higher dimensional "places" show up as geometric properties in Flatland. The converse is also true; each place in Flatland may appear as some spread of values in the higher dimensionality.

The problem becomes enormously compounded when either the Flatlander or the higher dimensional being set up test figures to check for the possibility of geometric warping. The test figure is usually chosen to be that which is easiest to measure *within a particular frame of reference*. The test figure which a Flatlander might choose does not necessarily correspond to a

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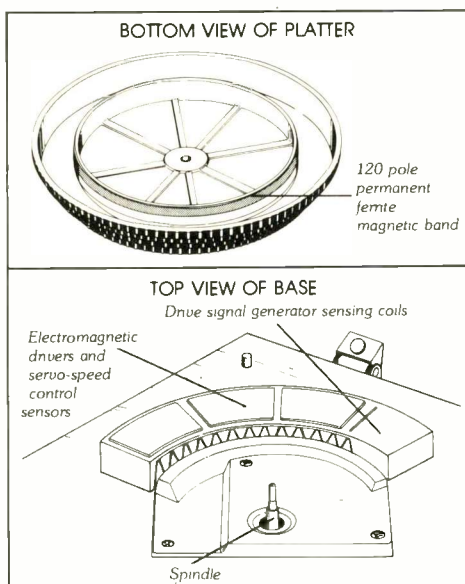
BEYOND DIRECT DRIVE: THE FISHER LINEAR MOTOR TURNTABLE

The direct drive turntable was a great advance in record playing precision. But Fisher has now taken turntable technology a major step further with the MT6225A Linear Motor turntable system.

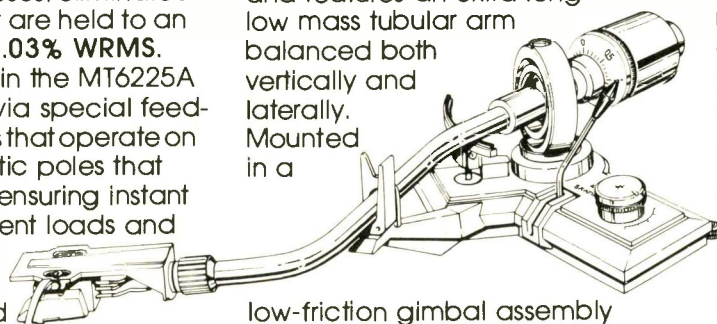
Conventional direct drive systems do a great job of reducing rumble. But the small diameter and relatively few poles (usually 12 or 16) of the motor result in low torque and a distinct "cogging" tendency that can make them susceptible to wow and flutter.

The Fisher linear motor, by contrast, uses 120 poles and a unique 3-phase electronic drive system that produce a perfectly timed sequence of closely overlapped drive impulses. So cogging is, for all practical purposes, eliminated. And wow & flutter are held to an incredibly low 0.03% WRMS.

Speed control in the MT6225A is accomplished via special feedback sensing coils that operate on the same magnetic poles that drive the platter, ensuring instant response to transient loads and long-term speed accuracy within 0.5%. Both 33 and 45 rpm speeds are independently adjustable over a $\pm 3\%$ range, and may be set exactly with the built-in stroboscope.



The tonearm of the MT6225A is as advanced as the drive system, and features an extra-long low mass tubular arm balanced both vertically and laterally. Mounted in a



low-friction gimbal assembly and equipped with calibrated anti-skating, the arm tracks even the most delicate audiophile cartridges with ease. Viscous damped

cueing and automatic shutoff are provided, plus a Reject button that returns the arm and stops the turntable at any time during play.

The MT6225A is mounted in a heavy, beautifully finished base equipped with adjustable feet and a built-in bubble level that makes it easy to set the turntable perfectly level for best performance. The level also serves as a stylus overhang indicator for precise cartridge mounting.

Considering the extremely high performance and "beyond state-of-the-art" engineering of the MT6225A, you might easily expect to pay \$400 or \$500 for it. But Fisher ingenuity (born of 42 years refining the high fidelity art) enables us to offer it at a price below that of many turntables that don't perform as well: \$250*. The same linear drive system with a slightly different tonearm is available in the MT6224, priced at \$200*.

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test figure which might be chosen for any other dimensionality.

So our audio Flatlander might set up a test figure which represents a perfect concentration of a unit volume of material at a well-defined "place." We might call it a delta function corresponding to unit energy at one frequency. (Another audio Flatlander, living in the one-dimensional time domain, would perceive that particular test figure as a "wave" extending over the whole of the time domain. He would call it a sine wave.)

The frequency domain Flatlander then checks for geometric warping by determining how much material appears at other "places" when the test figure is processed. The Flatlander might set up a standard of warping, such as: If no more than one thousandth of one percent of the volume of the test figure can be found at any place other than the original location, the geometric warping will be essentially nil. It would seem logical to presume that if one found two percent of the volume out of place, the warping would be greater than if one only found two-hundredths percent out of place. So the audio Flatlander can go about checking for geometric warping by placing test figures at various locations in his space.

But what might a higher dimensional being perceive? First of all, the Flatlander's test figure might have no particular significance in the view through the higher dimensional window. How might you feel if you looked out of your living room window and saw colored lights flashing across the sky like a giant aurora borealis display? If you asked what was going on, you would get a reply that a one-dimensional being was testing the universe for linearity. "See there," he would say, "that's a perfect signal at coordinate location 47." And you would see a steady green glow with ripples of red slowly moving across the sky.

The Flatlander's test figures are things that he can understand. In the Flatlander's world, a test figure corresponding to something of significance to a higher dimensional being might appear hopelessly complicated. If, in looking out of your window, you had said, "Hey, knock off the silly lights; if you want to check for geometric warping, use this meter rod." And you hold the meter rod up. After a brief pause the Flatlander would reply, "You're nuts, all I see is a blurring of edges and a purple glow."

Silly example? Perhaps, but the math, or more properly the geometry, is reasonably illustrated by such an example. One-dimension and five-dimension beings cannot agree on the subtler aspects of scene distortion be-

cause each sees the view through different windows.

Views

If you remember our discussion of the end product of audio, the query "how do we measure what we hear?" translates to "how do we measure the illusion we perceive?" This brief discussion has been our deepest penetration so far into the abstract. But the problem it addresses is of the utmost practicality. Perhaps we cannot measure the illusion of sound, but we might be able one day to grasp some of its structural properties, as a perceived higher dimensional experience.

In this case I am attempting to convey a reason why conventional distortion measurements, such as harmonic and intermodulation, need not necessarily correlate with our subjective impressions of distortion. Geometric warping of a perceived illusion and geometric warping of a lower dimensional test signal are both distortions. But they are distortions expressed in terms of the framework of the reference system against which they are measured. If those frames of reference are not the same, whether they differ in dimensionality or some other way, we cannot automatically rank them as equivalent. It may happen in a gross measurements that *three* is greater than *two*, and *two* is greater than *one* for certain types of distortion as expressed in either reference system. But somewhere along the line, we are going to get into difficulty quantifying subtler forms of distortion with such gross equivalents.

But whether we are talking about a distortionless situation or one that is badly distorted, the deeper geometric property I want you to consider is that of the possible dimensionality which is involved in any particular situation. We have only begun to touch on this subject and I hope to expand on it in later discussions, but the next time you hear an argument between a technologist and a golden ear about the audibility of certain types of distortion, think of this: Is the technologist really a Flatlander, and is it possible they do not agree because they each have a view through a different window? **A**

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3. C. Lanczos, "Space Through the Ages," Academic Press, New York, 1970 (p.88).

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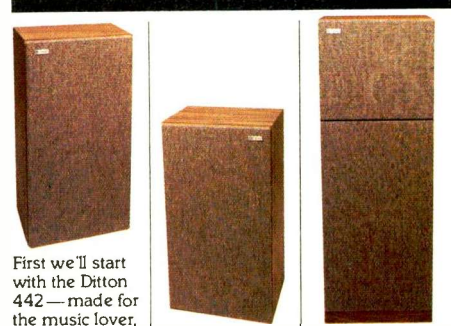
We've shown the Ditton 662, but all three new Ditton speakers, besides being technologically superb and precision engineered, are beautifully styled and assembled in the fine English cabinet-making tradition, to fit into any decor.

And we've used a completely different design concept for each of them to satisfy your individual taste and budget.

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First we'll start with the Ditton 442—made for the music lover, who wants full bass sound.

Large presentation for hi-power system. Sealed box design—inside, a second sealed infinite transmission line enclosure for the mid-range unit.

Drive units: FC 121, 330 mm bass unit with 46 mm voice coil.

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Our passive radiator (ABR) system gives solid bass, smooth response and dispersion, and stereo imaging. Use with all power amplifiers.

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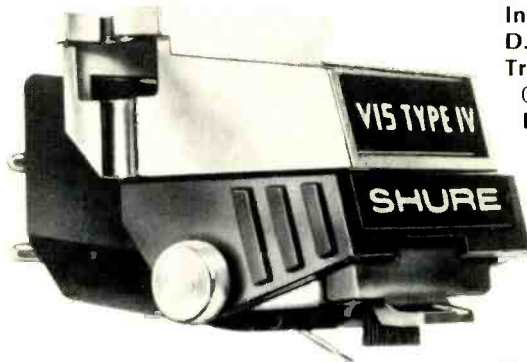
Typical Trackability: In SME tonearm at 1-gram tip tracking force, in cm/sec peak recorded velocity, 400 Hz, 29 cm/sec; 1000 Hz, 42 cm/sec; 5000 Hz, 47 cm/sec; 10,000 Hz, 37 cm/sec.

Output Voltage at 1 kHz: 5 cm/sec peak recorded velocity, 4.0 mV per channel.

Channel Balance: Within 2 dB.

Channel Separation (minimum): 25 dB at 1000 Hz and 15 dB at 10,000 Hz.

Optimum Load: 47,000 ohms resist-



ance in parallel with 200 to 300 pF capacitance per channel.

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Styli Available: VN45HE (Hyperelliptical Nude Diamond Tip), VN4G (Spherical Nude Diamond Tip, 0.6 mil radius), and VN478E (Biradial Nude Diamond Tip for 78 rpm Records, 0.5 x 2.5 mils).

Price: \$150.00.

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With progress being inevitable in the area of phono cartridges as it is in the entire audio field, there was no doubt in anyone's mind that Shure Brothers would eventually bring forth a new cartridge. However, we were not prepared for the stabilized, static-free, super-trackability, cartridge-stylus system that is the V15 Type IV cartridge. Our first impression was that now we could properly track most of today's records without further thought to the degree of warp present. After playing numerous warped records and along the way deliberately creating a washboard-ripple warp in a record, we were surprised how easily the V15 Type IV tracked warped records and, in particular, the washboard-ripple warped record. The viscous-damped Dynamic Stabilizer appears to have eliminated many of the problems associated with playing warped records. The warped record is undoubtedly here to stay inasmuch as the record manufacturers are apparently unable or unwilling to eliminate it. Another problem the Dynamic Stabilizer appears to have solved is the low frequency arm-cartridge resonance. With the Audio-Technica AT-1009 arm and V15 Type IV cartridge, and without using the Dynamic Stabilizer, the arm-cartridge resonance shows two peaks, the first at 5.5 Hz (+3.5 dB) and the second at 8.5 Hz (+2 dB). With the Dynamic Stabilizer in use, both resonance peaks are reduced to +1 dB at 5.5 Hz and 0 dB at 8.5 Hz, with a new peak of +0.5 dB at 7.8 Hz being visible. The Dynamic Stabilizer is a damping device that, in many ways, is similar to that presented by Rangabe (England) at a 1975 AES meeting and more recently the DiscTracker marketed by Discwasher, Inc. The Shure damping is performed by the "hinge" that attaches the brush to the cartridge. The brush itself consists of 10,000 ultra-fine conductive carbon-fiber bristles that fit down into the record groove to both pick up the static electricity and discharge it to ground and, also, to remove dust by sweeping the record clean just slightly ahead of the stylus, without grinding the dust into the groove wall. When using the viscous-damped Dynamic Stabilizer, the tracking force must be increased by 0.5 grams to compensate for the additional weight. When positioned all the way down, the Dynamic Stabilizer acts as a stylus guard.

Other important changes in the V15 Type IV in contrast to the V15 Type III are a lower stylus effective mass, a new type

cantilever bearing system, a new stylus shape called "hyperelliptical," a new magnet that is lighter in weight but higher in energy, and an improved tracking ability at both high and low frequencies.

The Dynamic Stabilizer has an important inclusion — a vertical white line that is in line with the stylus so that cueing is quite easily accomplished. The vertical white line is quite useful when centering the cartridge on the shell. It would be nice if all cartridge and shell manufacturers would put a vertical line on the front of their cartridges and shells.

The optimum load for the V15 Type IV is still 47 kilohms per channel, but the parallel capacitance has been lowered to between 200 and 300 pF per channel for a flat frequency response. The total capacitance includes the tonearm wires, connecting cable and preamplifier input capacitance. To ascertain that the total capacitance was not beyond the maximum recommended 300 pF, we measured the total capacitance with a relatively inexpensive capacitance meter available from Berkshire Audio Products, P.O. Box 35, Great Neck, NY 11021. Aside from measuring cable capacitance, we understand that it is probably the only capacitance meter currently available that is able to measure the preamplifier phono input capacitance.

Measurements

As is our practice, measurements are made on both channels, but only the left is reported. During the test period the average room temperature was $71^{\circ}\text{F} \pm 1^{\circ}$ (21.67°C) and the relative humidity was 68 percent ± 3 percent. All measurements were made without using the Dynamic Stabilizer except when measuring the arm-cartridge resonance where the measurements were made with and without the damping device.

Frequency response of the Shure V15 Type IV cartridge, loaded with 47 kilohms and 275 pF, using the Columbia STR-100 test record and our reference tonearm, an Audio-Technica AT-1009, mounted on a Technics SP-10 turntable, is flat within -0.5 dB from 40 Hz to 10 kHz, descending to -1.5 dB from 12 to 14 kHz, then slowly rising to +0.25 dB at 20 kHz. Accordingly, the frequency response was +0.25 dB, -1.5 dB, 40 Hz to 20 kHz. Separation over the audio range was quite

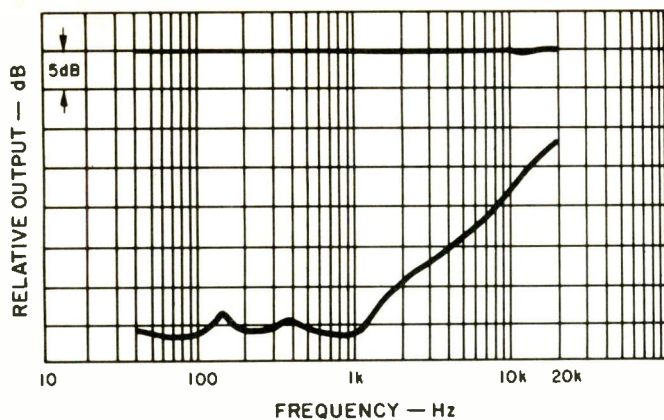


Fig. 1—Frequency response.

good, being 37.5 dB at 1 kHz, 18.5 dB at 10 kHz, 14.5 dB at 15 kHz, and 12 dB at 20 kHz. The optimum tracking force for the cartridge we tested was 1.2 g and the optimum anti-skating force was 1.5 g. The square wave response is well damped and has a good wave shape. When using the Dynamic Stabilizer, we added 0.5 g to the tracking force to compensate for the weight of the device. With the reduction of the arm-cartridge resonance peaks with the Dynamic Stabilizer, it is apparent that the damping device is quite effective. Further, the effects of record edge warp are practically eliminated when copying a record onto tape.

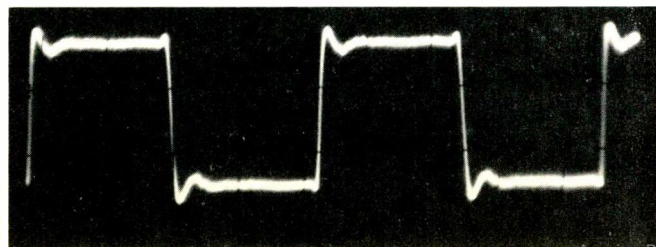
The following test records were used in making the reported measurements: Micro-Acoustics TT-2002; Shure TTR-103, TTR-109, TTR-110, and TTR-115; Columbia STR-100, STR-112, STR-170, and SQT-1100; JVC TRS-1007; Deutsches HiFi No. 2, and Nippon Columbia Audio Technical Records (PCM) XL-7004.

Wt. 6.7 g; d.c. res. 1294 ohms; inductance 503 mH; opt. tracking force 1.2 g plus 0.5 g for the Dynamic Stabilizer; opt. anti-skating force w/stabilizer 2.0 g; output 1.05 mV/cm/sec; IM dist. (4:1) +9 dB lateral, 200/4000 1.7 percent, +6 dB vertical, 200/4000 5.2 percent; crosstalk (using Shure TTR-109) -40 dB; ch. bal. 0.25 dB; TTR-103 trackability: high freq. (10.8 kHz pulsed) 30 cm/sec, mid-freq. (1000+1500 Hz lateral cut) 40 cm/sec, (although some distortion was observed while playing the 40 cm/sec level band, it was determined that the distortion was cut into the record groove and not the result of cartridge mistracking), low freq. (400+4000 Hz lateral cut) 30 cm/sec; Deutsches HiFi No. 2 300-Hz test bands tracked to 95 microns (0.0095 cm) lateral at 17.90 cm/sec at +10.33 dB level and 43.1 microns (0.00431 cm) vertical at 8.12 cm/sec and a level of +3.64 dB. Arm-cartridge resonance +3.5 dB at 5.5 Hz and +2 dB at 8.5 Hz; with the Dynamic Stabilizer the resonance was less than 1 dB at 5.5 Hz and 0 dB at 8.5 Hz. A new resonant peak of 0.5 dB was seen at 7.8 Hz.

The Micro-Acoustics TT-2002 musical test record was used to check for tracking and transient ability. The Shure V15 Type IV encountered no difficulty in playing all trackability bands, including one with the highest level a modern stereo cutter head can record. Transient ability was excellent, with no problems in tracing computer-generated high, low, and high/low mixed frequencies.

The Shure Obstacle Course — Era III was no challenge to this cartridge inasmuch as it passed all bands without difficulty. With the new Shure Era IV Obstacle Course, the Type IV encountered no difficulties in playing all levels on the record at 1.2 g.

Fig. 2—Response to 1-kHz square wave.



Listening & Use Tests

As usual, a rigorous listening evaluation was conducted utilizing the specific records listed below as well as many records listed in other reviews. Transient response and good bass reproduction were highly evident when playing the Fox and Fiedler recordings listed here, as well as the *Switched On Bach* recording of Walter Carlos on the Moog Synthesizer. There is no question of the Type IV having good clarity all across the entire audio spectrum, particularly in the bass region.

As always, our listening tests are performed both before any laboratory testing is done and again after all laboratory tests have been completed. Upon prolonged listening we believe that the Shure V15 Type IV introduced no coloration of its own, as well as no audible distortion. Transient and tracking ability was excellent, especially while playing some of the high recorded levels present on many direct-to-disc recordings. Sonic clarity was first rate, and the bass response was more than adequate. However, the biggest gain from this cartridge is the fact that we were able to play so many of our unplayable records (because of bad warp!) without the usual noises that accompany warped records. All these great benefits make the Shure V15 Type IV one of the best cartridges available today.

B. V. Pisha

Evaluation Equipment & Records

The equipment used for the listening evaluation included a Technics SP-10 turntable with the Audio-Technica AT-1009 arm, Technics SP-10 Mk II turntable with EPA-100 arm, Crown IC-150A preamplifier, a pair of Crown DC-300A amplifiers used in the monophonic mode, a pair of stacked Duntech DL-15B speakers in each channel, and a Columbia SQL-400A SQ decoder. A Platter Pad was used on one turntable and each pair of speakers was connected with Polk Audio SoundCables using an RC network.

The following records, along with many listed in other reviews, were used in auditioning the Shure V-15 Type IV. We highly recommend the two volumes of *Check Your Sounds* from RCA (Japan), which are superb recordings and have a detailed brochure. Audiophiles may easily use these discs to check and adjust their audio equipment by ear, rather than with instruments.

Stereo

Nicolai: *The Merry Wives of Windsor*, Bavarian Symphony Orchestra, Kubelik — London OSA 13127.

Berlioz: *Romeo & Juliet*, Vienna Philharmonic Orchestra, Maazel — London CS7021

Verdi: *Requiem*, Vienna Philharmonic Orchestra and Vienna State Opera Chorus, Solti, with Sutherland, Horne, Pavarotti, and Talvela — London OSA 1275.

Giacomo Aragall: *Italian Opera Arias* — London OS 26499.

Montserrat Caballe: *Dramatic Soprano Arias* — London OS 26497.

Beethoven: *Symphony No. 4 in B Flat Major*, Chicago Symphony Orchestra, Solti — London CS 7050.

Beethoven: *Symphony No. 7, Egmont Overture*, New Philharmonia Orchestra, Stokowski — London Phase 4 SPC 21139.

Howard Geller: *Plays for You*, The Royal Philharmonic Orchestra — PYE NSPLX 41053.

Check Your Sounds, Vols. 1 & 2, Grand Symphonic Orchestra, Kumagaya; NHK Symphony Orchestra, Komatsu — RCA (Japan) RVL 1, 2. (Both distributed by Audio-Technica.)

Direct to Disc

Jun Fukamachi at the Steinway — Toshiba/EMI LF-95001. Distributed by Audio-Technica.

Boyd Neel: *Bach Program*, Toronto Chamber Orchestra — Umbrella UMB-DD9, Vol. 2. Distributed by Audio-Technica.

David Montgomery: *The Piano*— Direct to Disk Records Lab Series No. 2. Distributed by Audio-Technica.

Rimsky-Korsakov: *Capriccio espagnol*; Tchaikovsky: *Capriccio italien*, The Boston Pops, Fiedler — Crystal Clear Records CCS-7003 (225 Kearney St., San Francisco, Calif. 94108).

Virgil Fox: *The Fox Touch, Vol. 2* — Crystal Clear Records CCS-7002.

K-H. Stockhausen: *Zyklus pour en batteur*; Noda: *Eclogue for Flute & Percussion* — RCA (Japan) RDC-1. Distributed by Audio-Technica. (The audio system on which this is played must be very good in order to properly reproduce the percussion instruments on this recording by one of Japan's top percussionists.)

Pulse Code Modulation

Shubert: *Death and the Maiden*; Tchaikovsky: *Andante Cantabile*, Prague Quartet — Nippon Columbia OX-7009-N.

Satie: *L'Oeuvre pour Piano*, Y. Takahasi (Steinway) — Denon OX-7071-ND. (Both these PCM records are distributed by Audio-Technica.)

Quadraphonic—SQ

Wild Cherry: *Electrified Funk*— Epic PEQ 34462.

Walter Carlos: *Switched-On Bach*— Columbia MQ 31018.

Bach: *Six Concerto/Sinfonias for Organ*, E. Power Biggs — Columbia M34272.

Enter No. 90 on Reader Service Card

Sansui Model SR-838 Direct-Drive Turntable

MANUFACTURER'S SPECIFICATIONS

Motor: 20-pole, 30-slot, d.c. brushless.

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

Drive: Quartz controlled, direct drive.

Wow & Flutter: Less than 0.025 percent W rms.

Rumble: -72 dB (DIN-B).

Fine Speed Adjustment: \pm 2.5 percent.

Tonearm: S-shaped, tubular with damping, and two-point pivot support.

Dimensions:

19 $\frac{1}{4}$ in. (48.9 cm) W
x 6 $\frac{3}{8}$ in. (16.8 cm) H x 15 $\frac{1}{4}$ in.
(38.7 cm) D.

Price: \$440.00

Sansui makes no fewer than nine turntables which cost from around \$100.00 to more than \$500.00. The unit selected for this review is number two in the range and uses a 20-pole, 30-slot, d.c. brushless, direct-drive motor in conjunction with a quartz-crystal servo-control system. A frequency generator built into the motor provides the error pulses or signals. All the controls are mounted along a narrow front panel, includ-





Does it
make
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to buy
a new
audio
component
you can't hear?

71

You bet it does. Especially if you care about absolutely accurate reproduction of recorded sound.

The new Crown DL-2 Distinction Series Controller is close to being the perfect pre-amplifier. It controls the signal level but changes nothing else unless you want it to.

The DL-2's sonic excellence is impeccable. New, patent-pending circuitry and no-compromise, common-sense design have resulted in outstanding specifications. Signal-to-noise ratio is better than 97dB unweighted. Frequency response ± 0.2 dB, 3Hz to 100KHz. THD, IMD and TIM are simply not audible.

One of the reasons you can't hear the DL-2 is that it is three components.

The revolutionary phono preamp mounts next to the turntable. That eliminates most RFI problems. But it also in-

cludes wholly new circuit concepts for unmatched sonic performance, and new convenience in hook-up.

The separate power supply keeps AC line noise completely out of the signal path.

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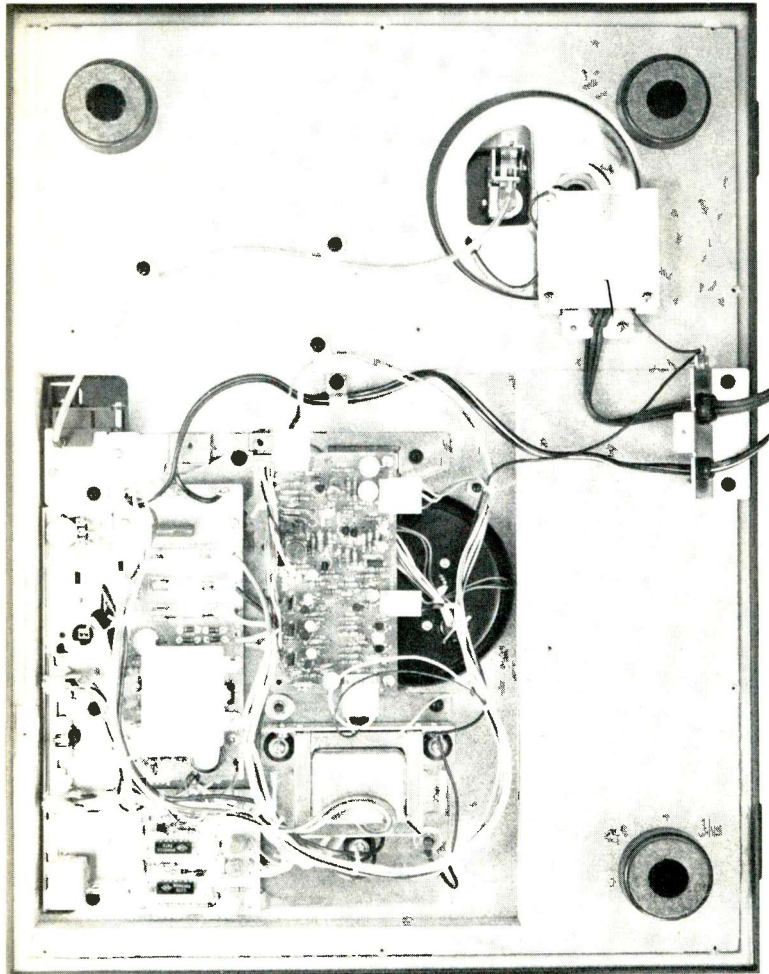
To believe the sonic excellence of the Crown Distinction DL-2 Controller, you'll have to try to hear it. At your dealer. Soon.

Write for free brochure on the DL-2. It, too, makes sense.



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ing the easy-to-use cue control. A large *On/Off* bar switch is first at the far left, followed by two speed-selector buttons, while a third button switches the quartz control out of circuit. A strobe light comes next in line, then the pitch control, and finally the cue control, which is somewhat larger than most, being in the form of a wide lever switch measuring more than an inch square.

The tonearm is a statically balanced S-type, and measures 9-1/16 inches from pivot to stylus. Sansui calls this type of arm "MCF Stabilized" (Mass Concentrated Fulcrum) because it employs a wide brass holder coupled to the support bracket by a horizontal pivot-bearing system. The mass of this support system is highest at the fulcrum — the advantage, according to Sansui, being a low moment of inertia with a stable fulcrum point, while extended pivot-to-pivot width prevents dynamic torsion.

The tonearm itself is made of polished aluminum filled with damping material, while the base is constructed from zinc alloy. A rubber damper decouples the rear balance weight, and the anti-skating force is provided by a suspended bias weight that can be set from 0.5 to 2 grams on its calibrated rod. There is an adjusting screw for the arm height, and the aluminum die-cast headshell can be rotated for accurate alignment. The die-cast platter weighs 3.7 lbs., and strobe markings are cut into the polished edge. The turntable base is constructed of 1½-inch, high-density particle board, heavily lacquered, with a glossy black finish. The unit stands upon four shock-absorber feet, employing a combination of springs, rubber, and felt to give maximum isolation and minimize the possibility of acoustic feedback. The 838 comes with a "free-stop" hinged dustcover which, by the way, covers the front controls when shut.

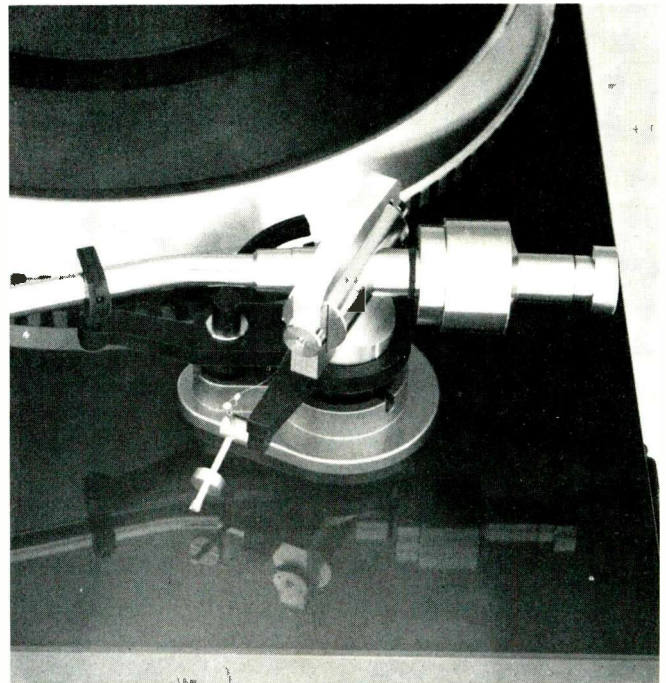
Measurements

For test purposes a Shure V-15 Mark IV phono cartridge was mounted in the headshell, and both the tracking force and anti-skating adjustments were set for 1.7 grams. The first measurement was for wow & flutter, and the combined figure came out at a low 0.03 percent using the DIN 45-507 standard. Switching the quartz-crystal control off increased the figure to 0.09 percent. Rumble measured a very satisfactory -63 dB (ARLL) which roughly corresponds to Sansui's DIN B specification of -72 dB. The fine speed adjustment gave a variation of ± 2.5 percent, as claimed. Tracking error was less than 0.5 degrees per inch and, as expected, both lateral and vertical arm friction were too low to measure accurately. The arm resonance was 8 Hz, showing a rise of 5 dB, but this was lowered to 1.5 dB when the Shure cartridge's stabilizer brush was lowered. Tracking force was found to be accurate within 5 percent, and the anti-skating device matched quite well. However, so much depends upon the cartridge used, it is possible that the optimum anti-skating force will be higher than the tracking figure, especially when this latter is below 1.5 grams.

Listening & Use Tests

The 838 turntable was used for a period of several weeks with great satisfaction. The cue control, in particular, was a real pleasure to use . . . not only is it placed in a convenient position, but it is very gentle in operation, with a minimum of backlash.

Another interesting feature of the 838 is the electronic speed changer: If the platter is rotating at 45 rpm and the 33 button is depressed, then that speed is effected almost immediately because a reverse drive current is generated. The strobe light is powered from the quartz-locked system, *not* from the line voltage. Although, in theory, the frequency of the a.c. power line does not vary in this country, there is



another advantage in this arrangement. As the strobe illumination is always synchronized with the servo frequency, only one strobe pattern is needed. A small point perhaps, but refinements like this, plus a better than average tonearm, make this Sansui SR-838 a really excellent value for the money one pays.

George W. Tillett

Enter No. 91 on Reader Service Card



**“In its price class,
the Dual 819 has some
formidable competitors,
and one has the right to expect
first-class performance from
any cassette deck selling
for more than \$400.**

**Nevertheless, even in such
distinguished company,
the 819 stands out.”**

*Hirsch-Houck Labs in Stereo Review,
December 1978.*

We shall be pleased to send you the complete Hirsch-Houck report if you write to us directly. If you'd rather not wait, here are some additional key excerpts:

“... the extremely low flutter, flat frequency response and low noise level of the 819, combined with its superbly accurate and useful meters, make this one of the more attractive values in a high-quality cassette deck. Such features as the fade/edit system and the bidirectional memory can be considered simply as bonuses.

“The Maxwell UD-XL-I tape provided a very flat record-playback response (at -20dB) within ± 0.75 dB from 30 to 15,000 Hz... the response with Sony Ferrichrome was flat within ± 1 dB from 33 to 15,000 Hz... the Dolby tracking was among the best we have measured... with a weighted rms reading the flutter was an amazing 0.035 percent. It is clear that in all aspects of its design and performance, the Dual 819 is a first-class unit.”

One final comment of our own. As you know, Dual's reputation for quality, precision and reliability has been based upon the performance of our turntables. When we introduced our first cassette decks, we knew they must establish a reputation of their own. And it is evident that they are doing just that.



United Audio
120 So. Columbus Ave.
Mt. Vernon, NY 10053

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Onkyo Model TX-2500-II AM/FM Stereo Receiver



MANUFACTURER'S SPECIFICATIONS

FM Tuner Section

Usable Sensitivity: Mono, 11.2 dBf (2.0 μ V); stereo, 19.2 dBf (5 μ V).

50-dB Quieting: Mono, 17.2 dBf (4 μ V); stereo, 37.2 dBf (40 μ V).

S/N: Mono, 65 dB; stereo, 60 dB.

Frequency Response: 30 Hz to 15 kHz, +0.5, -2.0 dB.

Capture Ratio: 2dB.

Image Rejection: 45 dB.

I.f. Rejection: 80 dB.

Spurious Rejection: 80 dB.

AM Suppression: 50 dB.

THD: Mono at 1 kHz, 0.2 percent; stereo, 0.4 percent.

Stereo FM Separation: 37 dB at 1 kHz, 30 dB at 100 Hz and 10 kHz.

Muting and Stereo Threshold: 14.7 dBf (3 μ V).

AM Tuner Section

Usable Sensitivity: 25 μ V.

Image Rejection: 45 dB.

I. f. Rejection: 30 dB.

S/N: 40 dB.

THD: 0.8 percent.

Amplifier Section

Power Output: 40 watts per channel, 8 ohms, 20 Hz to 20 kHz.

Rated THD: 0.1 percent.

Rated IM: 0.3 percent (0.1 percent at 1 watt).

Damping Factor: 40.

Frequency Response: 20 Hz to 30 kHz \pm 1.0 dB.

Input Sensitivity: Phono, 2.5 mV; High Level, 150 mV.

Phono Overload: 150 mV at 1 kHz.

S/N: Phono, 85 dB (re: 10 mV input "A" weighted); High Level, 95 dB (IHF "A" weighted).

Bass Control Range: \pm 12 dB at 100 Hz.

Treble Control Range: \pm 10 dB at 10 kHz.

High-Filter Cutoff: 6 kHz (6 dB/octave).

General Specifications

Power Consumption: 130 watts, 120 V, 60Hz.

Dimensions: 19 in. (48.3 cm) W x 6⁵/₁₆ in. (16 cm) H x 14⁵/₈ in. (37.1 cm) D.

Weight: 25.3 lbs. (11.5 kg).

Price: \$319.95.

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While some audio manufacturers tend to append their product model numbers with a "Mark II" or even a "Mark III" to justify a price increase or minor cosmetic change, that is not the case with the Onkyo mid-powered TX-2500-II stereo receiver. Compared with the earlier RX-2500, the new model's power output has been increased from a rated 27 watts per channel to 40 watts per channel and rated THD has been lowered from 0.5 percent to 0.1 percent. Onkyo's novel "servo-lock" tuning system has been carried over into this model and, although it operates in much the same way as their more expensive "quartz locked" tuning circuitry, it does not utilize a more expensive quartz reference oscillator.

The front panel of the TX-2500-II features a recessed pair of dial scales on a dark background with accurate calibration marks for FM frequencies at every 200 kHz. Signal strength and center-of-channel tuning meters are located on a sloped surface just below the frequency scales, as are three illuminated bars which are designated as "stereo," "tuned," and "locked." When the tuning knob is rotated to a frequency close to correct tuning, the "locked" light comes on. Releasing the knob at that point causes the AFC-like circuit to pull in the signal more accurately and the "tuned light" illuminates.

The remaining controls are located along the lower section of the panel and include a power On/Off switch, speaker selector switch, step-type bass and treble controls, balance control, step-type master volume control, and a three-position selector switch for AM, FM, or phono program sources. A phone jack is positioned near the speaker selector and two additional groups of pushbutton switches handle the high-cut filter, loudness, mono/stereo mode, FM muting (which, in its Off position also cancels the "servo-lock" tuning circuit), 25/75 microsecond de-emphasis selection, and

two tape monitor circuits, which include dubbing capability from one tape deck to another. There is no AUX setting on the selector switch and therefore any high level program sources to be used must be connected via one set of tape inputs and the appropriate tape button must be depressed to listen to such auxiliary program sources.

The rear panel of the receiver has screw-type connecting terminals for two pairs of speakers, one switched and one unswitched a.c. convenience outlet, antenna terminals for external AM and 300-ohm FM antennas, phono inputs, the two pairs of tape inputs and outputs, a chassis ground terminal, and the usual pivotable AM ferrite-bar antenna. Speaker protection fuse holders are also located on the rear panel.

Circuit Highlights

The FM front end of the TX-2500-II employs a dual-gate MOS-FET in the r.f. amplifier. The i.f. stages contain four-element ceramic filters followed by a quadrature detector. Stereo decoding circuitry is of the now-familiar phase-lock loop type. The power amplifier section is direct-coupled and equipped with thermal protection circuitry as well as speaker-line fusing. A complete schematic diagram was supplied with our test sample. Many of the circuit configurations include multi-purpose integrated circuits as, for example, the AM tuner section, the FM i.f. section, the multiplex decoder section, the phono pre-amp-equalizer, and the tone control amplifiers. The auto-lock circuit also utilizes an IC amplifier which results in an amplified or more sensitive AFC scheme. While this auto-lock circuitry is not of the supremely accurate crystal-controlled variety found in Onkyo's top-of-the-line receivers, it does the intended job with more than reasonable accuracy and is a welcome addition at this price level.

The ADS L810-II.

“...one of the best speakers in a decade.”*

Critics have put the ADS 810 at the top: the best.

Just listen to the 810's razor sharp transient response. Savor its accurate balance. Note its wide dispersion. Check the outstanding clarity of the critical mid and high ranges. Examine its superbly crafted acoustic suspension domes. They account for the 810's superior accuracy and definition, for an inner detail in your music you never knew existed.

Some of the things you can't see are the sea ed inner bracing between the dual woofers for perfectly phased, powerful bass. And the three pounds of copper in the computer grade crossover network. Uncompromised quality of design matched to uncompromised quality in execution.

What do YOU gain from all this painstaking attention to detail? Perhaps the respected critic Julian Hirsch says it best

in his recent Stereo Review test:

“...the tone-burst output of the 810 over the full audio range was as nearly perfect as we can recall seeing...the speaker's overall balance is outstanding...so accurate that we could not distinguish its sound from the original in a side-by-side comparison...one of the best speakers in a decade.”

ADS has indeed spared nothing in the quest for perfection.

At about \$360 apiece, the ADS 810 is accurate enough for the professional recording engineer and affordable enough for the lover of good music at home.

Discover the best today. Discover the ADS L810-II.

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(ADS L810-II shown with optional stands F800)

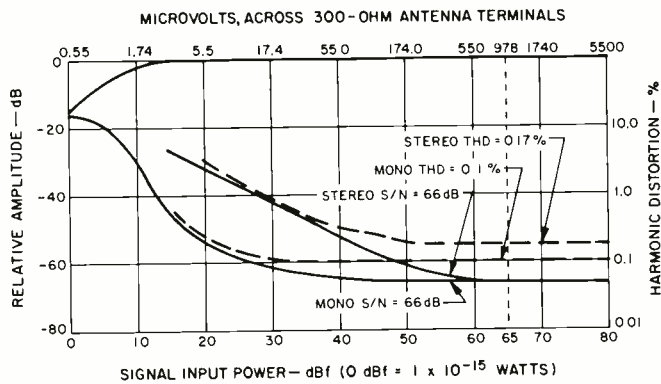


Fig. 1—Mono and stereo quieting and distortion characteristics in the FM section.

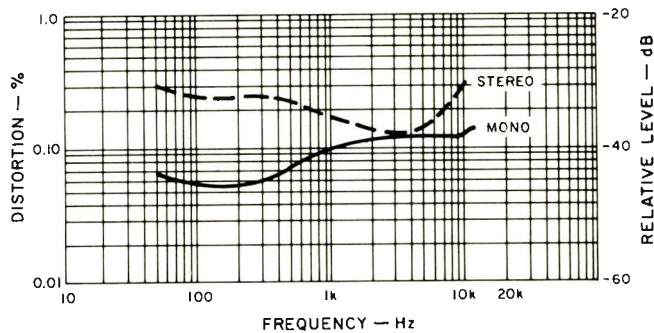


Fig. 2—Distortion vs. frequency in the FM section.



76 FM Performance Measurements

Usable sensitivity for the FM tuner section of this receiver measured 11.8 dBf (2.1 μ V) in mono and 19.2 dBf (5 μ V) in stereo. Reaching 50-dB quieting required signal strengths of 15.6 dBf (3.3 μ V) in mono and 38.3 dBf (45 μ V) in stereo. Best S/N in mono reached only 66 dB in mono with the same figure obtained in stereo. For a 1-kHz test signal, at 100 percent modulation, THD measured 0.1 per cent in mono and 0.17 per cent in stereo. Quieting and THD curves for a 1-kHz modulating signal are plotted against incoming signal strength in Fig. 1. Capture ratio measured a bit better than claimed, at 1.8 dB. Image rejection was 45 dB, the level Onkyo claims. The i.f. and spurious rejection both measured very close to the 80 dB claimed, while AM suppression measured 52 dB, a bit better than claimed.

Figure 2 is a plot of stereo and mono FM harmonic distortion at different frequencies. Counter to the usual situation, THD at low audio frequencies proved to be higher in mono than in stereo. Frequency response of the FM section, along with channel separation in stereo, is graphed in Fig. 3. The high-end response tended to rise a bit at around 10 kHz, but

was perfectly flat (taking into account pre-emphasis and de-emphasis) at the 15-kHz audio extreme. Response was down some 2.5 dB at the 30-Hz low frequency extreme. Separation measured 44 dB at mid-frequencies, a slightly higher 46 dB at 100 Hz, and 38 dB at 10 kHz. Rejection of sub-carrier products was 39 dB, and the previously mentioned THD and noise measurements were measured, as shown, only with appropriate filters inserted between the outputs and the measuring equipment, as authorized by the IHF/IEEE Tuner Measurement Standards. Used with a stereo cassette deck, the amounts of high-frequency content (19 kHz and 38 kHz) in the output might affect Dolby recordings of FM programs adversely unless your tape deck is equipped with an MPX filter switch position. Muting threshold as well as stereo switching threshold were set at a satisfactorily low 14.7 dBf (3.0 μ V).

AM frequency response of the tuner section of the Onkyo TX-2500-II is plotted in the spectrum analyzer 'scope photo of Fig. 4 and is essentially like the AM response of most stereo receivers we have tested, with rare exceptions. That is, roll-off begins below 100 Hz and above 2.0 to 3.0 kHz.

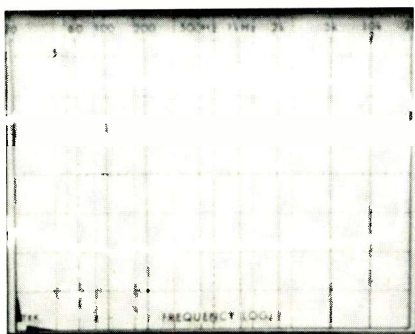


Fig. 3—FM frequency response (upper trace) and the stereo separation. (Each vertical division equals 10 dB.)

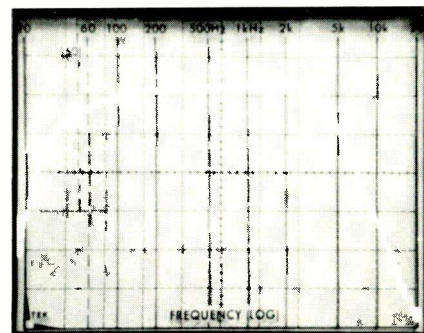
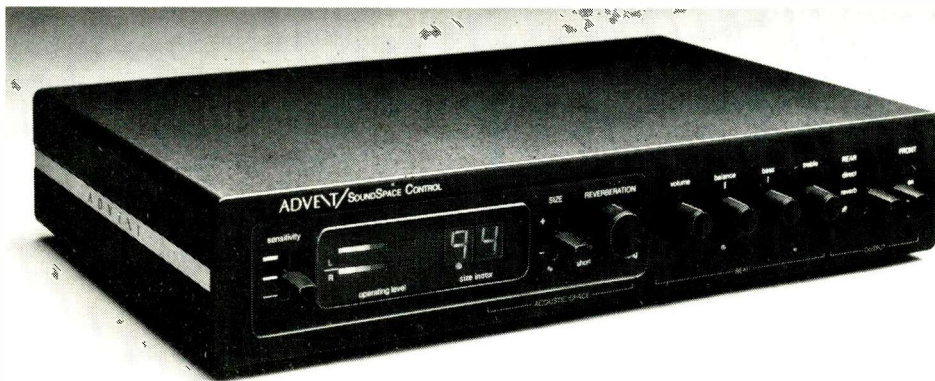


Fig. 4—AM frequency response.

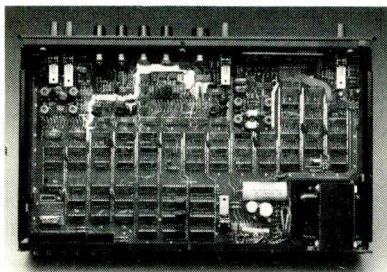
(The SoundSpace™ Control by Advent.)



Another Step Closer To Hearing It All.

Music sounds best in a space very unlike the usual listening room at home—a good-sized space where there is room for sound to expand and reverberate, and where the right proportions and right combination of sound-reflection and sound-absorption produce rich, warm and clear acoustics.

Advent's SoundSpace™ control, a new electronic product that uses the most sophisticated technology ever developed for home audio



The computer-grade construction of the SoundSpace control.

equipment, brings home the acoustic experience of good public listening spaces. It lets you hear music much as you would in good-sounding concert halls, cathedrals, night clubs, theaters, and auditoriums.

The SoundSpace control is a 32,000-bit computer—using the equivalent of more than 43,000 transistors. (In the days of vacuum tubes, its hardware would have filled an auditorium—and

required enough power to light up a city block.) It digitally processes signals from a preamp, integrated amplifier or receiver, and adds time delays that are multiply mixed and recirculated to model the ways in which sound is delayed, reflected and absorbed in good public listening spaces. The delayed sounds it creates—from standard stereo recordings and broadcasts—are meant to be fed to a second amplifier (which needs no controls) and heard over a second set of two or more speakers placed at the sides and/or rear of a home listening room.

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It enlivens the sound of *all* music—including the many rock and other recordings where the only original listening space is the one in the heads of the musicians, producer, and engineers.

The suggested price of the SoundSpace control is \$595.* For more information and a list of dealers, please send us the coupon.

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A-2/79

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Address _____

City _____

State _____ Zip _____

*Subject to change without notice.

Advent Corporation, 195 Albany Street, Cambridge, Massachusetts 02139.

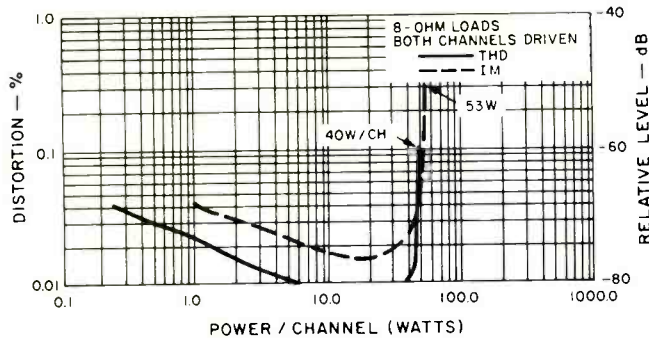


Fig. 5—Distortion vs. output at 1 kHz.

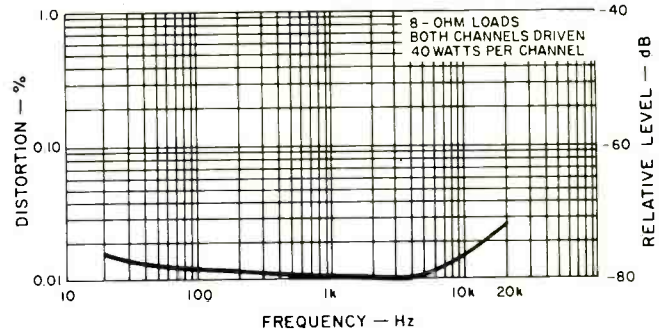


Fig. 6—Distortion vs. frequency.

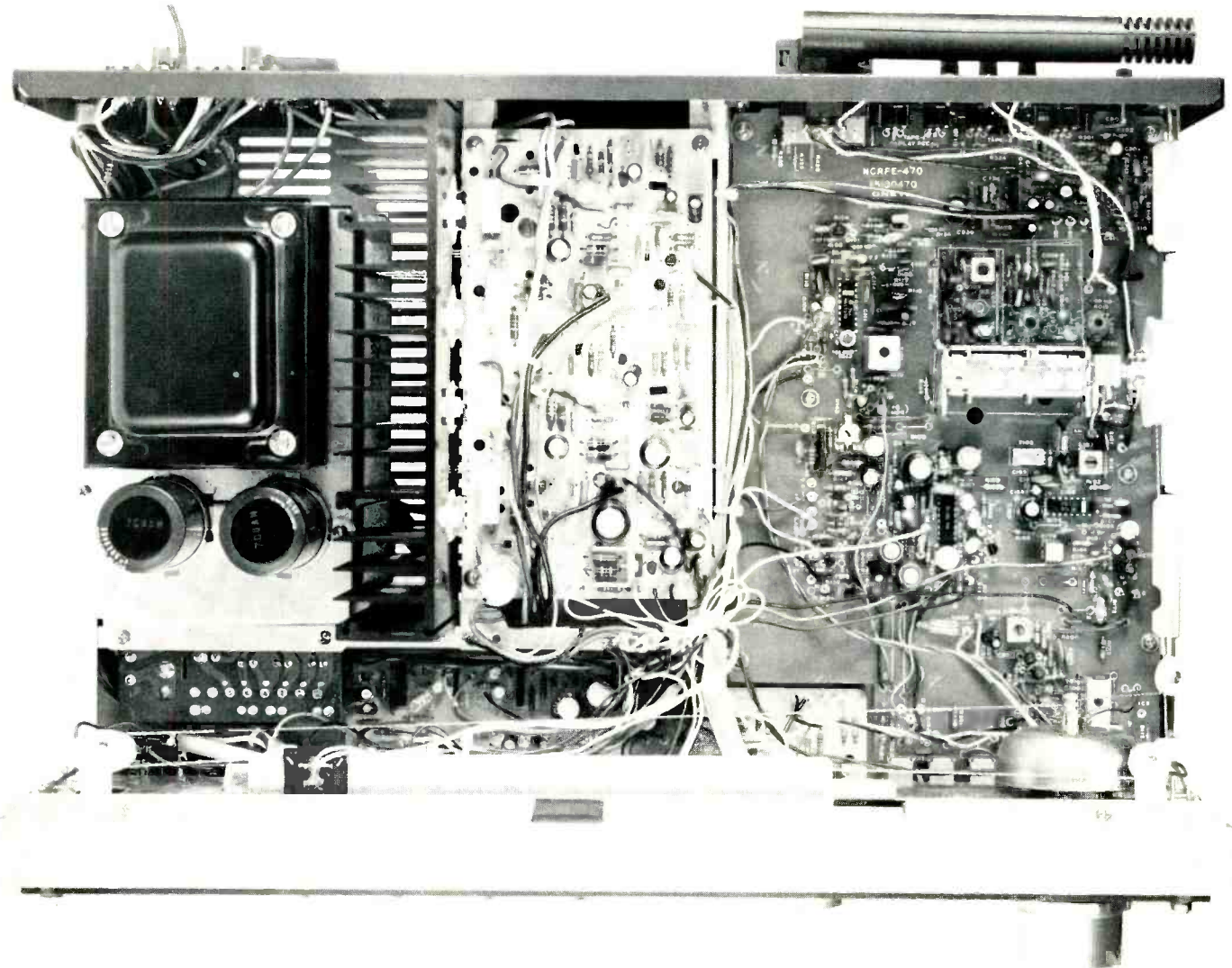
Amplifier Performance Measurements

The power amplifier section of the receiver delivered 50 watts of power at 1 kHz into 8-ohm loads before the rated harmonic distortion of 0.1 percent was observed. IM distortion reached its rated value of 0.3 percent when power output was increased to 53 watts per channel. At the published rating of 40 watts per channel, using a 1-kHz test signal, THD measured only 0.01 percent, while IM distortion measured 0.022 percent. These results are plotted in Fig. 5. As can be seen from the curve of Fig. 6, rated power output was easily obtained at the frequency extremes as well, with THD readings of 0.015 percent at 20 Hz and 0.027 percent at 20 kHz.

Our sample might well have carried a wattage rating of 43 watts plus and still conform to FTC power disclosure rules. Power band (the frequency extremes at which rated power can be delivered at or below rated THD) extended from 12 Hz to 50 kHz.

Dynamic headroom of the power amplifier section measured 1.58 dB above rated continuous power output, while clipping headroom measured 1.18 dB above rated output. Damping factor, measured at 50 Hz, was 40.

Frequency response, measured from the high level inputs to speaker outputs, was flat within 1.0 dB from 10 Hz to 30 kHz and within 3.0 dB from 7 Hz to 55 kHz. RIAA equaliza-



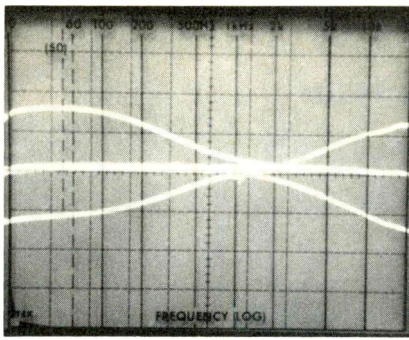


Fig. 7—Bass and treble control range.

tion of the phono preamp section was accurate to within a very fine ± 0.1 dB from 30 Hz to 15 kHz. Phono input sensitivity (based upon the new reference level of 1-watt output) measured 0.35 mV, while high-level input sensitivity measured 24 millivolts for the same 1-watt output level. Phono overload, for a 1-kHz input signal, measured 175 millivolts.

S/N using the phono inputs, measured in accordance with the new amplifier standards, was 78 dB, "A" weighted, (re: 5-mV input, 1-watt output), while for the high level inputs, "A" weighted noise was 83 dB below 1.0 watt output, using a reference 0.5 volts of input.

Tone control range is plotted in the spectrum analyzer sweep photo of Fig. 7, and we noted that the turnover points for this tone control arrangement were set fairly high (at around 1.5 kHz to 2.0 kHz). The result of this (evident in our subsequent listening tests) is that when one attempts to add a moderate amount of bass boost to reproduced program sources, much of the mid-range is also affected. However, the treble controls affect less of the mid-range region as configured in this design. The moderately sloped high filter response almost duplicates the action available in the treble-cut position of the treble control.

Use and Listening Tests

The amplifier section of the Onkyo TX-2500-II is, to our mind, the best part of this unit, and while the tuner section does come off second best in this internal match-up, it is no slouch either. To our ears, tonal quality of the amplifier section, when using good disc program sources or high quality tapes, was excellent. It seemed capable of delivering far more than its rated 40 watts under actual music listening conditions — this despite the modest dynamic headroom observed on the bench tests. Our listening tests were performed using a pair of relatively low efficiency bookshelf acoustic suspension speakers such as might logically be used in a medium priced component system using this receiver as its electronic section. In using FM signals as a program source, we did occasionally have some difficulty in separating weaker signals from close-in stronger signals that were nearby on the frequency scale, so if you plan to do any DXing of FM with this unit, a good directional outdoor FM antenna should be part of your system.

Considering its price and performance, plus the amount of upgrading that Onkyo has included in this revised version, the TX-2500-II gets a pretty fair grade overall.

Enter No. 92 on Reader Service Card

Leonard Feldman

WHY NOT THE BEST?

"Polk Audio is a small Maryland-based company whose speakers enjoy an enviable reputation among audiophiles who would prefer to own such exotica as the Beveridge System 2SW-1 or Pyramid Metronome but don't have the golden wallets to match their golden ears."

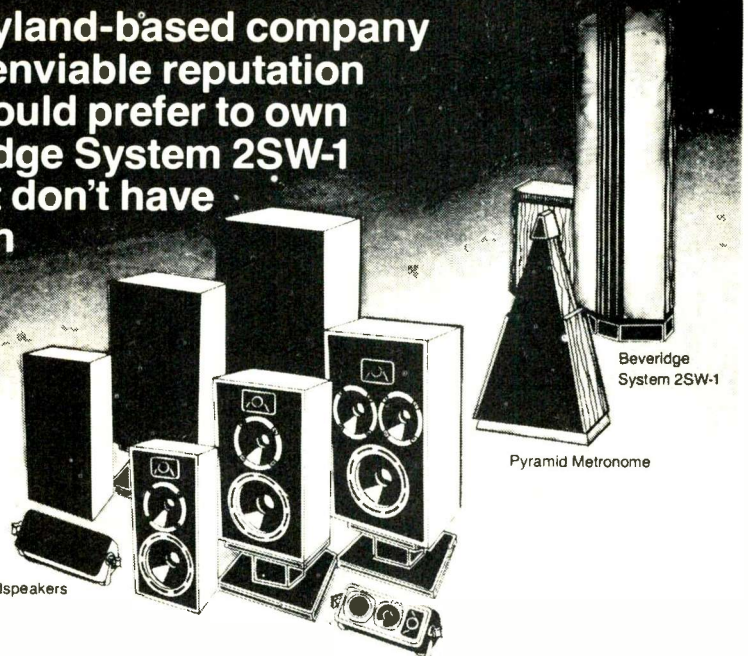
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The Pyramid Metronome
sells for \$4990 per pair.

The Polk Audio Monitor Series
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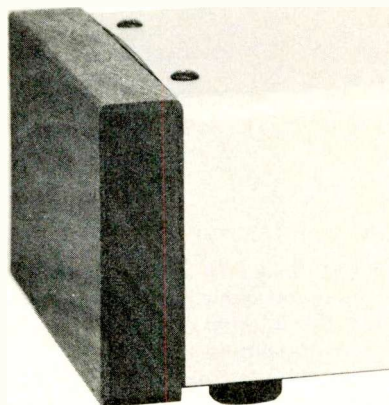


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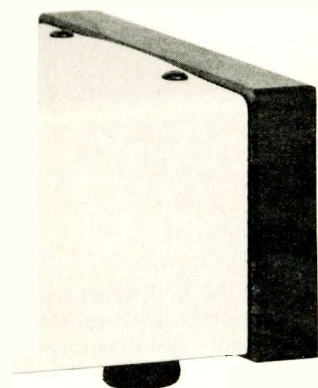
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Polk Audio, Inc. 1205 S. Carey St., Baltimore, Md. 21230 Dept. A15

PS Audio Model PS-II Phono Preamp



II



MANUFACTURER'S SPECIFICATIONS

Frequency Response: RIAA, ± 0.5 dB.

Overall Gain: Including equalization, 40 dB.

Input Impedance: 47 kilohms, 150 pF; other capacitance values available on request.

Input Overload at 1 kHz: 190 mV.

S/N Ratio: Referenced to 10 mV input at 1 kHz, 87 dB "A" weighted; 85 dB with 400-Hz filter, and 80 dB

unweighted (20 Hz to 20 kHz bandwidth).

Harmonic Distortion for 1 V Output: 0.022 percent at 100 Hz and 1 kHz, 0.028 percent at 20 Hz.

Dimensions: 11½ in. (29.2 cm) W x 5¼ in. (13.3 cm) D x 2½ in. (6.4 cm) H.

Weight: 2.2 lbs. (1 kg).

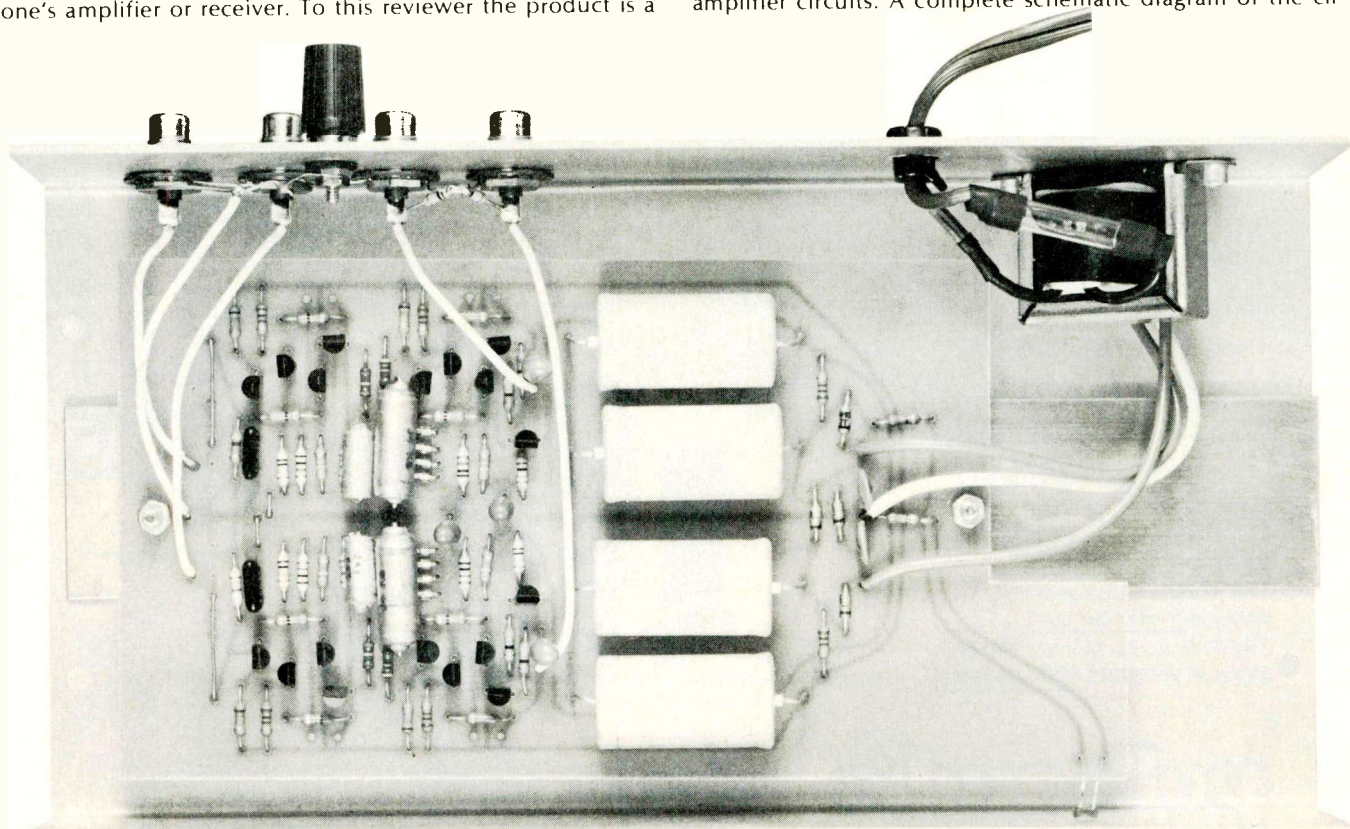
Price: \$99.95.

The recent emphasis given to proper interface between a phono cartridge and its associated preamplifier-equalizer electronics makes PS Audio's little phono preamp-equalizer a worthwhile and interesting product for those audio enthusiasts who are not satisfied with the phono preamps incorporated in their integrated amplifiers or all-in-one receivers. The PS-II is designed to replace such "built-in" preamp-equalizer sections. That is, the user connects cartridge outputs to the PS-II, which provides accurate RIAA equalization and some 40 dB of gain, and the left and right outputs of the unit are then connected to a high-level input (AUX or "spare") on one's amplifier or receiver. To this reviewer the product is a

bit reminiscent of some of the very earliest "phono preamps" of the 1950s which were sold for exactly the same purpose when magnetic phono pickups first became popular in high-fidelity equipment systems. Those early "one tube preamps" were, however, extremely crude in comparison with this neat little device from PS Audio.

Whereas most of today's preamp-equalizer circuits utilize frequency-dependent feedback networks to achieve the required RIAA playback characteristic, the PS Audio PS-II employs a completely passive equalization network and 16 high-voltage transistors that make up four high-speed linear amplifier circuits. A complete schematic diagram of the cir-

80



This new tuner, amplifier and turntable are all by LUX.

We'll leave the speakers up to you.

The tuner and integrated amplifier are from LUX's new Studio Standard Series, our newest and most modestly priced line of separates. Their features and performance, however, are anything but modest.

The T-4 tuner, for example, has LUX's exclusive Accutouch tuning system. The knob physically locks at every station that exceeds the muting threshold—from 5 to 300 μV . LUX's closed-loop tuning circuit is precisely referenced to the station's carrier frequency for lowest-distortion reception. And the i.f. bandwidth is adjustable—wide (normal) or narrow—to accommo-

date station density throughout the FM band.

The L-5 integrated amplifier has a DC direct-coupled power amplifier section with frequency response extending from 5 Hz to 100 kHz, $-0, -1$ dB. Bass and treble tone controls have switchable turnover frequencies, plus total tone delect. Subsonic filter in addition to low and high-cut filters. And when tape decks are not in use, a special switch totally disconnects them from the amplifier, preventing loading which causes preamp distortion.

The PD-272 is LUX's lowest-priced turntable. Its servo-controlled

direct-drive brushless DC motor is totally free of the cogging (pulsing) that plagues many other direct-drive motors. And the straight, statically-balanced tone arm has a nested tube construction and internal damping that deal very effectively with resonance. Another feature: the vertical pivots extend through the arm, minimizing lateral play.

Altogether, these three components will deliver a clear, virtually distortion-free signal to your speakers. We'll leave that final decision to you and your LUX dealer—whose taste is as high in speakers as in electronics and turntables.

LUX Audio of America, Ltd.

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

Luxman T-4 AM/FM stereo tuner. Usable sensitivity, 10.3 dBf (1.8 μV); 50-dB quieting sensitivity, 14.7 dBf (2.8 μV) S/N: 75 dB. Alternate-channel selectivity, 85 dB (narrow), 40 dB (wide). THD (at 1 kHz) 0.08% (wide). (Luxman T-2, AM/FM stereo tuner, similar to T-4, less Accutouch and CLL.)

Luxman L-5 integrated amplifier. 60 watts per channel minimum continuous power into 8 ohms, 20-20,000 Hz, with no more than 0.03% total harmonic or intermodulation distortion. Damping factor: 80 at 1 kHz (8 ohms). Phono signal-to-noise ratio better than 92 dB (IHF-A re 10 mV input). (Luxman L-3, similar, but 35 watts per channel, 20 Hz-20 kHz, 0.04% THD.)

Luxman PD-272. 12" die-cast aluminum platter with high density mat, 3.96 lbs. Detachable hinged cover, adjustable isolating feet. Separate pitch control ($\pm 4\%$), each speed. Rumble: better than 70 dB (DIN B); wow and flutter: better than 0.03% (WRMS).



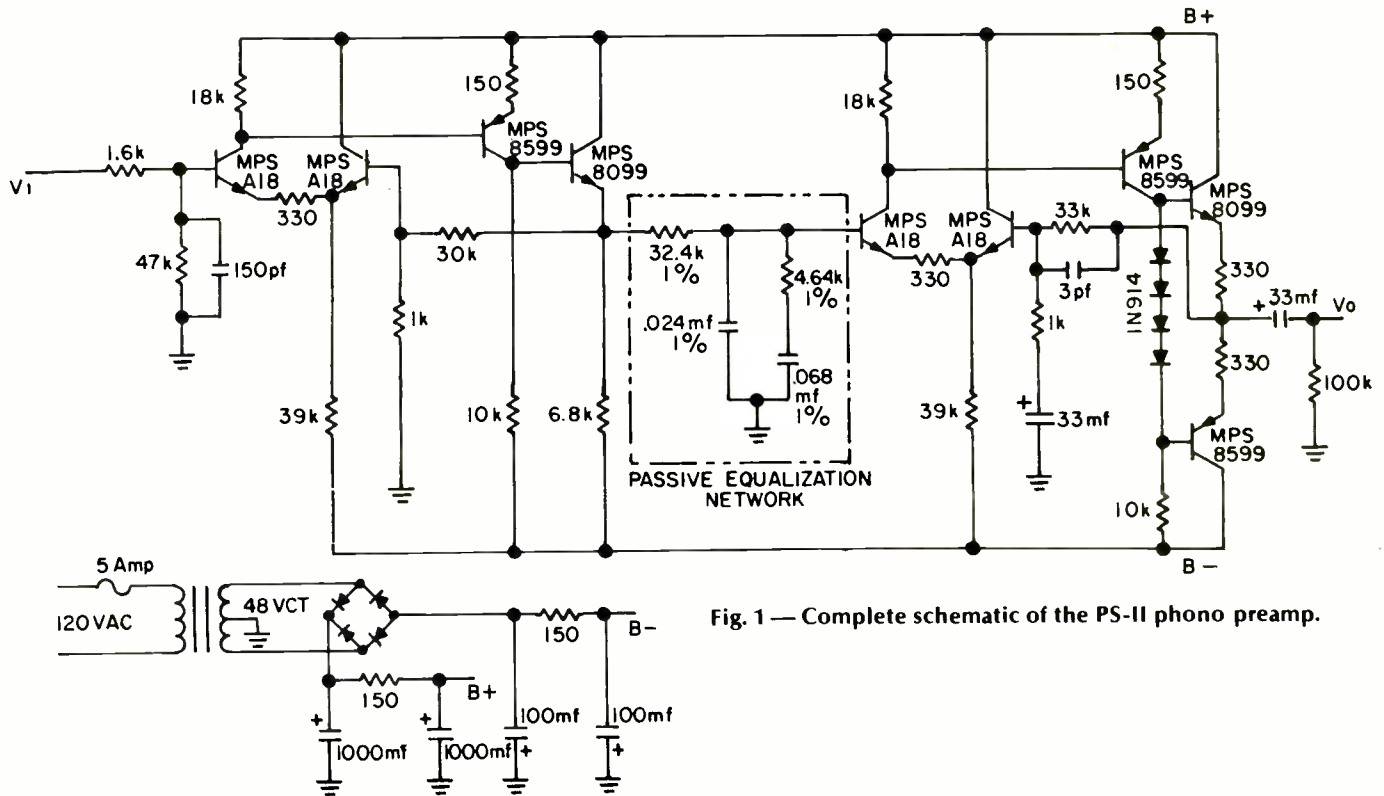


Fig. 1 — Complete schematic of the PS-II phono preamp.

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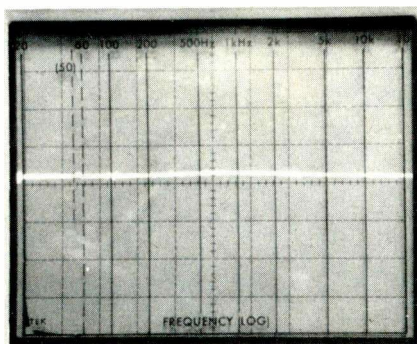
cuit is shown in Fig. 1. The power supply, in addition to delivering high levels of d.c. for the operation of those high-voltage transistors, is also passive and uses two stages of high-capacitance filtering. PS Audio's engineers maintain that this approach leads to better sound compared with using electronically regulated power supply circuitry.

There are no controls on the front face of the PS-II — just a pair of input jacks, a pair of output jacks, a chassis ground terminal, and a fuseholder containing a ½-ampere line fuse. Since the PS-II consumes negligible amounts of power, there is no *On/Off* switch either, though users will undoubtedly want to connect its line cord to one of the "switched" outlets usually available in its line cord to one of the "switched" outlets usually available on the rear panels of associated amplifiers or receivers. An earlier version of the PS-II carried a suggested price of \$119.95, but recently, a redesign of the chassis (including elimination of wood side panels) and increased production has enabled PS Audio to lower the price of the unit to its present suggested level of \$99.95.

Laboratory Measurements

Our measurements were made in accordance with the new IHF Amplifier Measurement Standards, which call for an input reference level of 5 millivolts and an output reference level of 0.5 volts (for preamps). Although there is no gain control on the PS-II, its gain happened to be exactly 40 dB, so that an input of 5 mV produced an output of 0.5 volts (at 1 kHz).

Fig. 2 — RIAA-compensated frequency response. (Vertical sensitivity in this scope photo is 2 dB per division.)

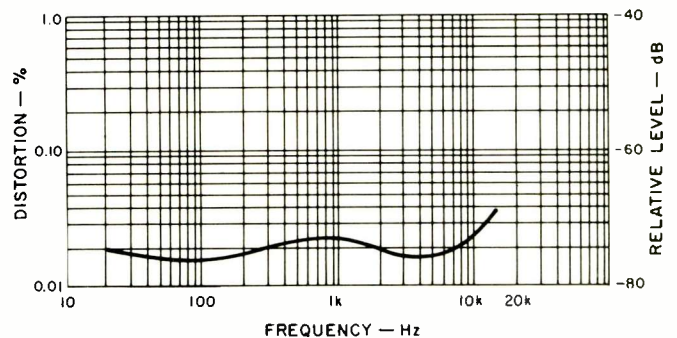


On the basis of these input and output reference levels, the IHF "A" weighted signal-to-noise ratio for the PS-II measured 81 dB. Had we used a reference level of 10 mV (as PS Audio used in preparing their published specifications), we would have come up with exactly 87 dB, as claimed by them.

Figure 2 in a spectrum analyzer 'scope plot of frequency response, using an inverse RIAA input signal. Note that in this display, the vertical sensitivity of the analyzer was increased to 2 dB per division (most of these displays supplied in our test reports use a sensitivity of 10 dB per division), and the "flatness" of response is therefore all the more impressive, varying, at most, by no more than ± 0.1 dB, as opposed to ± 0.5 dB claimed.

Figure 3 is a plot of harmonic distortion versus frequency, for the same input and output reference levels. IM distortion was measured using the 1-kHz difference frequency technique, with input signals set to 14 kHz and 15 kHz. The analyzer, fed with the composite output signal from the preamp, was swept from 10 to 20 kHz, in its linear mode (disregard frequency notations shown at the top of the display, and the two major peaks are the 14 and 15 kHz primary signals. The most significant IM products appeared at 13 and 16 kHz and, calculating the equivalent IM, we came up with a percentage figure of 0.3 percent, which is quite low compared to the IM figures normally obtained from preamps that use negative feedback to achieve required RIAA equalization and a good

Fig. 3 — THD vs. frequency for a 5 mV input signal.



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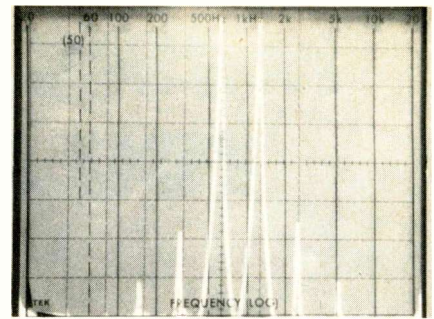
deal lower than the IM likely to be obtained from even the best recordings using top-grade phono cartridges. These results are shown in the 'scope photo of Fig. 4.

Phono overload measured 160 millivolts at 1 kHz, a bit lower than the 190 mV claimed, but more than adequate in terms of even the most heavily modulated record grooves found on most direct-to-disc recordings when played with higher output phono cartridges. At 100-Hz signal inputs, overload was 100 mV, while with 10-kHz input signals, the preamp was able to handle signal input levels as high as 420 mV.

Listening & Use Tests

We decided that the best way to evaluate the performance of the little PS-II preamp was to compare reproduction from records by quickly switching cartridge output from the inputs to the PS-II to the phono inputs of a mid-priced receiver. We constructed a switching circuit for this purpose that would enable us to keep cartridge loading constant at correct capacitive loading levels under both listening situations. On the run-of-the-mill musical records, we could detect little if any difference between the receiver's preamp-equalizer performance and that of the separate PS-II. When we switched to playing some of our recently acquired direct-to-disc recordings, the differences were immediately apparent. There was an improved sense of musical presence with the PS-II and

Fig. 4 — IHF distortion, using 14 and 15 kHz input signals (tall peaks), is represented by outputs at 12, 13, 16, and 17 kHz. The sweep is linear from 10 to 20 kHz and the vertical sensitivity is 10 dB per division.



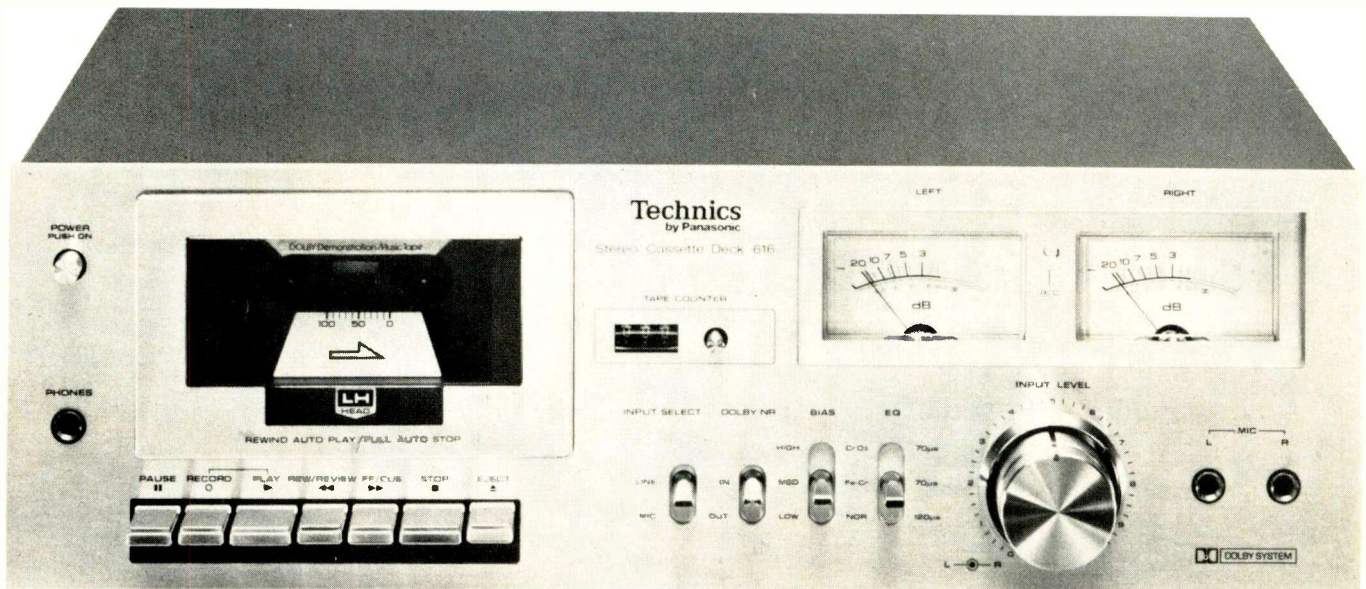
absolutely no clouding or masking of sharp transients. Somehow, we were better able to pick out individual instruments in complex musical orchestrations using the PS-II than when the same music was reproduced via the self-contained preamp equalizer of the receiver in our test system.

All in all, the PS Audio PS-II seems to be a carefully designed product that will appeal to those who, for budgetary reasons, are confined to using mid or low priced equipment in their hi-fi systems where circuit refinements are at a minimum, but who value their better record collections enough to warrant this relatively moderate additional investment for improved phono reproduction.

Leonard Feldman

Enter No. 93 on Reader Service Card

Technics Model RS-616 Cassette Deck



MANUFACTURER'S SPECIFICATIONS
Frequency Response: Normal, 30-14,000 Hz; FeCr and CrO₂, 30-15,000 Hz.

Wow & Flutter: 0.07 percent W rms.
S/N Ratio: 66 dB with Dolby.
Inputs: Mike, 0.25 mV; Line, 60 mV.
Output: 0.42 mV at 22 kilohms.

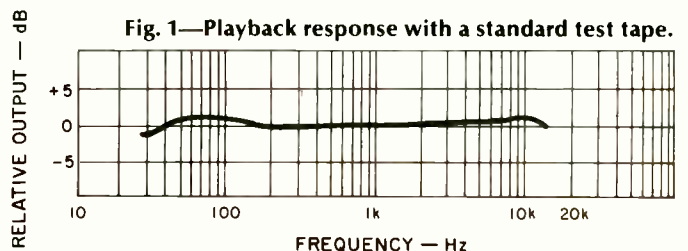
Headphone: 65 mV.
Motor: D.c., electronically controlled.
Bias Frequency: 90 kHz.
Price: \$200.00.

In spite of the decline of the American dollar on the world market and higher production costs in the Far East, the prices of audio components haven't risen very much at present. How long this situation will continue is anybody's guess, but it would seem that prices will have to show a sharp increase in the next year. At the moment, such items as direct-drive turntables and cassette decks — especially those in the "budget" range — are available at remarkably low prices.

An example of this is the Technics RS-616 cassette deck which offers good all-round performance with specifications comparable to those decks costing a lot more. It is a front-loading deck, and the styling is similar to the more expensive Technics' models with the usual satin-finished aluminum panel and polished instrument-type controls to match. The

metal cover is finished in matte black, and the deck looks more expensive than its modest price would suggest. Among its features are a Dolby N/R system, fully automatic stop, and switches for changes in bias and equalization.

The vertical cassette compartment is on the left, and I was pleased to note that the door opens slowly . . . it doesn't throw the cassette out. Underneath are six tape-transport keys, plus one for *Eject*. To their right is a *Mike-Line* input



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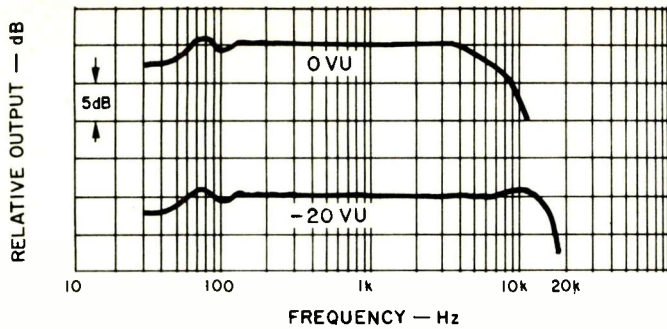


Fig. 2—Record/replay response with Maxell UDXL-1 tape.

switch followed by a *Dolby* switch. Then come the two three-position lever switches for bias and equalization, plus a large dual-concentric input control. Two standard quarter-inch mike jacks are at the extreme right, and a digital counter is at the far left. The *On-Off* switch is to the left of the cassette compartment with the headphone jack underneath it.

The motor is a d.c. type fed from a stabilized supply — but not servo controlled. Inside, all components are mounted on a single large circuit board with access from underneath. The case is constructed of strong, black-plastic moulding, and the overall dimensions measure 17 in. (43.2 cm) x 10½ in. (27 cm) x 5½ in. (14.3 cm).

Measurements

Figure 1 shows the frequency response from a standard test tape, while Fig. 2 shows the record-replay response with the Maxell UDXL-1 tape, with the *Normal* setting on the *bias* switch and equalization set to 120 μ S. The -3 dB point was at 14.3 kHz, and the low end was well maintained down to 30 Hz. Next the *Bias* switch was changed to *CrO₂*, and the equalization was set to 70 μ S for the TDK SA tape, which is a chrome-substitute formulation. As shown in Fig. 3, the frequency response was fairly similar to the Maxell UDXL-1 tape. Finally a Sony C-46 FeCr cassette, which came with the deck, was tested after the *Bias* was changed to *FeCr*, and the results are shown in Fig. 4. The high frequency response extended to 15.3 kHz, with a slight reduction in high frequency saturation at 0 Zero, VU. The three tapes were then tested for distortion at 1 kHz (see Fig. 5) and then distortion vs. frequency (see Fig. 6). The latter was measured at 0 VU (1 kHz)

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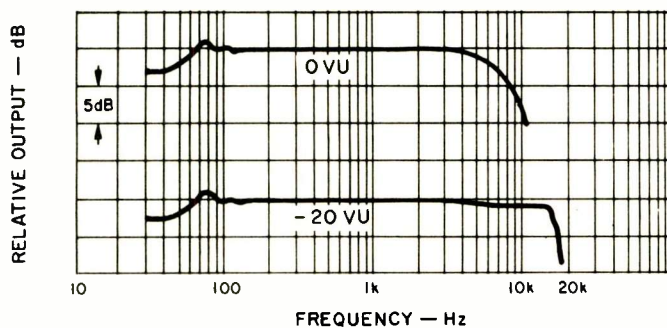
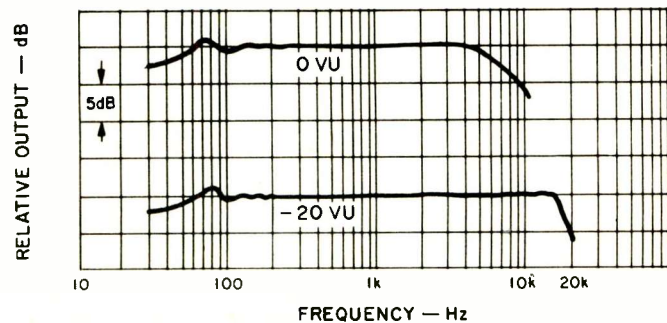


Fig. 3—Record/replay response with TDK SA tape.

Fig. 4—Record/replay response with C-46 Sony FeCr tape.



and the input level was kept constant. However, the VU meters indicate an equalized signal so they read 1 dB less at 100 Hz, -10 dB at 50 Hz, and 20 dB down at 30 Hz. This method, used on several other decks, works well, but care must be taken to avoid overloading when recording organ or electronic music.

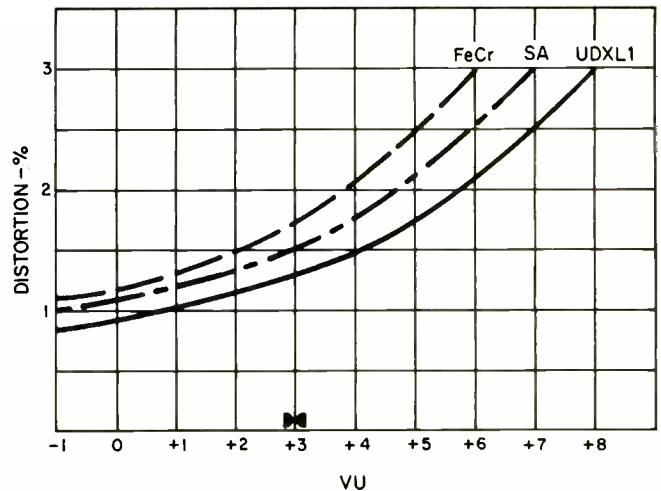
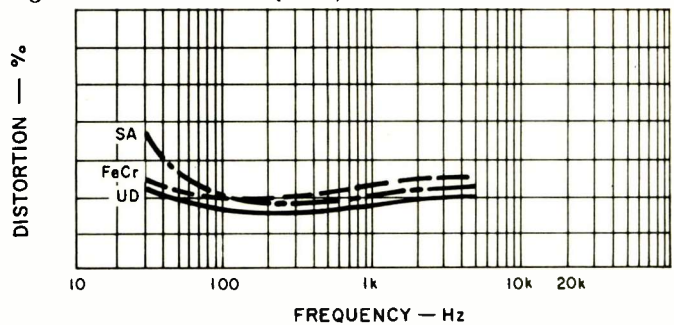


Fig. 5—Distortion at 1 kHz.

Fig. 6—Distortion vs. frequency.



Signal to noise measured 60 dB ("A" weighting, 3 percent THD reference) for the Maxell UDXL-1 and Sony FeCr, while the TDK SA clocked in at 61.0 dB. Switching in the *Dolby N/R* increased the figures for the UDXL-1 and SA to 69 dB, and 68 dB for the FeCr. The *Dolby* tracking was within 1.5 dB down to -40 dB. The input signal for 0 zero VU was 70 mV line and 0.26 mV for mike, and when the latter was switched in the S/N ratio decreased by some 9 dB. Output varied between 400 and 440 mV depending upon the tape used. Erase efficiency was better than 70 dB.

Wow & flutter measured 0.06 percent (DIN 45-507) and tape speed was less than 0.03 percent slow. Rewind time for a C-90 cassette was 95 seconds.

Listening & Use Tests

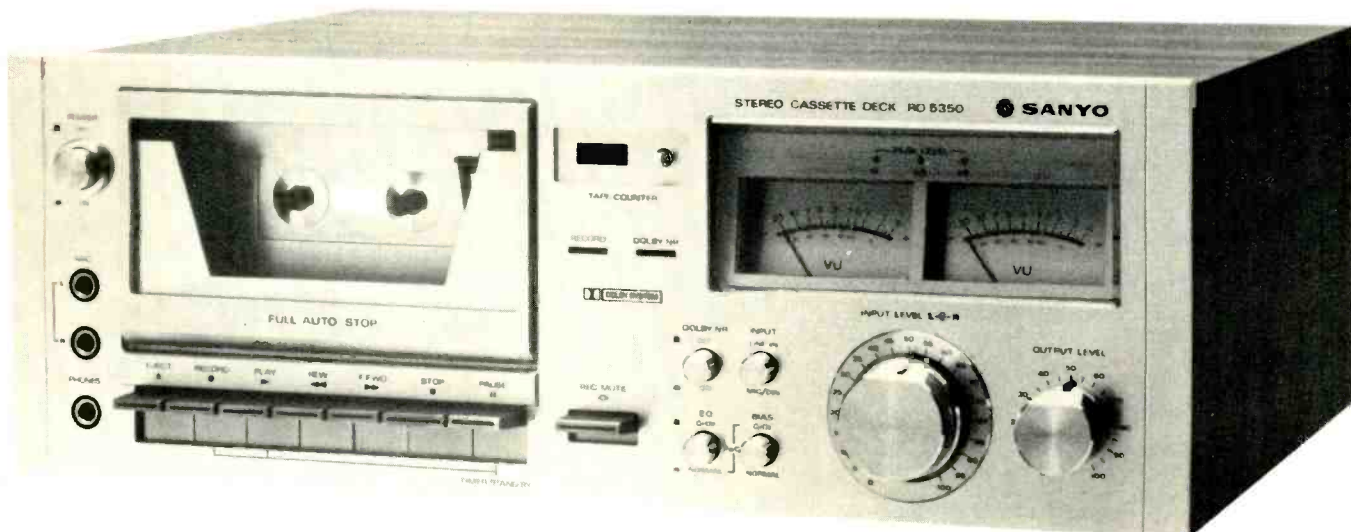
As you might expect, the low price means that some compromises are inevitable, but they are surprisingly few . . . there is no output control, peak indicator, or memory switch, and you cannot switch from *Fast Forward* to *Playback* modes without pressing the *Stop* button first.

However, in terms of frequency response, distortion, and S/N ratio, the RS-616 compares quite favorably with decks costing a lot more . . . in fact the noise level is lower than most. I found the transport control keys a little too close for comfort, but other than that I have no criticisms to make. As I mentioned before, this cassette deck is really an excellent value for the money, and with the present currency crises, there is a chance that this low price will show a substantial increase in the very near future.

George W. Tillett

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Sanyo Model RD5350 Stereo Cassette Deck



MANUFACTURER'S SPECIFICATIONS

Frequency Response: 30 Hz to 14 kHz, 30 Hz to 17 kHz with FeCr and CrO₂ tapes.

Signal-to-Noise Ratio: 56 dB, 64 dB with Dolby.

Input Sensitivity: Mike, 0.3 mV; line, 50 mV.

Output Level: Line, 550 mV; head-
phone, 40 mV at 8 ohms.

Flutter: 0.05 percent W rms.

Wind Times: 90 seconds for C-60.

Dimensions: 16 $\frac{1}{2}$ in. (42 cm) W x 6 $\frac{1}{8}$ in. (15.5 cm) H x 11 $\frac{7}{16}$ in. (29 cm) D.

Weight: 13.2 lbs. (6 kg).

Price: \$249.95.

The Sanyo RD5350 cassette deck delivers generally acceptable performance, for a low price. The clear-plastic door cover of this front-loading unit is easily snapped out, giving very good access for cleaning and demagnetizing. The plastic loading guides were judged to be a bit flimsy. Tape-motion control was with piano-key levers, which were a little springy. *Pause* also functions as a timer start switch when power is turned on, with *Record* or *Play* preset. The counter has a reset, but there is no memory function. The level meters are well illuminated and of good size. The scales are mirror-backed and extend to +6, with the Dolby cal mark at +3. There are 0, +3, and +6 peak level indicators above the meters, a good location. To the left are the *Record* and *Dolby NR* status lights, slightly less convenient. A spring-loaded, momentary-contact lever switch below provides *Rec Mute*, which removes the record signal although the meters will continue to indicate level.

There are four pushbutton switches for Dolby NR, mike, or line input selection, 120- or 70-microsecond EQ, and normal or CrO₂ bias. Switches are set for 70 microseconds and normal bias for FeCr tapes. The dual-concentric input level pots have

very large knobs with fine knurling, with smooth friction coupling between sections. The output level pot has a medium-size knob with fine knurling.

Mike and phone jacks are on the front panel and line/out phono jacks and a DIN socket are on the back. Inspection of the interior showed that most of the circuitry was on one large PCB with very good soldering, although some lead ends were slightly long. There were no parts identification with the exception that adjustment pots were well marked. A specific search for a possible cause of erratic results in preliminary tests revealed that a collector heat sink was barely touching a diode lead. Repositioning the too-long-lead transistor gained steady performance. Interconnecting wires were neatly bundled. The capstan flywheel was of good size.

Performance

The playback responses of the test tapes with the Sanyo deck were within 2 dB at all frequencies with the exception of 40 Hz at +2.9 dB with the 70-microsecond tape. Meter indications for standard levels were very close for the left channel and about a dB low for the right. The RD5350 gave

Fig. 1—Frequency response with Ampex Grand Master tape.

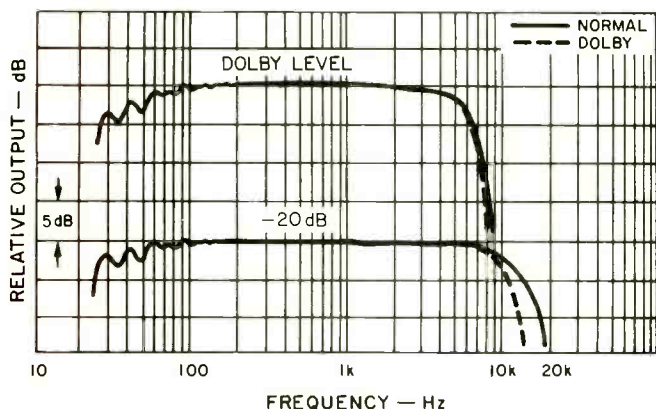
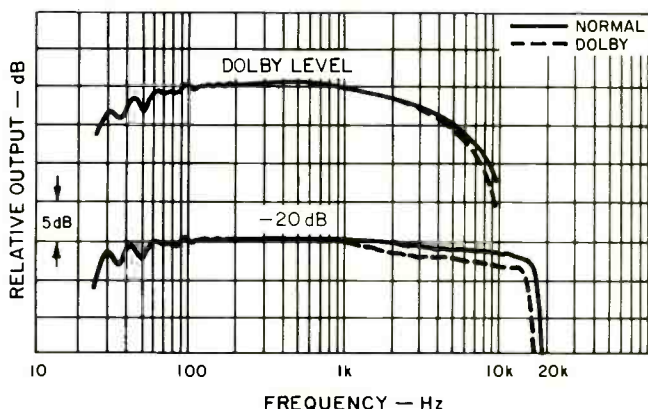


Fig. 2—Frequency response with Sony FeCr tape.



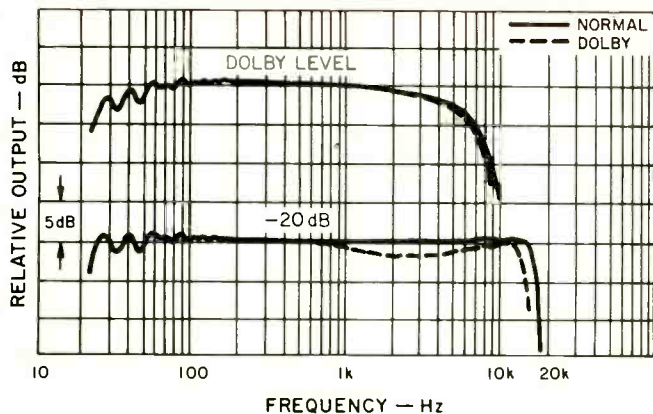
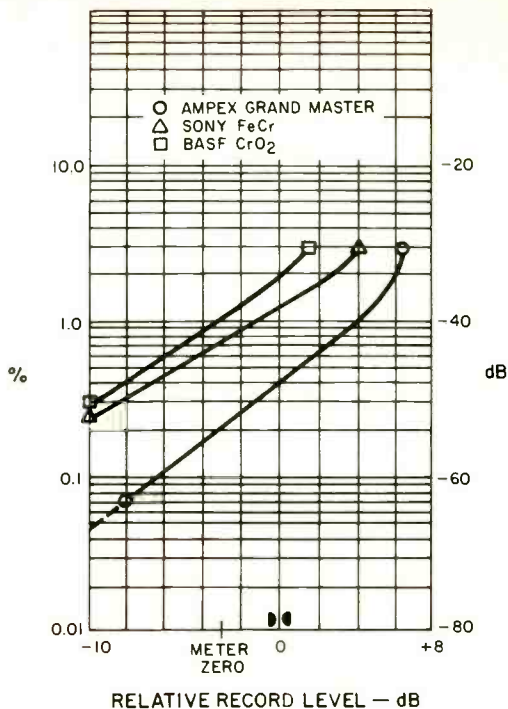


Fig. 3—Frequency response with BASF CrO₂ tape.

Fig. 4—Third harmonic distortion vs. level at 1 kHz with Ampex Grand Master, Sony FeCr, and BASF CrO₂ tapes.



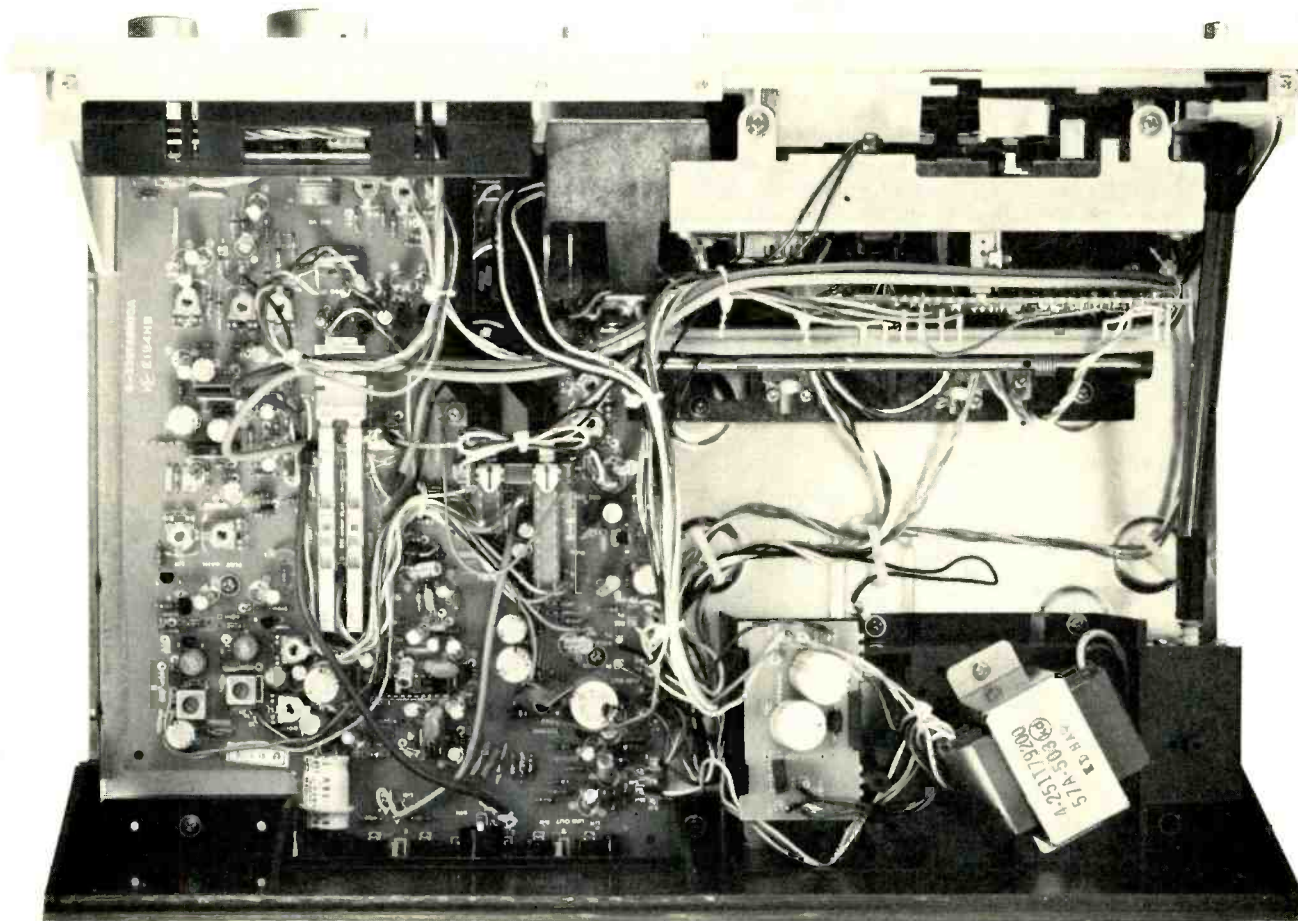
its best performance with a limited number of tapes. Ampex Grand Master had high-end response out to 12.3 kHz at 20 dB below Dolby level, to 10.0 kHz with Dolby NR switched in.

At Dolby level, the response was 3 dB down at 5.7 kHz in both cases. At the low end at -20 dB, the response was down 3 dB at 25 Hz and also at 35 Hz with a head-contour dip. At Dolby level, there was a similar result although the points

were at 40 and 51 Hz. With Sony FeCr, the low-end results were all the same, but the high-end was mixed. At -20 dB, the 16.7-kHz response was very close to the specified 17 kHz, but the droop in response from 1 kHz up with Dolby was only fair. The 0-dB headroom was limited to 3.6 kHz or less.

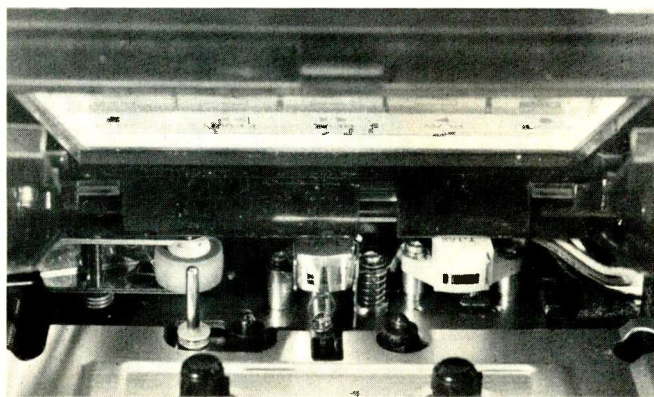
The results with BASF CrO₂ were the best for the tapes tried, with a very flat response from 23 Hz to 16 kHz at -20 dB. Dolby NR results were almost as good with a 15.0 kHz

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limit and a 1.5-dB droop at 3 kHz. At 0 dB, the headroom was about the same as with the Ampex tape, but the low-end response was much better. Playback of a recorded 10-kHz tone had about 40 degrees of phase jitter, one channel compared to the other, which is very good for a cassette deck. Bias in the output during recording was satisfactorily low. The multiplex notch filter appeared to be in at all times and was measured to be -29.5 dB at 18.9 kHz.

HDL₃ vs. record level was measured for the three tapes at 1 kHz with Dolby level (+3 meter) as the zero reference. The distortion was markedly lower with the Ampex tape, with the CrO₂ tape the poorest in this regard. In one respect, the Sanyo was excellent: All other distortion products were of very low level for all three tapes. The use of Dolby NR reduced HDL₃ without increasing HDL₂, as some units do. HDL₃ vs. frequency at -10 dB with Ampex Grand Master produced some very low readings around 1 to 2 kHz, while the distortion was a bit over 1 percent at the lowest frequencies. At Dolby level, the signal-to-noise ratios for the Ampex, Sony and BASF tapes were 53.0, 56.5 and 57.0 dBA, and 61.2, 63.9 and 64.5 dBA with Dolby, respectively. With a HDL₃ = 3 percent reference, the results were 59.5, 60.5 and 58.5 dBA for the Ampex, Sony, and BASF tapes, and 67.7, 67.9 and 66.0 dBA with Dolby, respectively, for the same tapes. These figures are certainly excel-



lent, particularly for a lower-price unit. Recording up to the 3 percent distortion point, however, could cause noticeable losses in the higher frequencies. Erasure of a 1-kHz tone was at least -90 dB, and separation was also excellent at 52 dB. Crosstalk was far enough down at -74 dB, but not as good as the better current units.

Input sensitivities were 0.24 mV for mike and 49 mV for line, both better than specifications. Input overloads were 24 mV for mike and greater than 11 V for line. Clipping of the output occurred at a level equivalent to +15 meter indication. The input pot sections tracked to +15 meter indication.

Fig. 5—Third harmonic distortion vs. frequency at 10 dB below Dolby level with Ampex Grand Master tape.

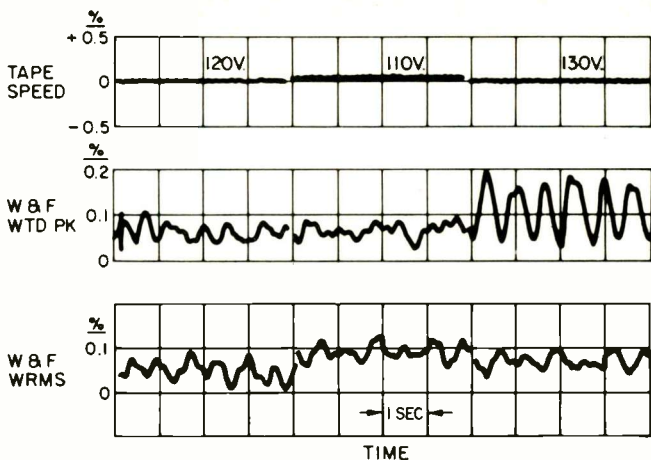
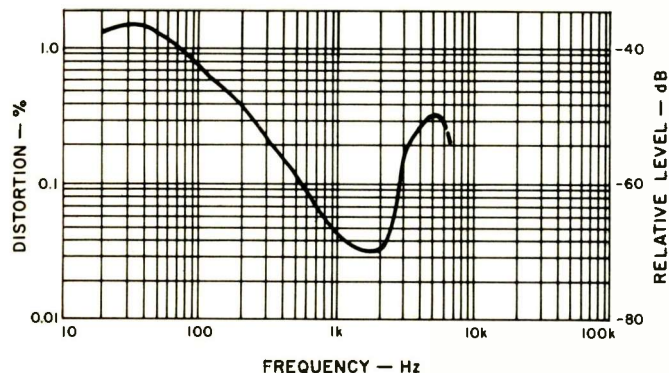


Fig. 6—Wow and flutter and tape speed variations.

The input pot sections tracked within a dB from maximum level to 35 dB lower. The headphone level of 32 mV was adequate for most phones, though below the specified 40 mV. The line output was slightly under spec at 530 mV. The sections of the output pot tracked within a dB for more than 60 dB from maximum. The meter ballistics matched VU standards, but the frequency response was a little shy on the high end. The LED peak indicators turned on at -1, +2, and +4.7 VU with a CW signal, all about a dB low. The response threshold were basically the same with a 10-mS tone burst. Meter scale calibration was a bit inaccurate below 0 VU, being 2 dB off at -10, raising a question on the possible value of the mirror backing.

Play speed was within 0.3 percent or better, and there was substantially no change as line voltage was varied. The flutter tests were run with the cassette near the middle with three different play starts for each of the W&F standards. The results were variable, with great changes in the flutter at times, most evident in the last Wtd peak plot. The typical W rms figure of 0.068 percent was quite good, although over the 0.05 percent spec. Wind times were 81 seconds.

Listening & Use Tests

Tape insertion was easy, latching was smooth, and the *Eject* key opened the door quietly. Maintenance was an easy task with the door cover removed. All controls worked well, with the smoothness of the pots of particular note. It was not possible to cause a tape-motion malfunction during the testing, but there is some question on the theoretical desirability of being able to switch from *FFWD* to *Play* directly. Meter action was good, and the peak LEDs were helpful. The record-muting and timer-start functions worked satisfactorily. Memory function was missed at times, but the deck price is quite low for such a feature to be included. The instruction book was adequate.

In general, the sound from the Sanyo deck was quite good, probably aided by the flatness of the response from 100 Hz to 10 kHz. The limitations of high-level recording, however, were apparent, most so with the FeCr tape, which seemed dull in Dolby mode. With the BASF CrO₂ tape, the sonic results were better, with just a subtle dulling of the highs and a loss in presence in the Dolby mode. Record and stop clicks were of very low level, and no such effects were observed from the use of *Pause*. Overall, the Sanyo RD5350 cassette deck has generally acceptable performance, particularly for its low price. Tape selection appeared to be important for best response and to minimize Dolby tracking errors.

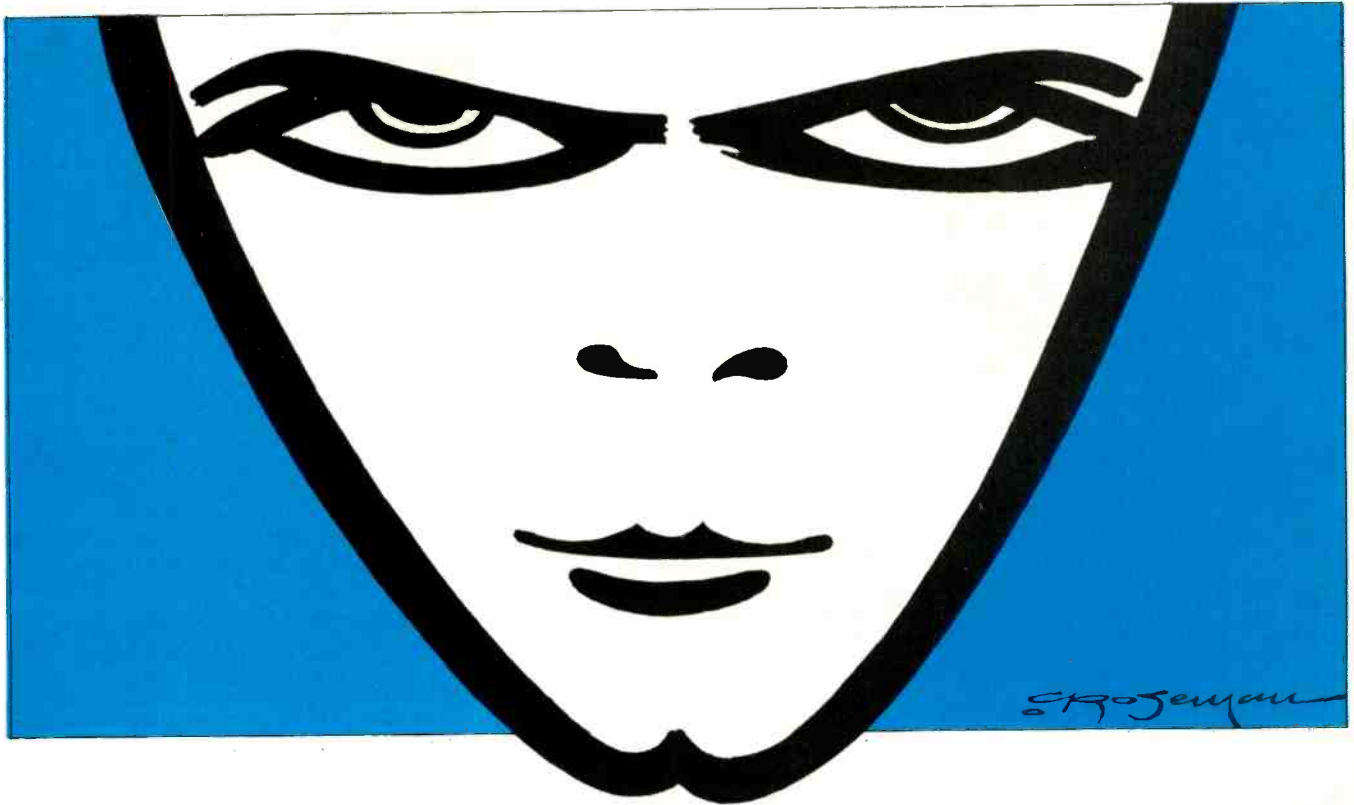
Howard A. Roberson

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Michael Tearson

Jon Tiven

The column



90

Stage: David Bowie
RCA CPL2-2913, stereo, \$13.98.

Stage is one of the best live albums I've ever heard. The band is so polished it's hard to believe that it's playing without much recourse to mixing or overdubs, and Bowie's voice is relaxed, powerful, and expressive. Most groups couldn't sound this good in a normal studio setup, but Bowie's back-up combines technical skill with the vitality of an onstage jam.

In these times of predictable rhythms, it's nice to remind ourselves that there are still artists willing to express themselves with various time signatures. With selections from **The Rise and Fall of Ziggy Stardust**, **Station to Station**, **Low**, **Young Americans**, and **Heroes**, **Stage** presents itself as a miniature oeuvre by a man with brains and a rock orchestra at his command. It's a good anthology for Bowie fans and a clever piece of merchandising that any "rockologist" would be proud to own.

The front sides of both records have the spacey tunes and the flip sides the more upbeat numbers. Although I find that the songs from **Ziggy**, replete with

vocal echoes and sci-fi lyrics, suffer from an acute case of "artsyfartsiness," the excellence of the playing and production propels the tunes. The only bone I have to pick with Bowie concerning the selection on the opening side of this two-record set is the style I'm grateful he's discarded, and I do think his attempt at an Irish accent makes **Star** almost yukable.

There are new guitar and synthesizer effects on *Speed of Life* that give the live version an extra kick. The impressionistic airport noises of *Station to Station* sound better than ever, and if the churchly synthesized organ and horns on *Sense of Doubt* don't make you feel sublime, your spine ain't conducting. Finally *Heroes* boasts an improved mix that allows Bowie's vocal more distinction from his back-up.

In the case of live albums, one should examine the artist's motive in releasing new (or just additional) versions of old songs. Is **Stage** meant to be a commemorative record, an anthology that saves you from buying every record Bowie ever made, or the marketing brainstorm of a lackluster studio musician who comes to life on

stage? Judging from the musical quality of this record and the choice of decidedly non Greatest Hits, Bowie is offering us something somewhat new and as much improved as an exceptional piece of art could be. *Sally Young*

Performance: A

Sound: A

The Reggie Knighton Band
Columbia JC 35286, stereo, \$7.98.

The first album by this Elvis-look-alike may have been a bit too far from the mainstream for some tastes, but it left its mark on this listener. Full of genuine humor, peculiar (but interesting) sounds, and a vocalization guaranteed to bring forth a yuk, Reggie seemed one of the few bright young hopes in the Columbia Records stable. Unfortunately, it appears he hung around the Black Rock all too long.

If you were to tell me that the fellow responsible for a John Lennon parody called *VD Got To Idi* (about the Ugandan cretin) would end up sounding like The Eagles, I would have refused to believe it. Believe it, because his latest record (which has all the superficial marks of a good rock album, like

AUDIO • February 1979

powerful drums and tasty guitar leads) has left the artistry behind. This sounds like the most formulaic bunch of dullards since Styx, and somehow Reggie's wit got lost in the shuffle. Instead, we get *Clone In Love* (a one-line joke that doesn't make it) and *Rock 'n' Roll Alien* (which makes the Mork & Mindy TV show look positively deep by comparison). He may sell a lot of records sounding like everybody else, but who needs records like this?

J.T.

Sound: B Performance: D

Hearts of Stone: Southside Johnny & the Asbury Jukes

Epic JE 35488, stereo, \$7.98.

Southside and the boys are back and in top-flight form on **Hearts of Stone**, their third and best album. Given the crisp and punchy production and catchy songs from Miami Steve VanZandt (Bruce Springsteen's E St. Band guitarist) plus three from Bruce himself, all the band has to do is blow their guts out playing, which they do.

Hearts of Stone is a good-time album. Play it when you feel good. It rocks just for the hell of it. M.T.

Sound: B Performance: B+

Shiny Beast (Bat Chain Puller): Captain Beefheart & The Magic Band
Warner Brothers BSK 3256, stereo, \$7.98.

Talk about your startling reversals, take the case of Captain Beefheart. After a series of distinguished, brilliant, eccentric, and commercially disastrous albums that included **Trout Mask Replica**, **Lick My Decals Off, Baby**, **Spotlight Kid**, and **Clear Spot**, Captain Beefheart and Warner Brothers parted company.

A pair of awful records followed on another label as some whiz-bang producer/manager fellow took over the Captain and tried to work a magic formula. These almost mercifully van-

ished. For if a man must abdicate his vision to move vinyl, can the personal toll be worth it? And what if things are more commercially disastrous than ever?

Fortunately Don Van Vliet, Beefheart's secret identity, returned, got together a new Magic Band (who play like crazy), and whipped together a new hot shot album, to have the title reviewed here. Unfortunately, legal realities snagged the album from ever getting released, and he was cut from the earlier label. Finally (happy ending time), Warner Brothers got interested in resigning Beefheart who updated and newly recorded the hot-shot album, **Shiny Beast (Bat Chain Puller)**.

Was it worth all the grief and delays? You bet. **Shiny Beast** is very possibly the best Beefheart album ever. The new Magic Band is spot on. You feel that producer Pete Johnson and engineer Glen Kolotkin (special mention to Glen) have finally gotten on vinyl the sounds in Van Vliet's head.

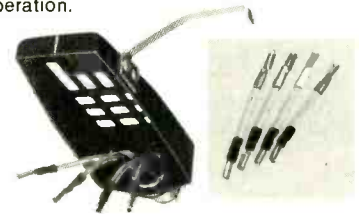
The songs are laced with the humor that has always been in Beefheart's songs, but which time has only enhanced throughout the Captain's canon. *Tropical Hot Dog Night* cooks behind a blazing slide trombone on which Bruce Fowler sounds like a Caribbean trumpet. *Harry Irene* is no less than slapstick comedy. *Apes-Ma* is timeless — "Apes-Ma, your cage isn't getting any bigger, Apes-Ma." Van Vliet's cavernous voice staggers, rumbles, hisses, careens, caresses, even croons. Besides Fowler others in the Band include guitarists Jeff Tepper and Richard Redus along with Eric Feldman on keyboards and Robert Williams drums. Erstwhile magician Art Tripp III adds percussion and marimba to some cuts. If some of it is challenging, even difficult, none of it is anywhere near boring.

A friend posed me the question of whether Captain Beefheart mattered in 1979, but I don't think his question matters. I always admire the survivor/

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individual and Don Van Vliet and Captain Beefheart are in that class. Beefheart is Van Vliet's vision, and **Shiny Beast (Bat Chain Puller)** is the most fully realized and captured piece of it. M.T.

Sound: A- Performance: A

Journey To Addis: Third World Island ILPS 9554, stereo, \$7.98.

Reggae groups aren't often distinguished by instrumental virtuosity, nor is it particularly hip for Jamaican nationals to cover O'Jays tunes. Nevertheless, Third World breaks with tradition and gets a hit in the bargain (*Now That We've Found Love*, the Gamble & Huff tune), and by the way their sound and feel have never been stronger than on **Journey To Addis**. Richie's monstrous bass guitar, Carrot's peculiar percussion, and the very Western sounding electric guitar of a cat named Cat makes the Third World's sound truly distinctive, and

among the most likely contenders for the hearts and minds of Americans whose only contact with this kind of music comes from Eric Clapton, Boney M, and Bob Marley.

The main problem with reggae, in terms of it being translated into something other than a cult music, is that a lot of it seems difficult to dance to. The beat, although reliable, seems erratic because of the way the accents are placed. Americans are simply too well schooled in the ways of KC & the Sunshine Band, The Bee Gees, and Teddy Pendergrass. However, I must add that the barriers are breaking down slowly, and the most recent album by Third World could be more ammunition for the fight. If such is the case, I surrender to the beat, wave my white flag, and burn all my Commodores albums in acquiescence to Third World, praying for more firepower like **Journey To Addis**. J.T.

Sound: A Performance: A

- Kiss: Gene Simmons
- Casablanca NBLP 7120, stereo, \$7.98.
- Kiss: Ace Frehley
- Casablanca NBLP 7121, stereo, \$7.98.
- Kiss: Peter Criss
- Casablanca NBLP 7122, stereo, \$7.98.
- Kiss: Paul Stanley
- Casablanca NBLP 7123, stereo, \$7.98.

Not content to take your \$10.00 for their live two-LP sets, each member of Kiss has recorded a solo album so that they can get \$32.00. To give the consumer some idea of the effort put behind such a four-album release, each Kiss splinter album is being shipped platinum (one million units apiece),

and there's a \$3 million advertising and promotional campaign to back it up. One can only shudder at the thought of four such exceptional musical talents getting any less exposure — where would the world be without the latest Peter Criss album?

After listening intently to the four discs, it is genuinely difficult to come up with something positive to say about any of them. Gene Simmons' is the least objectionable, as he's written one appealing song (*See You Tonite*) on which the Beatlemania boys back him up and he does a John Lennon imitation. He's stolen the first song's



AUDIO • February 1979

title from Roger C. Reale (*RadioActive*), he's gotten some decent people to play on his record (Bob Seger, Cheap Trick's Rick Neilson, Jeff Baxter, and Cher), and still it sounds like heavily reprocessed gunk, as if some old man was asking himself what some young kids could really go for.

It's all downhill from there — Paul Stanley has some command over the riff, but even his friends from Meatloaf and The Rod Stewart Band can't rescue him from total lack of melodic ability. Ace Frehley does *New York Groove* an English hit by Hello, written (and then produced) by Russ Ballard with an arrangement indistinguishable from the original momentarily adding color to an otherwise pallid hard-rock album. As for Peter Dinklage, he's living out his Ringo Starr fantasies by having Vini Poncia as his producer, but by comparison Mr. Starkey is the epitome of rock 'n' roll and musicality. I think it's fairly evident to everyone in the music business that these albums will sell because of what Kiss means to a lot of young kids, but it's unfortunate that the members of the group have so little shame that once they are stripped of their Kiss group identity they have no reservations in demonstrating just how shallow they truly are. I secretly hoped that these albums would be

musically creative and would be attempts of an aesthetic nature; unfortunately, when you've spent the past five years as a burlesque performer, it's a little hard to get any of the makeup off. *J.T.*

Sound: B- Performance: D

Q, Are We Not Men; A, We Are: Devo Warner Brothers BSK 3239, stereo, \$7.98.

The Akron Compilation: Various Artists

Stiff GET #3, stereo, \$7.98.

More Songs About Buildings & Food: Talking Heads

Sire SRK 5058, stereo, \$7.98.

The Bride Stripped Bare: Bryan Ferry Atlantic SD 19205, stereo, \$7.98.

If this be the hope of the future, then all you prospective musicians should forget about taking up guitar and grab a pot or pan and start banging away. These four albums are meant to represent the so-called New Wave, Avant Garde, or Apres-Punk and are certainly no more musical than Johnny Rotten. Punk rock was supposed to take us closer to rock roots, while these performers go in an altogether different direction — allusions have been made to New Wave film-

makers so it would appear that we are dealing with a nonmusical vision. Talking Heads showed promise with their first album as being the logical merger of The Velvet Underground and Disco Music, but unfortunately with Eno as producer they have obscured the crucial rhythm section with silly overdubs that only make David Byrne's vocals seem more postured and difficult to take. Eno also has managed to produce Devo's debut album, which is a similar type of music and is singularly unimpressive. Their self-produced singles of *Mongoloid* and *Satisfaction* were entertaining at the very least, but the rerecorded versions of these tunes shows that Eno may not be the best producer for the group, as he seems to be involved in his own musical stylings and not totally attentive to the artist he's working with. His former compatriot in Roxy Music, Bryan Ferry, might do well by Eno's production, however, as his latest album displays a dangerous turn for the worse. While his last few albums had Ferry's voice advantageously grafted onto Chris Spedding's guitar, the current Ferry is singing out front of a sparse rhythm section, and the result is embarrassing and primarily mundane (with the exception of his rendering of *What Goes On*, written by the late Lou Reed). Last

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and most definitely least is a collection of groups from Devo's homeland (Akron, Ohio) that not only have little to do with one another musically, they most assuredly are not listenable. The cover is scratch 'n sniff, but what is inside really smells. The least they could do is immortalize Hershey, Pennsylvania, with a chocolate cover, but I suppose some people just have as peculiar olfactory tastes as they have auditory ones. J.T.

None of these albums deserves a rating.

Inner Secrets: Santana
Epic FC 35600, stereo, \$7.98.

The 70s is the age of bland, or if you must be euphemistic, fusion music, and Santana is just one of many previously "individual" groups which has submitted its musical vision to the steam roller effect of the contemporary music industry. Santana's new album, **Inner Secrets**, is intended for a disco rather than ethnic or rock audience: Its sound is too innocuous for my taste and if I didn't allow for commercial capitulation, I'd pronounce Carlos deprived of both ethnic funkiness and spiritual viability.

Dealer, a Jim Capaldi tune, gets the LP off to a decent start. The Spanish guitar work in the intro is Carlos' trademark of musical deception — what sounds like an intricate web of notes is really only a few played with flamenco flash. All too soon, however, the song fragments under rapid tempo changes: Rhumba gives way to Mahavishnesque tranquility and then to Woodstock bongo basics. The group does better with a slow ballad like *Life is a Lady*, by Dennis Lambert, where Carlos' guitar produces the tone of a tortured lover more convincing than the notes he plays. Again, the song deteriorates midway when the Santanisms take over in the form of Latin back beat, bongo, and guitar. The most interesting song is *Well All Right*, and its superiority owes to production rather than musicianship — its doubled guitar and vocals make the song an effective number.

Needless to say **Inner Secrets** reveals nothing but the mediocrity to which an artist will stoop for financial security. As an old Santana fan I refuse to believe that Carlos is as spineless or musically stagnant as this LP suggests. However, until the band renounces



Because of this Hackett's album, already diverse, takes on the feel of a sampler of several bands. There is no strong central force evident holding the whole together.

Hackett's material is engaging enough. The instrumental pieces range from Renaissance sounding (the period, not the band) to metal. Several of the songs stand out, *Narnia* and *Racing on A* with Walsh and *How Can I?* with Havens. All three are on side one making it, by far, the more interesting side.

Sonically, the album is absorbing. Hackett makes extensive use of cross-cutting textures and sudden switches. **Please Don't Touch** emerges as a classic example of an album that could only have been made with the new miracle of computer mix-down. The recording is excellent, but a noisy American pressing costs the sound a full grade.

Surer and more optimistic than his first, Steve Hackett is now his own man with **Please Don't Touch**. As for the title, this stuff is, after all, Art, and it always says that in museums, doesn't it? M.T.

Sound: C- Performance: B

Willie and Family Live: Willie Nelson
Columbia KC2 35642, stereo, \$11.98.

A generous two-record concert set that runs over 90 minutes, Willie Nelson's live album is a faithful version of the man and his crackerjack band. If the album merely covers known ground, it is in the hands of a master. With everything he does, Willie Nelson is surer handed than any big league shortstop. Cameo appearances by Emmylou Harris and Johnny Paycheck are added pleasures.

Hey, it's just a real good time of an album I'd rather play than talk about. M.T.

Sound: B Performance: A



Between *Soul Sacrifice* and *Europa* Carlos seems to have exhausted his musical insight; every Santana track since then has been a watered down version of one standard or the other. Unfortunately **Inner Secrets** is his weakest effort yet, despite the reliance on Santana factory techniques of tried-and-true beat, bongos, guitar solo, and breaks in each song. Santana has wandered so far from musical statement into the doldrums of dance muzak that the better tracks on the album could only be those penned by others.

disco, I'll stick with *Black Magic Woman* and leave this record for hustling enthusiasts too young to know from Woodstock. Sally Young

Performance: C Sound: B+

Please Don't Touch: Steve Hackett
Chrysalis Chr 1176, stereo, \$7.98.

With this, his second solo album, Steve Hackett has left Genesis behind him. As Steve is not much of a singer, he has gathered several guest voices to do for him, Kansas' Steve Walsh, Richie Havens, and Randy Crawford.

Top of the pile

The Art of Fuguing: Bach, trans. by Wm. Malloch; Chamber Orch., Lukas Foss cond. Town Hall Records (P.O. Box 5332, Santa Barbara, CA 93108), multi-mike S-20, \$12.98; stereo mike, S-21, \$12.98.

These records represent Town Hall Records' attempt to resolve the multi-mike vs. stereo mike debate (See *Audio*, Nov., 1978). Two simultaneous recordings were made of the same orchestra, one with a single stereo mike (an AKG C-24), the other with over 20 microphones mixed together to create the stereo image. The music is a transcription by the Canadian composer William Malloch of J.S. Bach's *The Art of Fugue* (*Die Kunst der Fuge*). This particular work has always been the subject of controversy among Bach scholars since the work is apparently unfinished and Bach never indicated a particular instrument or group of instruments for this composition. (This has led some scholars to declare that this work is PURE MUSIC and was never intended to be played!) Thus the work is heard today only via someone else's transcription, usually on the organ or string quartet. Mr. Malloch's transcription, however, calls for a modern orchestra of about 40 pieces and includes a large percussion section.

The transcription, on the whole, is an excellent one, requiring virtuoso playing in many sections but it will probably be a bit upsetting to Bach purists, especially in places like *Fugue #8*, where Malloch has inserted snippets of Beethoven, Brahms, Mendelssohn, Tchaikovsky, and Saint-Saens (just to name a few) ala P.D.Q. Bach. Great fun!!

Musical considerations aside, the work provides an excellent showcase for the recording engineers by utilizing every possible orchestral combination and timbre. The resulting recordings make for fascinating listening when the identical selections from each album are played one after the other.

Overall, I prefer the stereo mike version, which is more successful in recreating the sound of the orchestra in the concert hall. The multi-mike version is much less reverberant, so much so that it is hard to believe that these recordings were made at the

same time in the same place. The stereo mike captures the sound of the orchestra as a whole. The multi-mike version, while providing more detail, recreates the orchestra as a group of individuals. The violins, for example, have a uniform section sound with the stereo mike, but sound a bit ragged and out of tune with the multiple mikes.

These records *do not* prove the superiority of one mike technique over another. A change in the mix of the multi-mike version could easily change the sound to closely resemble that of the stereo mike. Similarly, a change in the location or pattern of the stereo mike could result in a totally unacceptable sound. The microphone(s) used on a recording are still not as important as the person using them.

My review pressings were of average quality. Although Townhall Records is a division of Sheffield, these records were not given the super deluxe treatment accorded their direct disc releases. The records aren't bad, but not as great as the regular Sheffields.

An interesting sidenote. The jacket liner notes list Dr. Tom Stockham of Soundstream as part of the recording team on the stereo mike version. This aroused my curiosity since the records are not advertised as being digital recordings. A quick phone call to Town Hall revealed that the recording sessions actually consisted of simultaneous digital (via Soundstream), conventional 24 track, and the two conventional two-track recordings used to produce these records (one for the stereo mike and one for an instant mix of the multi-mike). The people at Town Hall (Sheffield) are to be commended for their experimental zeal. It's not likely they will recover the cost of such a complicated session from the sale of these records. But, it perhaps means we will be seeing some digital recordings from Town Hall in the future.

Charles P. Repka

Multi-Mike Version

Record.:B Pressing:B- Perform.:A+

Stereo Mike Version

Record.:A+ Pressing:B- Perform.:A+

Prokofiev: Cello Sonata Op. 119; Shostakovitch: Cello Sonata Op. 40 Clark-Schuldmann Duo. **Musical Heritage MHS 3828 (mail order: 14 Park Rd., Tinton Falls, N.J. 07724).**

Sonatas for Trumpet. (Jolivet, Stevens, Ibert, B. Hummel, Kennan). James Darling, trumpet, Genevieve Sidoti, pf. **Telarc 5032, \$7.98.**

There are two ways in which "specialty" recordings of this sort can appeal to the general musical listener — and one way in which they do not appeal at all. Who wants to hear trumpet music, or cello music, or harp, guitar, oboe, whatever? Too often only the performers' colleagues in the business, plus sisters and cousins and aunts, and, of course, foundation presidents, symphony trustees, and the like! But not you and me.

The right ways are (1) to surround your special instrument with others, even as far as an orchestra, to add general interest — it works fine. Crystal records, for example, has many such discs. And (2) to do as these two teams do — play beautifully and play interesting music, good for any ear. And, of course, with optimum hi-fi recording. This last is increasingly a thing that small companies do even better than the biggies. Hurrah and hurray!

The cello record from Musical Heritage is fascinating. Harry Clark is a first-rate cellist, the sort who can make his instrument interesting for anybody. He plays expressively, accurately, in tune and in marvelous style; his cello tone as captured here is superb. The piano (wife) is equally proficient, though for my ear she is not quite as good at phrasing and shaping a melodic idea as her husband; even so, the two work together marvelously and the recording of their respective instruments is of top quality on excellent surfaces. None better! The Prokofiev is ; one of those graciously melodic, almost old-fashioned pieces, full of tunes and pleasantly wry harmonies. The Shostakovitch, a middle-early piece (1934) from around the time of the ever-popular *Fifth Symphony*, is one of the composer's best, not yet acid and tired, nor bombastic and overstuffed, still spiced with the sharp humor of the earliest Shostakovitch but full of pleasant melody as well. I really enjoyed it and so should you,

with such a big, lively sound to help.

The trumpet recording is period music, all neo-classic. Good trumpet, and interesting music too. Indeed, as this somewhat derivative music poured forth so expertly along with the expert accompanying piano, I had a curious daydream: I saw a dim stage and in front of it these performers; on the stage were three shadowed figures, to the right, Igor Stravinsky, on the left, Aaron Copland and, in the middle, corpulent and solid, Paul Hindemith. The neo-classic influences! Halsey Stevens' *Trumpet Sonata* caused old Aaron to gyrate and prance a bit on his side, twitching that magnificent nose

— this was *his* music. But Stravinsky, too, could be seen to be beating time hard, with the tip of one little finger; his influence was also easy to hear. And Hindemith sat stolid but benign; Halsey Stevens learned from him as well. The three patron saints of the neo-classic. But when Kent Kennan's *Sonata for Trumpet* began, a violet spot came up and bathed Paul Hindemith in a rosy aura — Hindemith could be seen to bow, and bow, and bow again, as Ken Kennan made his musical points. Pure Hindemith!

Dream or no, all this neo-classic music is good, if derivative, and the sum of it makes an interesting musical pic-

ture of an era that we are now almost ready to rediscover. (Excellent record.)

E.T.C.

Musical Heritage

Sound: A- Recording: A- Surfaces: A

Telarc

Sound: A- Recording: A- Surfaces: A-

Fatha: Earl "Fatha" Hines

M&K Real Time Direct To Disc, RT-105, stereo, \$15.00.

Earl Hines is a jazz performer perfectly suited for direct-to-disc recordings. His hands range the entire length of the piano, extracting its full sound. Yet, he maintains an evenness of performance that makes the engineering of his sessions a relatively stable and predictable affair. For **Fatha**, Hines uses a trio of Red Callender on bass (and I assume he is the uncredited tuba on the opening track), and Bill Douglas on drums.

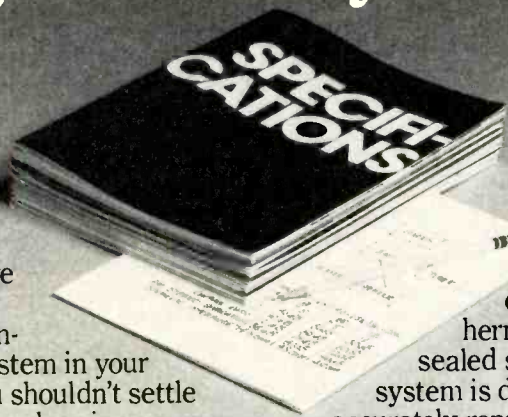
The surface of the record is absolutely clear. There are none of the usual pops and clicks associated with mass-produced records, nor is there even a hint of tape hiss. Of course that's because tape isn't used but it's conspicuous in its absence for those accustomed to ordinary records.

Hines' piano has been miked both for maximum sound pick-up and to spread it across the stereo spectrum. The sound they get is unusually dry and lacking in any of the reverberation or echo normally used in recording. It is the actual sound of the piano in the studio with the natural room dynamics found there. This dryness tends to make the piano overly percussive at times. On Art Tatum's *Humoresque*, the piano sounds like it cracks when he rivets some of those notes on the high end . . . but the dynamic range of the instrument is brought out in a way that is unheard of in traditional recordings.

The bass and drums do not seem to get the same attention as the piano, but they are still heard with a clarity equal to or better than traditional recordings. Both are mixed into the center. The bass has a full-bodied tone but doesn't jump out of the speakers the way Hines does. The same is true of the drums which have a crispness and precise definition of sound but don't kick out quite as hard as live drums will.

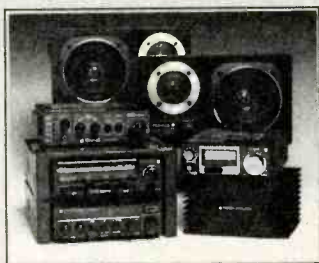
Fatha plays it safe in terms of musical intensity. Hines lends a brisk and light reading to these contemporary and traditional standards. But on the few tunes when things start cooking, as on Horace Silver's *The Preacher* and

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Tatum's *Humoresque*, the percussive demands of Hines' high end tax the recording process almost to its limits. Write M & K Realltime Records, 8719 Wilshire Blvd., Beverly Hills, CA 90211.
John Diliberto

Sound: A- Performance: C+

Gale Maximum Fidelity Recordings.

17th Century Italian Music, Vol. 1: The London Early Music Ensemble, Christopher Hogwood cond. **Gale GMFD 1-76-001**, \$14.95. **J. S. Bach: The Complete Flute Sonatas:** Christopher Taylor, flute; Leslie Pearson, harpsichord, and Dennis Vigay, cello. **Gale GMFD 2-76-002-3**, \$21.95.

Chavez, Serebrier, and Hovhanees: Music For Percussion: Tristan Fry Percussion Ensemble, John Eliot Gardner cond. **Gale GMFD 1-76-004**, \$14.95.

Beethoven: Piano Sonatas Op. 53 "Waldstein" & OP. 57 "Appassionata": Peter Frankl, piano. **Gale GMFD 1-76-005**, \$14.95.

Schumann: "Frauenliebe und Leben," Op. 42; Brahms: "Leider.": Sheila Armstrong, soprano, and Martin Jones, piano. **Gale GMFD 1-76-006**, \$14.95

Nowdays, the majority of classical and popular recordings are made using multitrack tape recorders and a forest of microphones connected through a console and a myraid of electronic gadgets to most, if not all, of the available tape tracks. The final master cutting tape is the product of the balance engineer and the tape editor, and their objective is to make a note-perfect recording of the music, without musician-created noise, with little consideration being given to anything else. However, during the recording process, the tape is often infused with the coloration, distortion, and hiss inherent in all signal-processing equipment.

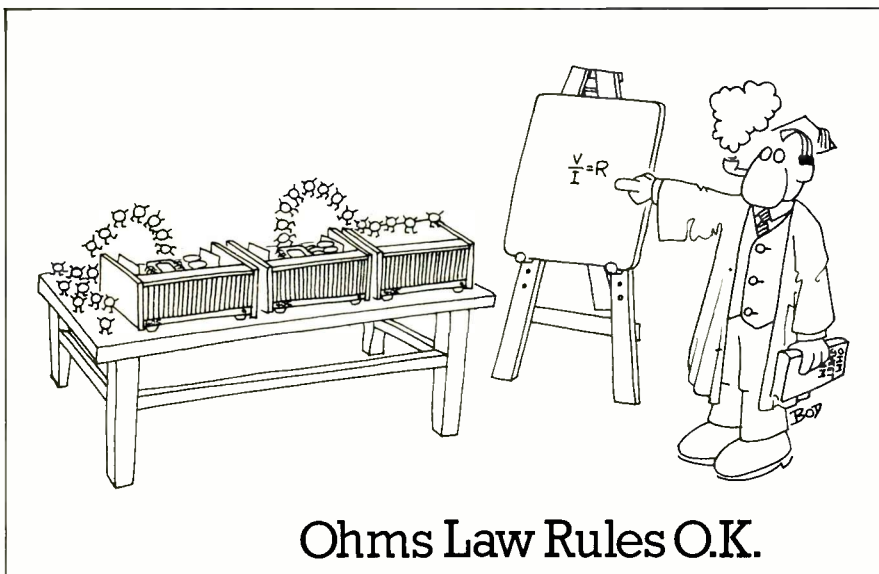
Ira Gale of Gale Maximum Fidelity Recordings reviewed the entire recording process and concluded that most of the recording stages could be eliminated if extra care was used on the remaining mechanical and electronic processes so as to eliminate as much noise, tape hiss, coloration, and distortion as possible. Using only a mixing console, as few microphones as possible, and a custom-designed tape recorder, the performance is recorded on as few tape tracks as are absolutely necessary. After the master tape goes through the balance and editing process, it has become the master cutting tape. This tape is played back on the same tape recorder that was originally used to make the tape, but this time the recorder is used to drive the cut-

ting head. The resultant lacquer and all the remaining steps used to make the final pressing are all handled with the greatest of care so that the finished product is as perfect as possible. Pressing of the Gale records is a hand operation, rather than an automated process, and uses specially formulated PVC. In this process, every record is visually examined prior to packaging. The records are then packed in a sturdy record box to overcome the warp problem believed to be caused by the shrink wrap used to seal record albums in their jackets. Each record weighs about 165 grams (relative to the 110 or so in a normal disc), which also assists in preventing record warp. Checking our copies of the Gale records we were

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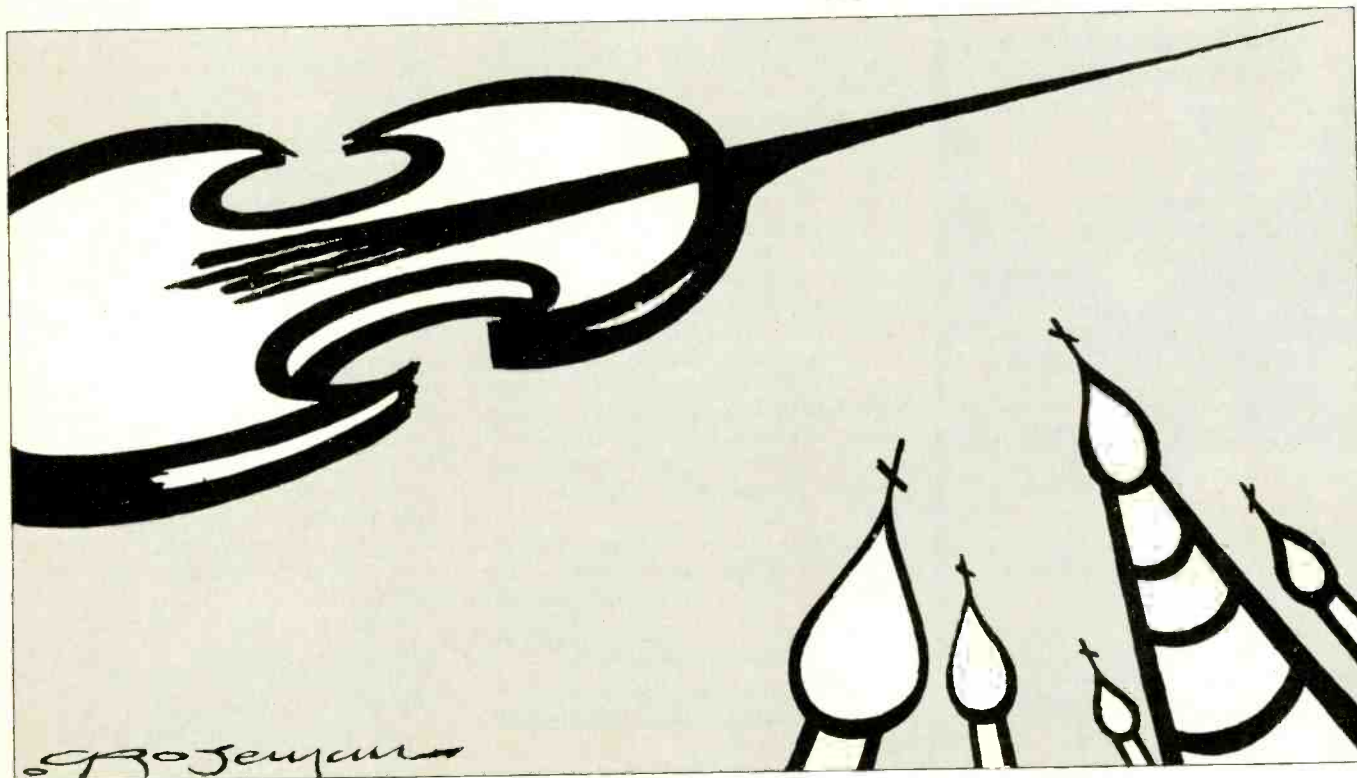
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where the performance (recording) took place, the city, or the recording date. Frequently, the instruments used in a recording are not identified. These recordings are distributed by Audio-Technica and are available at most of the stores handling high-end audio equipment.

Generally speaking, most of the music on these Gale recordings are offerings of esoterica and of relatively limited appeal. The instruments used in the **Seventeenth Century Italian Music** album are actually musical instruments from that era. We've never heard these instruments before and, thus, cannot fully relate to them. There are instances where the instruments sound rather odd. It is assumed that the instruments were properly tuned against the standard pitch used in the 1600s. We consider this record the best in this series. In the **Bach: Complete Flute Sonatas** (two records) the positioning of the instruments is difficult to determine, and they appear to have been placed close together at center stage. It is difficult to sit through the playing of both records at one time unless, perhaps, you are a flautist. The **Music for Percussion** is a noisy recording that gives the impression of being too hollow sounding. The **Serebrier: Symphony for Percussion** is well performed and worth hearing. In the **Beethoven: Piano Sonatas**, the piano is recorded rather well, actually sounding like the Steinway it was, but at times some of the notes appeared to be slightly fuzzy and indistinct. While listening to the **Schumann: Frauenliebe und Leben** as well as the **Brahms: Lieder**, we concluded that the singer, Sheila Armstrong, was not in tremendously good voice that day and she was, at times, difficult to understand.

As a whole, the pressings are very good even though some scratches, finger prints, and few loud pops and other noises were occasionally present. While our set of Gale records are the flattest records we have encountered in more than 25 years, we did detect a subtle rumble that originates on each record, though it was not obtrusive beyond four or five feet from the speakers. The dynamic range is excellent, but because no sound processing equipment was used, the average recording level was necessarily kept below the industry average so as to avoid clipping of the musical peaks. This, in turn, does make the rumble and tape hiss more noticeable. The perspectives are not always real due to the close-miking technique used in making these recordings. Also, the transient response is not as good as we have experienced from other audiophile recordings.

Folk bag



Ukrainian-American Fiddle & Dance Music, Volumes 1 and 2

Folklyric 9014, 9015, mono, \$6.98 each.

Most Ukrainian-language radio programs I've encountered are dominated by large, dour choruses singing artsy arrangements of doleful folk songs. To an outsider, this can be quite fascinating in small doses. But before long, one wonders if all Ukrainian music is so utterly lacking in color, rhythm, and spirit.

No, it isn't, as demonstrated in this tremendous collection of 78s recorded between 1926 and 1936. Volume One gets off to a rousing start with two *kolomyikas* (the most popular Ukrainian dance form) by the legendary Pawlo Humeniuk. Humeniuk was undoubtedly the most famous Ukrainian-American folk musician of his day, an exciting fiddler with a contagiously whirling style which spread his fame far beyond the Ukrainian-American community. On these two albums, Humeniuk is supported by small groups (featuring a booming bass drum), playing with such infectious *joie de vivre*, it's impossible not to get caught up in the music's rhythmic tunefulness.

Volume one also contains his two-part hit, *Ukrainske Wesilie*, depicting the sounds and happenings of an old-country wedding through singing, dialogue, and Humeniuk's fervid fiddling. Side two, band four, omitted from the cover title listing, is a Humeniuk oberek which I recognize from my childhood as a Polish favorite, illustrating the musical interaction between these neighboring countries.

Volume two opens with Humeniuk's *Oj, Pidu Ja Szicher Wicher*, a Yiddish favorite recently revived by the Klezmerim as *Yoshke, Yoshke*. The two-part *Chrestyny* ("Christening") is, perhaps, a natural followup to his wedding medley and follows the same format.

There's much more to these two records than Pawlo Humeniuk, though. Volume one includes singer Theodor Swystun's polished, yet exhilarating *Yac Poidu Z Kinmy Na Nicz*, with rollicking instrumental breaks played by flute, fiddle, bass, and jingle bells. Also noteworthy is the raw, highly impassioned old-time fiddling of Josef Pizio.

Volume two has a music-box-like solo on the *tsymbaly* (the Ukrainian version of the Hungarian cimbalon),

Koketka Polka by John Grychak, which isn't too far removed from American hammered dulcimer music. Two cuts by Orch. Bratia Holutiaky-Kuziany, featuring a clarinet lead, have a distinct Polish flavor. Josef Davidenko's *Kozak* is a lilting tune played, I believe, on the *bandura* (though I've only heard the stringed instrument in ensembles before).

Both volumes are rounded out by a fine assortment of waltzes, *kolomyikas*, polkas, *kozaks* ("cossack dances"), and other dance tunes, by small combos featuring fiddles and *tsymbalys*.

Sound quality is fair enough, considering the originals were hardly of the highest fidelity. Side one of Volume 2 was marred by a loud, regular crunch and assorted static. *Tom Bingham*

Performance: A

Directions: Norman Blake
Takoma D-1064, stereo, \$7.98.

The second Norman and Nancy Blake release in recent months, this album repeats the same kind of mixture

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of traditional Southern tunes and original Norman Blake compositions which made **Blackberry Blossom** (Flying Fish 047) so distinctively theirs. Highlights include a flowing *Blue Ridge Mountain Blues*, with Norman's bluegrass-influenced vocals pitching it just right, and a spinning medley of *Loch Lavan Castle/Santa Ana's Retreat/Cattle in the Cane*, which features Norman on mandolin and Nancy on guitar. A multi-tracked *Uncle Sam* — Norman's *Sam Stone* song — features Miles Anderson on a variety of horns — three kinds of trombone and a bass trumpet. There are also a number of tunes with Norman backed by Nancy on the cello which has become such a prominent part of their stage performance over the past two or three years. What you think of his interesting album depends on whether you like the chamber-music feelings called up by this combination — it was a part of early Grand Ole Opry shows — or whether you'd rather hear Norman's dazzling finger-work by itself.

Available from Takoma Records, P.O. Box 5369, Santa Monica, CA 90405. *John McLaughlin*

Sound: B+ Performance: B+

The ABC Collection: Mac Wiseman **ABC AC-30033/2**, stereo, two records, \$5.98.

Mac Wiseman Sings Gordon Lightfoot **CMH 6217**, stereo, \$6.98.

The ABC Collection consists of two of Mac Wiseman's many albums for the now-defunct Dot label.

The first two sides apparently date from the mid-50s, unquestionably Wiseman's "Golden Era." The first three songs, casting Wiseman in the unaccustomed role of group singer, reflect his formative association with Bill Monroe much more than any of his later recordings do. Indeed, with Wiseman's intense, throaty vocals, excellent material *I'm a Stranger, You're the Girl Of My Dreams*, and *Don't Blame It All On Me* stand out), and top-notch instrumental backing (spotlighting twin fiddles), these two sides rank among the most essential examples of classic 50s bluegrass now available.

Sides 3 and 4, with backing by no less than the Osborne Brothers, were probably recorded in the early 60s. This session is more relaxed, less staunchly traditional than the first two sides. After opening with three standards, the focus shifts to worthwhile unknown songs. *This Is Where I Came In* sounds like it's done by a forerunner of the Seldom Scene. *Don't Make Me Go to Bed And I'll Be Good and New Black Hat* are the type of super-

maudlin songs few people can handle as believably as Mac Wiseman. Also worth mentioning are *The Bluebirds Are Singing For Me*, featuring the chiming tenor of Bobby Osborne; and the honky-tonkin' *How Lonely Can You Get*, written by one Rusty Nail!

The notes claim "Sides 1 and 2 are issued in their original mono form," those irritating echoes coming out of the right channel tell me otherwise. Sides 3 and 4 are true stereo, and quite good at that.

Mac Wiseman Sings Gordon Lightfoot looks like a stroke of genius on paper. After all, Lightfoot's folk-rooted songs should need little adjustment for bluegrass, while Wiseman has a much broader scope and versatility than most bluegrass singers. Alas, the merger doesn't come off.

The album gets off to a promising start with easy-going country-rock treatment of *Did She Mention My Name?* Unfortunately, the vital fusion of song, arrangement, and voice that marks this cut is rarely matched on the rest of the album and approached only on the best-known songs (*For Lovin' Me, Ribbon of Darkness, Early Morning Rain*).

Producer Arthur Smith tries to go after the bluegrass, country, and "contemporary" audiences all at once, this giving the arrangements a cliched, hodge-podgy clutter. Moreover, Wiseman is nowhere near his top form — not only is his voice overly scratchy, his vocals too often sound like uncommitted runthroughs rather than fully-formed interpretations. Definitely a disappointment. *Tom Bingham*

ABC Collection

Sound: C- to B Performance: A

Sings Gordon Lightfoot

Sound: B- Performance: C+

Stefan Grossman & John Renbourn **Kicking Mule KM 152**, stereo, \$7.98.

This is a somewhat historic meeting on vinyl between two superb guitarists. John Renbourn is best known for his work as part of Pentangle, while Stefan Grossman is an American expatriate who has also been a prolific recording artist with several excellent instruction albums, as well as purely musical ones, and a founder of Kicking Mule Records. On the album Grossman most often plays electric guitar to Renbourn's acoustic. Karl Dallas' liner notes make it clear who solos when, and who improvises over whose basic part and where.

Little more than "it works" and "ex-

quisite musicianship" need be said about this album. The rapport of the musicians is excellent, and the recording is up to the label's usual good standards.

Michael Tearson

Sound: B+

Performance: A-

Old Time Songs: Vernon Dalhart
Davis Unlimited DU 33030, mono, \$4.50.

The name Vernon Dalhart may not mean much today, but in the three years between 1924 and the simultaneous emergence of the Carter Family and Jimmie Rodgers, Dalhart almost single-handedly transformed country music from a regional idiom into an international phenomenon.

Dalhart's sales figures are astounding even in this age of platinum albums. It is estimated that his versions of *The Prisoner's Song* and *The Wreck of the Old 97* sold over 30 million 78s. His total sales reached over 75 million. Interestingly enough, Dalhart began his recording career in 1915 as a light-classical and pop singer, enjoying several years of success before reverting to his rural roots (and then only because his early popularity had run its course). It's largely for this reason that,

despite his role as country music's first superstar, both the present-day Nashville establishment and the "old-time music" audience find it convenient to ignore him. **Old Time Songs** is the first-ever reissue album devoted to this important figure's pioneering efforts.

Dalhart sang in a clear, polished, sincere, and expressive voice which betrays his conservatory training and professional background. Yet he retained enough of his Texas-ranch upbringing to enable him to loosen up on novelties like *Zeb Turney's Gal*, the minstrel-like *My Blue Ridge Mountain Home*, and Uncle Dave Macon's *On the Dixie Bee Line*. Unfortunately, Dalhart wasn't averse to spreading on an exaggerated pseudo-hillbilly accent which sounds rather ludicrous today ("Oh, ah wee-ish ah hay-ed suhmm-one to love me"). The modern listener learns to adjust to this before long.

The subject matter of Dalhart's songs reflected the Southern-rural concerns of the day. In other words, he sang of train wrecks (*Old 97*, *Billy Richardson's Last Ride*) and other tragedies (*Death of Floyd Collins*, heard here as both a straight vocal and a lovely, mostly instrumental waltz), dying mothers, (*Letter Edged In Black*), outlaws (*Frank Dupree*, *Kinnie*

Wagner, reminders of the days when country-music outlaws carried guns, not guitars!), and the like.

Accompaniment was provided by a sweet-toned fiddle (Murray Kellner or Adelyne Hood), simple, yet effective guitar strumming (Carson Robinson, who wrote much of Dalhart's material), Dalhart's own harmonica, whistling, and jew's harp, and an occasional additional instrument (such as John Cali's banjo, plus what I believe is an English horn on *Little Rosewood Casket*). Their style wasn't exactly straight-from-the-mountains, which may explain why Dalhart found it easy to cross cultural and geographical barriers; still, it was a close enough approximation to have appeal for rural listeners until the "real thing" became better distributed. It may sound quaint on first hearing, but it complements Dalhart's singing perfectly.

The original recordings were surprisingly clear, though the amount and variety of surface noise differs considerably from track to track. Write to Davis Unlimited Records, Route 7, Box 205-A, Clarksville, TN 37040.

Tom Bingham

Performance: A-

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Jazz & blues



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Early Roots: Roland Kirk
Bethlehem BCP 6016, stereo, \$7.98.

The late Roland Kirk developed a remarkable ability to improvise on three-reed instruments simultaneously. He did this by using a circular breathing technique that allowed him to play on one seamless breath for periods as long as a half hour. While such instrumental athleticism might strike some as mere gimmickry, the blind modern jazz sax virtuoso was a highly creative player-composer with a passionate commitment to his music. As Kirk grew in stature and refined his technique, his recordings took on an increasing presence and forcefulness. His pungent ensemble voicings showed a strong Mingus influence, and, like Mingus, his tautly controlled instrumental sketches often built to peaks of jolting excitement.

This is an excellent Bethlehem reissue of Kirk's first LP recording cut in 1956 for King, a Cincinnati-based R&B label later absorbed by the recently revived Bethlehem catalog. On **Early Roots**, one hears Kirk at age 20, playing only two horns at a time — the alto-like stritch and the manzello (a

reed instrument in the soprano sax range used in Spanish *Paso Doble* bands). Kirk also stretches out solidly with some tough tenor rides backed by a solid rhythm with James Madison's crisp piano breaks particularly outstanding.

The Bethlehem LP is a fine documentation of the birth of a powerful new voice in modern jazz. In those early years, Kirk had not completely perfected his multi-instrumental technique, and, on two cuts, *Stormy Weather* and *The Nearness of You*, Kirk uses overdubbing (playing his tenor in tasty counterpoint to his work on the stritch). The monaural sound has splendid clarity and definition, and Dan Morgenstern's liner notes are comprehensive and informative.

John Lissner

Performance: A-

Sound: A

The Vibration Continues: Rahsaan Roland Kirk
Atlantic SD2-1003, stereo, \$10.98.

This double record set covers 1968-1976, Rahsaan Roland Kirk's best, most

productive period. I might quibble about some of the selections included and some omitted, but it has a lot of Kirk's best stuff. It gives at least glimpses of many sides of this curious and complex man.

Rahsaan Roland Kirk was a joy to watch in performance, decked on all sides by woodwinds of all sorts and shapes, many held together only by tape. Blind since early boyhood, a story related by his classic *The Inflated Tear*, he had a special intensity and humor. With words, as with musical notes, he could make the language jump through hoops.

The Vibration Continues is an apt name for a fine retrospective collection.

Michael Tearson

Sound: B

Presentation: A-

Modern Man: Stanley Clarke
Nemperor JZ 35303, stereo, \$7.98.

Chick Corea's Return to Forever crew has certainly been dishing out the cosmic slop lately. First Chick comes out with his flimsy musical fantasy, **The Mad Hatter**, followed closely

AUDIO • February 1979

by drummer Lenny White's macho science-fiction tale, **Adventures of the Astral Pirates**. Only some solid music saved the puerile story it was surrounding.

Now bassist Stanley Clarke renders his musical tribute to those "space warriors" who have "fought for freedom . . . but now choose the sound of the plucked string." These guys are giving science fiction a bad name. Their concept of galactic tranquility is to add a good dose of pretentiousness to the old "moon in June" love lyrics and let a few pseudo-space synthesizer gurgles handle the rest.

It's a shame that Stanley has chosen to bury his vast talents in this mush. His tunes meander between AWB-styled funk and grandiose fanfares that lend his virtuosity to empty intellectual exercises. In his bid for stardom he has even abandoned the successful, if contrived formula of **School Days** which brought him high into the charts. The one cut on **Modern Man** which approaches anything on **School Days** for inspiration seems to be a leftover from those sessions. **Rock 'N' Roll Jelly** features Jeff Beck's scintillating guitar work in an invigorating tune that proves that Carmine Appice can't play funk drums even when he wants to.

Modern Man is a heavily produced opus designed for immediate flash impact. The bass is mixed in high along with the drums, both of which kick annoyingly throughout the disc. It's all recorded with a gleam that is as untouchable as it is unnatural.

John Diliberto

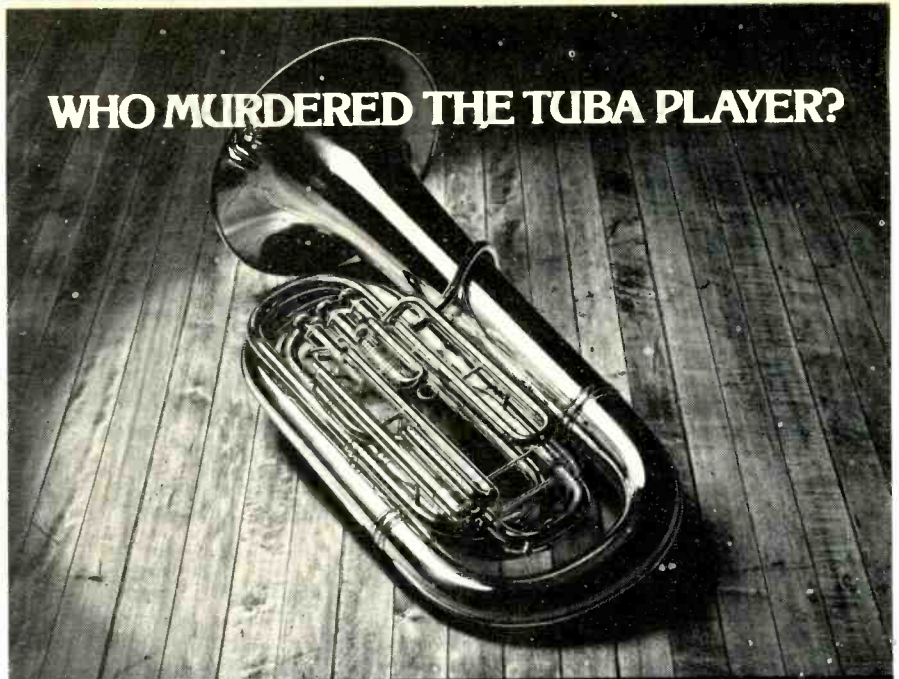
Sound: B

Performance: C-

Live and Burning: Son Seals
Alligator AL 4712, stereo, \$7.98.

You used to have to travel into the rougher parts of Chicago to hear the kind of stunning electric blues that its fans always insisted typified the music at its best. Now all you have to do to hear this decade's most consistently exciting electric bluesman in concert in a Chicago club is pick up a copy of Son Seals' **Live and Burning**. The record lacks the fidelity of Alligator's studio efforts, but it's a textbook example of how to properly record the blues in a club, which has always been this genre's natural setting. The set's been skillfully edited so that the songs flow right into each other for maximum overall impact, just as they do when Son performs, and that helps approximate the feverish pitch of his live performances.

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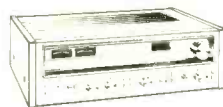
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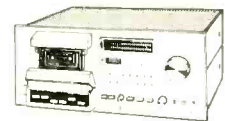
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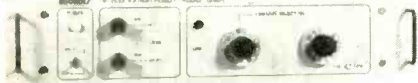
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The superb live album features material that Son hasn't waxed before, with the excusable exception of his signature go-for-broke guitar rave-up, *Hot Sauce*. The disc also marks the first time that Son has relied heavily on songs by anyone but himself. *I Can't Hold Out*, the Elmore James classic, starts off the set, and while Son's version isn't as screamingly frantic as the original, it ably captures the latter's exhilarating energy and sense of hopeful expectation. As with any blues master, the strength of Son's stylistic stamp is such that his versions of tunes associated with Jimmy Reed, Little Walter, Lowell Fulson, and B.B. King stand distinctly apart from both the original recordings and the myriad interpretations of them. The remainder of the tunes are blues potently brewed with a dollop of soul music and urban funk, a mixture that's Son's specialty.

Live and Burning is bursting with the feeling and skill Son pours into his live work that's often overlooked in light of his overwhelming combination of machine gunned notes and controlled distortion. While Son, a young 36, lacks the depth of some of the Chicago's grand old men of the guitar, his playing has matured since his 1973 debut album without losing any of its bite and intensity.

If you have the least interest in the blues and where it's headed, you owe it to yourself to hear **Live and Burning**.

Roy Greenberg

ate themselves in your mind. The other horn is European trumpeter Manfred Schoof. He plays with a stifled energy that's bursting to get out, but Schoof keeps it under control with brilliant flurries and strained eerie whines.

Waldron himself drives the unit with a rhythmic style on which he builds sparse, stark solos of strong emotional power and depth. He ties together his rhythm team of Jimmy Woode on bass and Makaya Ntshoko. Woode is a fine accompanist and one of the few able to complement the wanderings of Steve Lacy. Ntshoko is the only weak point of the group as he tends to overplay the rhythms, as in the bittersweet ballad, *The Seagulls of Kristiansund*.

One-Upmanship is one of the most exciting records I've heard recently. Waldron composes music which maintains an inner pulse of earthiness, no matter how far out it gets.

John Diliberto

Sound: B

Performance: A

Milt Jackson at the Kosie Nenkin Pablo Live 2620 103, stereo, \$7.98.

Pablo Live's double-set encompasses a concert recorded in Tokyo; the music is in the best tradition of what might now be called mainstream modern jazz. The musicians are all outstanding — the underrated tenor Teddy Edwards; Cedar Walton, heard on both acoustic and electric piano; together with bassist Ray Brown, drummer Billy Higgins, and, of course, Bags — Milt Jackson — one of the most accomplished players in jazz (with all due respect to Lionel Hampton, Jackson is today's vibes master). Bags (to quote from Benny Green's liner notes) combines "a straightforward, uncomplicated approach with the most devious and baroque manners of execution."

This is no jam session, rather, it is the work of a group cooperating like a band, playing arrangements that have obviously been organized amongst themselves. The tunes range from modern jazz standards (Miles' *All Blues*, Sonny Rollins' *St. Thomas*, Oliver Nelson's *Stolen Moments*, and Benny Golson's *Killer Joe*) through such pre-World War II items as Vincent Youman's *Get Happy* and Will Hudson's *Organ Grinder's Swing*. The atmosphere is enthusiastic without being frantic, and the solos have authority and style.

John Lissner

Sound: B

Performance: A-

Sound: C+

Performance: A

One-Upmanship: Mal Waldron Inner City IC 3010, stereo, \$7.98.

Mal Waldron has been an underrated, though vital force in jazz for many years, going back to the days when he accompanied Billie Holiday. With his feet planted in blues and bop, Waldron has not become stagnant but continued to grow over the years. Even at his most experimental, Waldron brings a surety born of his firm mastery. In recent years he has recorded albums that span from solo blues recitals to ecstatic wailing. On **One-Upmanship** he forges in a style that's becoming known as "avant-bop." Waldron swings with upbeat tunes and a consistent, if volatile pulse, interspersed with solos that disregard meter and completely free sections.

For this recording Waldron has obtained two horn men who helped in an earlier exploration of "avant-bop" on Waldron's *Hard Talk* album. Steve Lacy's soprano has seen a lot of wax in recent months, and again he proves what a unique individual stylist he is. Lacy's pleading, winding lines insinu-

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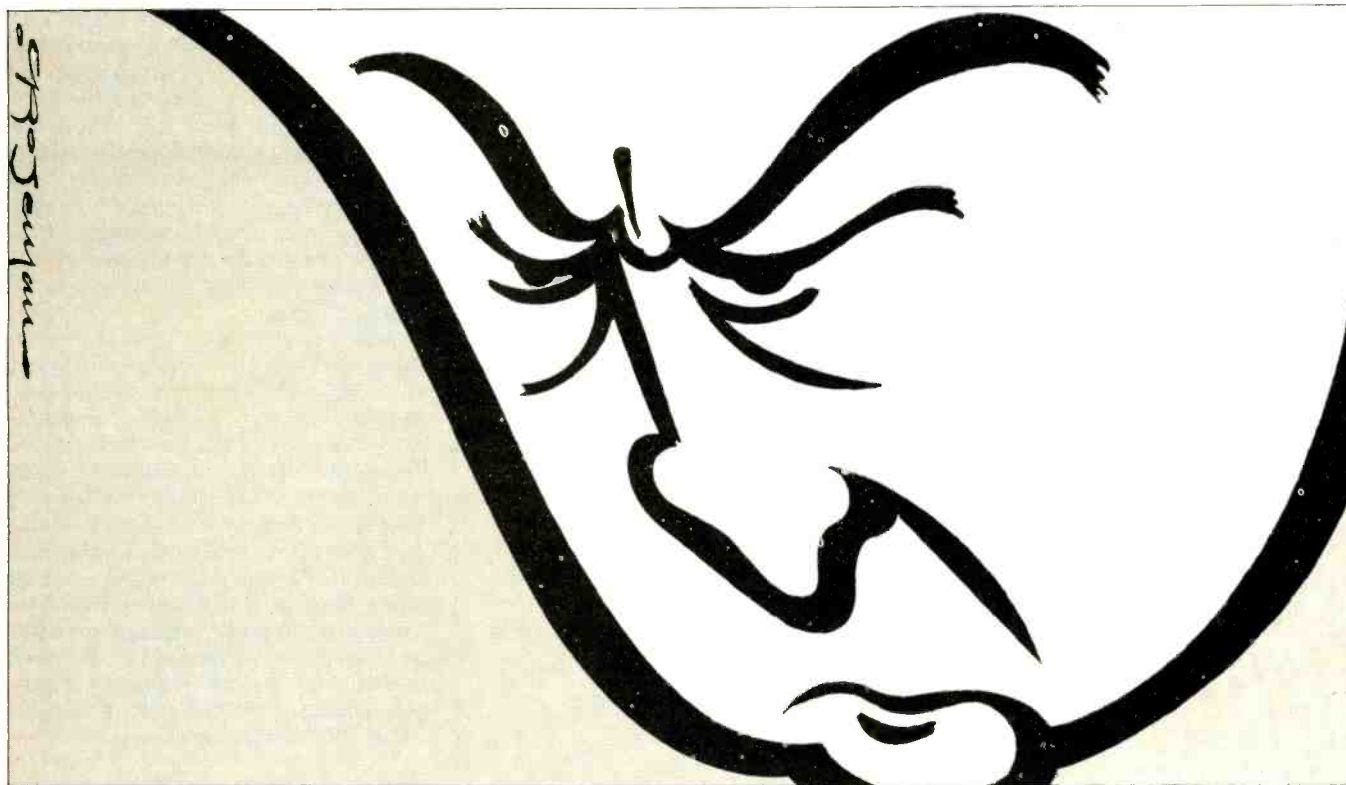
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Classical reviews

Edward Tatnall Canby



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Boulez Conducts Varèse: Amériques, Arcana, Ionisation. New York Philharmonic. **Columbia M 34552**, stereo/quadrasonic, \$7.98.

This must have been one of the last of the domestic-made SQ discs, and how tiny is the little square on the album rear that acknowledges the same! The SQ coding will do your stereo no harm at all, and might even provide some thrills for four channels, if you have them as I do. It's a splendid record in the sound, any way you play it, enough to stop anybody cold. You never heard music, *you never heard sound*, like this before.

We all have got to know Varèse as the indomitable modernist and forerunner of electronic music, but due to expense we mostly hear his littler works. They are impressive enough — but here, uniquely, thanks to the indomitable Boulez, now departed, we have two of the huge works, for enormous orchestra, too expensive to hear under ordinary circumstances. Where else could it have happened?

I suppose half the Philharmonic audience walked out of these live performances, but *you* won't in your living room. Varèse is surely the most dissonant composer of all time — such in-

credibly biting, acid, screeching, booming sound textures you will never hear anywhere else, to fascinate and astonish any hi-fi man! This is what a real musician can do with sound itself — *organized* sound as Varèse later called it.

The big works are in fact by now elderly, *Amériques* from just after the composer's arrival in the U.S. in 1915, *Arcana* from 1925. At this late date you will be amused at the now easily audible influence of Stravinsky's *Le sacre*, not to mention Ravel and Debussy (*La Mer*) — but then, Varèse was a Frenchman, so why not? Dissonant as it is, this is music very much of its period, a mere half century or so back. Phew! Magnificently performed and recorded, too.

Sound: A- Recording: A- Surfaces: B

Aram Khachaturian/Piano Music. David Dubal. **Genesis GS 1062**, stereo, \$6.98.

David Dubal must surely be of Armenian descent, like Khachaturian himself — he seems to have an easy affinity for this piano music out of the Soviet Union, an interesting diversion after the usual and too familiar orches-

tral works including the perpetual *Gayne Sword Dance*, now being heard as a pop piece. And the *Piano Concerto*, the *Violin Concerto* . . . he is a well played composer. I began to think I really liked some of this more rigorous, less flashy piano music. The man is no slouch, and neither is David Dubal. Nice touches of the East throughout, well turned.

A big, full piano sound, just dry enough to suit the relatively modern music, very natural. I liked it. But the usual problem — just barely so-so surfaces, with ticks. Better try yours.

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

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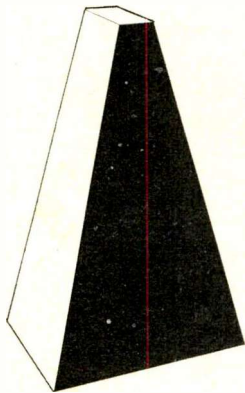
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ius works, easily the equal of the (much more expensive) Colin Davis sequence and in some ways better in the interpretation.

Neither of these, nor most other neo-Sibelius recordings — he is happily undergoing a revival — quite gets the real tensions and sense of this late Romantic music, so full of unsuspected modernisms. I was brought up on the originals, back when the old man himself was still alive, and I think my memory knows; much is now lost in telling detail, via overlooking, via wrong emphasis, via miscast drama, the "build-up" and loosening of tension not well calculated. Sibelius has more than you might think, if only he is played *right*.

Well, almost right. Abravanel is no neophyte and his Utah performers have learned from him. Mostly, the tensions are well done. But every so often there is — to me — an unaccountable lapse, a flubbed Great Moment, a muffed effect. No worse than other current jobs! It isn't easy to go back several generations, pick up a tradition that for years was moribund while Sibelius was "Out of Fashion." The rather distant Vanguard sound is as steadfastly satisfactory as ever, which helps no end. A bargain, unless you want to play a batch of ancient 78s to find how it once was done.

Sound: B+ Recording: B Surfaces: B+

Gentleman Gypsy. Vincent P. Skowronski, vl., Donald Isaak, pf.
Eb-Sko Productions ES 1004, stereo, \$7.98.

Sometimes reviewers (and editors) really get it in the neck. Here is an excellent record — and I say so in spite of the Eb-Sko team, husband and wife (she is a singer), who have the Latest Ideas on Publicity, such as calling upon us in person, telephoning long distance to one's home retreat, or sending demanding letters — you name it. Nevertheless, a reviewer is in business to judge records for their intrinsic worth, and this indeed is a good one and highly recommended.

Vincent Skowronski seems to have found his *métier* as gentleman gypsy — and, good Delaware/New Englander that I am, I have always had a soft spot in my ear and heart for gypsy music. To be sure, this is the classicized version of that notable art, following after such as Brahms and Liszt, the music of Bartók, Ravel, and Szymanowski. But the line between pop and classical grows exceedingly thin in gypsy-based music, and this violinist, very simply, has the knack, the gypsy knack, wherever he may have learned

AUDIO • February 1979

it. He has found, too, a pianist who is as good as himself at the same time, Donald Isaak, and they make an excellent team, beautifully recorded as well, with ideal balance between the two instruments.

The disc begins with the well-known Bartók *Rhapsody No. 1*, in two sections, followed by the rarely heard *Tzigane* (Gypsy Piece) of Ravel, one of the toughest bits of violinistic interpretation anywhere — almost all of it a gypsy candenza for the violin alone. Excellent! This man is much more comfortable in the music than, say, the famed Joseph Szigeti, a Hungarian to begin with, who recorded it years ago. Side two, back to Bartók, gives us the tuneful *Rumanian Dances* (would that all Hungarians had the political objectivity that Bartók had!) and then, right in the same spirit, two gypsyish pieces by Szymanowski, who is about as *echt* gypsy as the other two composers, not to mention Brahms and Liszt. No matter — this gypsy business is catchy among the musical minded, and that could include you too:

Sound: B+ Recording: A- Surface: B

Schubert: Sonata in C Minor, Op. Posth.; Impromptu in G Flat, Op. 90, No. 3. Ruth Geiger, piano. **Critics Choice CC 1709**, stereo, (1697 Broadway, New York, N.Y. 10019).

There are many more flamboyant Viennese-born pianists than Ruth Geiger, who now lives in New York, but not any are better at Schubert, though perhaps different to a Viennese degree. You will not go wrong if you try this tough, difficult late Schubert in her discerning and understanding version. It is a terror for the performer — not the mere finger work but, rather, the sense of the huge thing, and that sense all too often eludes even the greatest of celebrity pianists. Not Geiger. She has it all under control, in the “heavenly lengths” of Schumann’s description. She plays it so you know what Schubert had in mind, especially those astonishing harmonies, changes of key, never more complex than in this work, one of so many that never were heard at all until long after the composer’s death. Not outside of the tiny Schubert circle of friends, anyhow.

The recording is clean enough but a bit on the dry side. A warmer, slightly more distant sound would have been more appropriate for this music, I’d say.

Sound: B+ Recording: B- Surfaces: B

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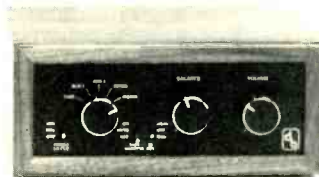
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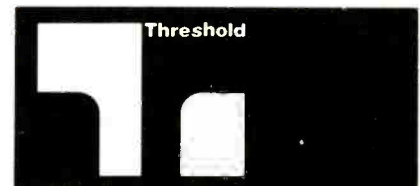
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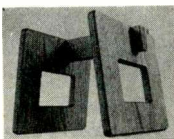
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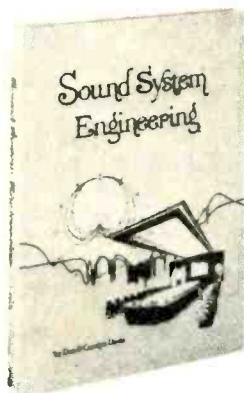
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