

# Audio

THE AUTHORITATIVE MAGAZINE ABOUT HIGH FIDELITY • APRIL 1974 75¢ ©  
47425

## Lirpa Student Discovers Mono

Tape  
Them

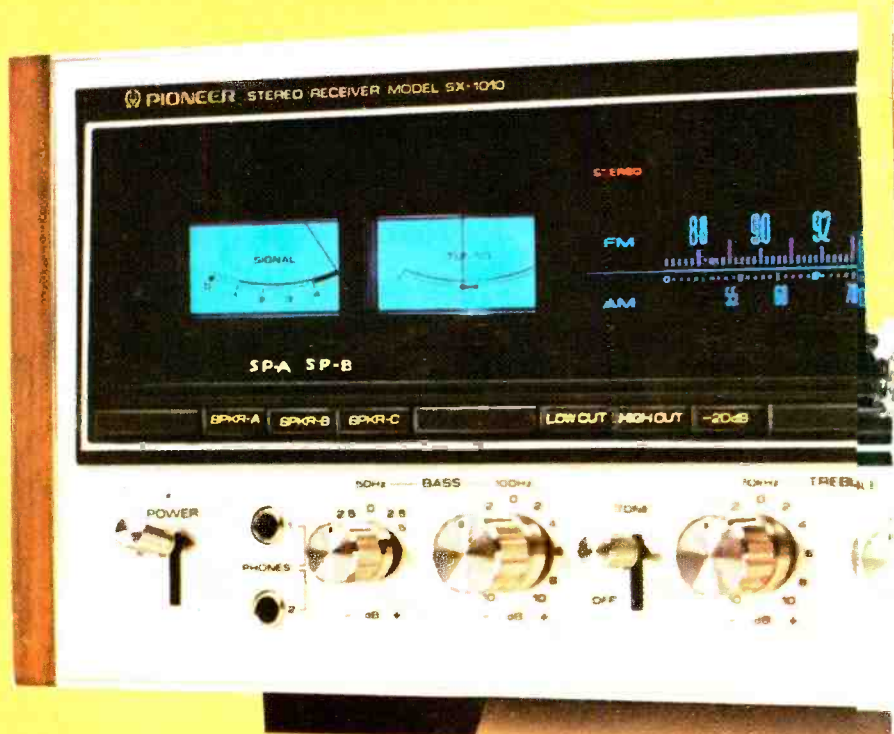
Rx for  
18S--

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MR WILLIAM W KAYSER  
424 E GILPIN AVE  
NORFOLK VA 23503



Jim Wilson

# There can be only one best.





**3,025 possible tonal compensations with unique twin stepped tone controls (SX-1010, SX-939)**

Selector that permits FM recording while listening to records and vice versa. Up to three pairs of speakers may be connected to each model.

INPUTS	SX-1010	SX-939	SX-838
Tape monitor/4-ch. adaptor	3	2	2
Phono	2	2	2
Microphone	2	2	1
Auxiliary	1	1	1
Noise reduction	1	1	1
OUTPUTS			
Speakers	3	3	3
Tape Rec./4-ch. adaptor	3	2	2
Headsets	2	2	1
Noise reduction	1	1	1
4-channel MPX	1	1	1

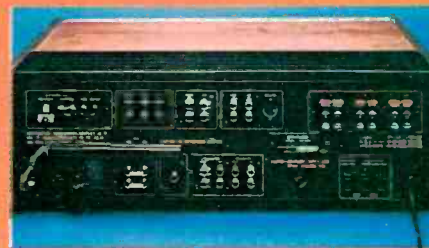
**Master control system capability**

Pioneer's engineers have surpassed themselves with a combination of control features never before found in a single receiver. All three units include: pushbutton function selection with illuminated readouts on the

ultra wide tuning dial, FM and audio muting, loudness contour, hi/low filters, dual tuning meters and a dial dimmer.

Never before used on a receiver are the twin stepped bass and treble tone controls found on the SX-1010 and SX-939. They offer over 3,000 tonal variations. A tone defeat switch provides flat response instantly throughout the audio spectrum. The SX-838 features switched turnover bass and treble controls for more precise tonal compensation for room acoustics and other program source characteristics.

In their respective price ranges, these are unquestionably the finest values in stereo receivers the world has ever known. Audition their uniqueness at your Pioneer dealer.



**Maximum input/output capability (SX-1010 shown)**

SX-1010 — \$699.95; SX-939 — \$599.95, SX-838 — \$499.95. Prices include walnut cabinets.

In addition to these new units, Pioneer offers three equally outstanding receiver values at more modest prices. SX-626 (\$339.95), SX-525 (\$259.95) and SX-424 (\$199.95), with walnut cabinets.

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Send 25¢ and a self-addressed stamped envelope for our Technical Bulletin *Clean Records and Chemistry*, to find out what's happening to your records today.  
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# Audio

APRIL 1974

Successor to **RADIO** Est. 1917

Vol. 58, No. 4

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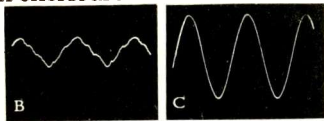
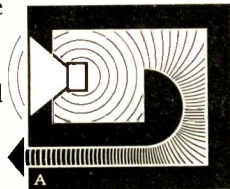
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# Now BIC VENTURI™ puts to rest some of the fables, fairytales, folklore, hearsay and humbug about speakers.

## Fable

*Extended bass with low distortion requires a big cabinet.*

Some conventional designs are relatively efficient, but are large. Others are small, capable of good bass response, but extremely inefficient. The principle of the BIC VENTURI systems (pat. pend.) transforms air motion velocity within the enclosure to realize amplified magnitudes of bass energy at the BIC VENTURI coupled duct as much as 140 times that normally derived from a woofer (Fig. A). And the filtering action achieves phenomenally pure signal (Scope photos B & C). Result: pure extended bass from a small enclosure.



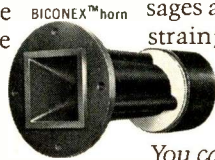
B—Shows output of low frequency driver when driven at a freq. of 22 Hz. Sound pressure reading, 90 dB. Note poor waveform.

C—Output of venturi coupled duct, (under the same conditions as Fig. B.) Sound pressure reading 111.5 dB, (140 times more output than Fig. B.) Note sinusoidal (nondistorted) appearance.

## Fairytale

*It's okay for midrange speakers to cross over to a tweeter at any frequency.*

Midrange speakers cover from about 800 Hz to 6000 Hz. However, the ear is most sensitive to midrange frequencies. Distortion created in this range from crossover network action reduces articulation and musical definition. BIC VENTURI BICONEX horn (pat. pend.) was designed to match the high efficiency of the bass section and operates smoothly all the way up to 15,000 Hz, without interruption. A newly designed super tweeter extends response to 23,000 Hz, preserving the original sonic balance and musical timbre of the instruments originating in the lower frequencies.



## Folklore

*Wide dispersion only in one plane is sufficient.*

Conventional horns suffer from musical coloration and are limited to wide-

angle dispersion in one plane. Since speakers can be positioned horizontally or vertically, you can miss those frequencies so necessary for musical accuracy. Metallic coloration is eliminated in the BICONEX horn by making it of a special inert substance. The combination of conical and exponential horn flares with a square diffraction mouth results in measurably wider dispersion, equally in all planes.

## Hearsay

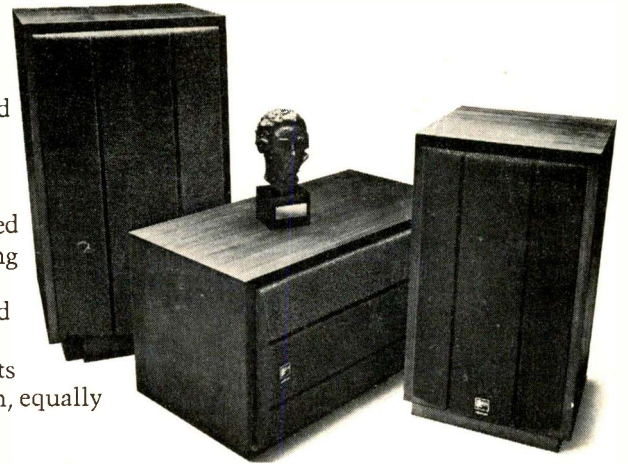
*A speaker can't achieve high efficiency with high power handling in a small cabinet.*

It can't, if its design is governed by such limiting factors as a soft-suspension, limited cone excursion capability, trapped air masses, etc. Freed from these limitations by the unique venturi action, BIC VENTURI speakers use rugged drivers capable of great excursion and equipped with voice coil assemblies that handle high power without "bottoming" or danger of destruction. The combination of increased efficiency and high power handling expands the useful dynamic range of your music system. Loud musical passages are reproduced faithfully, without strain; quieter moments, effortlessly.

## Humbug

*You can't retain balanced tonal response at all listening levels.*

We hear far less of the bass and treble ranges at moderate to low listening levels than at very loud levels. Amplifier "loudness" or "contour" switches are fixed rate devices which in practice are defeated by the differences in speaker efficiency. The solution: Dynamic Tonal Compensation™. This circuit (patents pending) adjusts speaker response as its sound pressure output changes with amplifier volume control settings. You hear aurally "flat" musical reproduction at background, average, or ear-shattering discoteque levels—automatically.



## A system for every requirement

FORMULA 2. The most sensitive, highest power handling speaker system of its size (19¾ x 12 x 11½)!" Heavy duty 8" woofer, BICONEX mid range, super tweeter. Use with amplifiers rated from 15 watts to as much as 75 watts RMS per channel. Response: 30 Hz to 23,000 Hz. Dispersion: 120° x 120°. \$98 each.

FORMULA 4. Extends pure bass to 25 Hz. Has 10" woofer, BICONEX mid-range, super tweeter. Even greater efficiency and will handle amplifiers rated up to 100 watts. Dispersion: 120° x 120°. Size: 25 x 13¼ x 13!" \$136 each.

FORMULA 6. Reaches very limits of bass and treble perception (20 to 23,000 Hz). Six elements: 12" woofer complemented by 5" cone for upper bass/lower midrange; pair of BICONEX horns and pair of super tweeter angularly positioned to increase high frequency dispersion (160° x 160°). Size: 26¼ x 15¾ x 14¾!" \$239 each.

Sturdily constructed enclosures. Removable grilles in choice of 6 colors. Optional bases for floor standing placement. Write for brochure A-4.

Audition today's most advanced speakers at your BIC VENTURI dealer.

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# BIC VENTURI™

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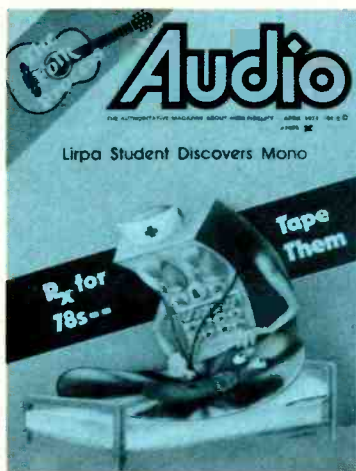
coming in  
May

## SPECIAL HEADPHONE ISSUE

### Electrostatic Phones Explained

**Distributed Headphone  
System**—Len Feldman  
explains how you can put a  
set of phones where you  
want them

**Language of High fidelity**—  
Martin Clifford continues his  
series of article on basic  
audio concepts



**About the cover:** This month we are featuring tape recorders in one of their special uses—restoration of 78 discs. Together with filtering and other means, taping can be just the “right dose of medicine” for tired 78s.

# Audioclinic

Joseph Giovanelli

## Sparking When Connecting an FM Antenna

*Q. When connecting the twin lead of my outdoor antenna to the tuner, I noticed a spark when I made the connections. By using a VTVM, I measured the voltage at my twin lead's terminals: zero volts. However, when I connected only the probe to the twin lead, I got a reading of 4 V a.c. By reversing the 120 V a.c. wall plug polarity of the VTVM, I got zero volt with both the probe and the ground clip connected. Again, using the probe only to either side of the twin lead I obtained a reading of 30 V a.c.*

*The mast of the antenna is embedded in the earth at the side of the house. The twin lead runs perpendicularly to a telephone line and several cables of house wiring but is no closer than 6 feet from the twin lead. The twin lead is twisted to avoid pickup.*

*My main concern is the sparking when I connect this twin lead.*—Serge Zamora, San Diego, California

A. I think your antenna problem has to do with the fact that your mast is grounded, as it should be. The way some antennas are designed means that at low frequencies (in this case, 60 Hz) the antenna is grounded, too.

If your tuner's chassis is connected to the a.c. via of bypass capacitors, and if the wall plug is inserted in the right polarity, the chassis will be just a bit “hot” with respect to ground. If the input of your tuner is connected to ground, possibly by a centertapped, balanced input coil, then the two input terminals to which the twin lead would be connected, would also be “hot” with respect to ground.

Reversing the wall plug would eliminate this problem.

If you connect your voltmeter between your twin lead and chassis ground, you will see quite a bit of voltage. This is the same voltage which was present when you obtained the sparking.

Stray voltages are all around us, and the measurements you have described have to do with them. They are picked up capacitively by your twin lead. They are much like the voltage which you obtain merely by touching the “hot” probe of your a.c. voltmeter.

It is the difference of potential between the twin lead and the input of your tuner which accounts for the sparking. By grounding the chassis of your tuner, this voltage will be eliminated.

## Phonograph Channel Separation

*Q. I took my turntable to a local sound dealer who has a large electronic service department of good reputation. I asked to have it cleaned, lubricated and to correct its main problem. The signals from channel 1 and from channel 2 were not properly separated in my earphones. His repairs corrected the problem so that it is not normally noticeable except when using a test record. The right channel still is heard in the left earphone just slightly and vice versa.*

*Should not one earphone be completely silent with such a test or is there some bleeding of one channel into the other?*—Nelson C. Vogel, Clearwater, Florida

A. No cartridge will produce perfect separation between channels. This is the reason why the data sheets which accompany a cartridge when it is purchased state the amount of separation between channels at various frequencies. These separation figures are expressed in dB. If separation between channels was perfect, there would be an infinite number of dB separation. If only one channel was recorded on a disc, only one speaker or one headphone would be producing sound, assuming that we did have this infinite separation between channels. Because there is really a finite separation between channels, however, there will be some leakage. Thus, when only one channel is recorded, signals will be heard in that channel, with some signal also heard in the channel having no actual recording. The undesired, leakage signal will be lower than the desired signal in an amount equal to the separation between channels **AT THE FREQUENCY OR FREQUENCIES OF THE RECORDING.** To make things just a bit worse, the discs, themselves, are not perfect. They have a limited amount of separation between channels, thus adding to the leakage you hear. It is a fortunate circumstance that we need only a few dB of separation in order to produce good stereo. Discs and cartridges in combination have far more separation than this “few dB.”

If you have a problem or question on audio, write to Mr. Joseph Giovanelli, at AUDIO, 134 North Thirteenth Street, Philadelphia, Pa. 19107. All letters are answered. Please enclose a stamped self-addressed envelope.

# People who are really serious about their records are the best ones to ask about turntables.

Most people who decide they want components turn to a friend who knows something about high fidelity equipment. If the friend is a reader of this magazine, that's good. And if the friend happens to be someone who reviews recordings, that's even better.

Record reviewers must select their equipment with great care, since they must listen with great care. To such things as the interpretation of the artist. To the recording and microphone techniques. And to the quality of the record surface itself.

All this is why the professional listeners select their turntables so carefully.

## What most serious listeners know.

Professional listeners know that what they hear (or don't hear) often depends on the turntable.

After all, the turntable is the one component that actually handles records, spinning them on a platter and tracking their impressionable grooves with the unyielding hardness of a diamond. And the professional realizes that much depends on how well all this is done.

Which is why so many record reviewers listen to their records on a Dual. And why the readers of the leading music magazines buy more Duals than any other quality turntable.

They know that a record on a Dual will rotate at precisely the right speed, to give precisely the right pitch. (If a record happens to be off pitch a Dual can compensate for it.)

They know that a Dual tonearm will let the most sensitive stylus track the

wildest curves ever impressed on a record groove, and not leave a trace of its passage.

And they know that a Dual will perform smoothly, quietly and reliably year after year after year. Despite all the precision built into a Dual, they know it's one turntable that doesn't have to be handled with undue concern. (Even if the tonearm is locked when play is started, or if the tonearm is restrained in mid-air while cycling, no damage will result.)

## If you'd like to know more.

A few examples of Dual precision engineering are shown in the illustrations. But if you would like to know what several independent test labs say about Dual we'll send you complete reprints of their reports. Plus a reprint of an article from a leading music magazine that tells you what to look for in record playing equipment.

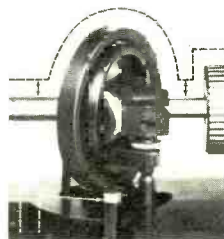
Better yet, just visit your franchised United Audio dealer and ask for a demonstration.

Dual turntables may seem expensive at first, but not when you consider your present and future investment in records. And now that you know what the professional listeners know, doesn't it make sense to own what they own?



The gyrosopic gimbal suspension of the Dual 1218 and 1229 tonearms is the best known scientific means for balancing a precision instrument in all planes.

The 1218 and 1229 tonearms track records at the original cutting angle. The 1229 parallels single records, moves up for changer stack. A similar adjustment is in the 1218's cartridge housing.



In all Dual models, stylus pressure is applied around the pivot, maintaining perfect dynamic balance of the tonearm.



Separate anti-skating calibrations for conical and elliptical styli achieve perfect tracking balance in each wall of the stereo groove.

Dual 1214, \$119.95

Dual 1216, \$154.95



Dual 1218, \$189.95

United Audio Products, Inc., 120 So. Columbus Ave., Mt. Vernon, N.Y. 10553  
Exclusive U.S. Distribution Agency for Dual.

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Dual 1229, \$259.95

The  
Professional  
Line

Wanted by  
the most  
Discerning  
Audiophiles



SX824

There is a distinct difference between tape equipment mass-produced by a consumer manufacturer and tape equipment built by a professional audio manufacturer. At Crown International this distinct difference involves five things: over-engineering, rugged construction, hand-crafting, exhaustive testing and conservative rating. After 26 years, Crown is the only remaining original U.S. tape equipment manufacturer still marketing professional quality to discerning audiophiles.

The Crown tape equipment line is designed for audio pros who make their living by recording, to whom an equipment failure at a taping session means money out the window. After four years, when many hi-fi models are traded in, Crown decks still produce recordings with truer fidelity than most new hi-fi decks. No wonder Crowns enjoy such high resale value.

At Crown, each active electronic component, each circuit module and each completed unit is tested from every angle. A tape deck undergoes over 100 hours cumulative testing. Finally, each unit is accompanied by its individual hand entered proof-of-performance report.

For free product data on Crown professional monaural, stereo and quadraphonic tape decks and players, write Crown, Box 1000, Elkhart, Indiana, 46514.



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Made Only in America

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# Tape Guide

Herman Burstein

## Phono Cartridges & Recording

*Q. I have a Sony TC-SW stereo cartridge recorder/player and a Garrard Model SLX-2 stereo record player. I use the Sony to make 8-track stereo cartridges. When I connect the Garrard directly to the Sony, I do not get a sufficient output signal from the Garrard to cause the input signal level light on the Sony to work. This is not due to a defect in the Sony, because I have an older turntable that does cause the recording level light to work OK. Can you please advise me on my problem?—Willard L. Bowen, Sulphur Springs, Texas*

A. Your record player apparently comes with a magnetic cartridge that delivers insufficient signal to drive your tape machine. This would be true of any magnetic cartridge you might employ. The tape machine you use is not designed to accept a signal directly from a magnetic cartridge, which requires a great deal of amplification plus substantial bass boost and treble cut. I suspect that the cartridge in your older turntable is of the piezoelectric (crystal or ceramic) type, which puts out a high level signal and one that is relatively flat.

The solution would be to replace the magnetic cartridge in your turntable with a piezoelectric type of high quality. Consult your audio dealer about a suitable one. Alternatively, if you have an audio system, feed your tape machine from the "tape output" jack of this system.

Generally the performance of magnetic cartridges is superior to that of piezoelectric ones. Therefore, if you must feed the Garrard to the Sony, but not through an audio system, you might purchase a phono preamp that can be inserted between a magnetic cartridge and your tape machine. Such preamps can be obtained for something like \$15 to \$20. Again, consult your audio dealer about one. The cost of such a preamp would be little if any more than that of a high quality ceramic cartridge.

## Increasing Tape Life

*Q. I have a vast number of tapes that I have recorded. They are very valuable to me and I would like to be able to preserve them indefinitely. Some of these tapes are not played for months and years. I always rewind tapes at least twice before playing if they have been unplayed for a long time. Most are stored in tin cans and metal boxes, and some in plastic containers and original cardboard boxes. Are there any other precautions that can be taken?—Wallace Beck, Madison, Fla.*

A. Try to keep your tapes at "normal" room temperatures, without extremes of humidity. Store the tapes on edge rather than flat. Wind and rewind each tape at least once a year, whether you play it or not.

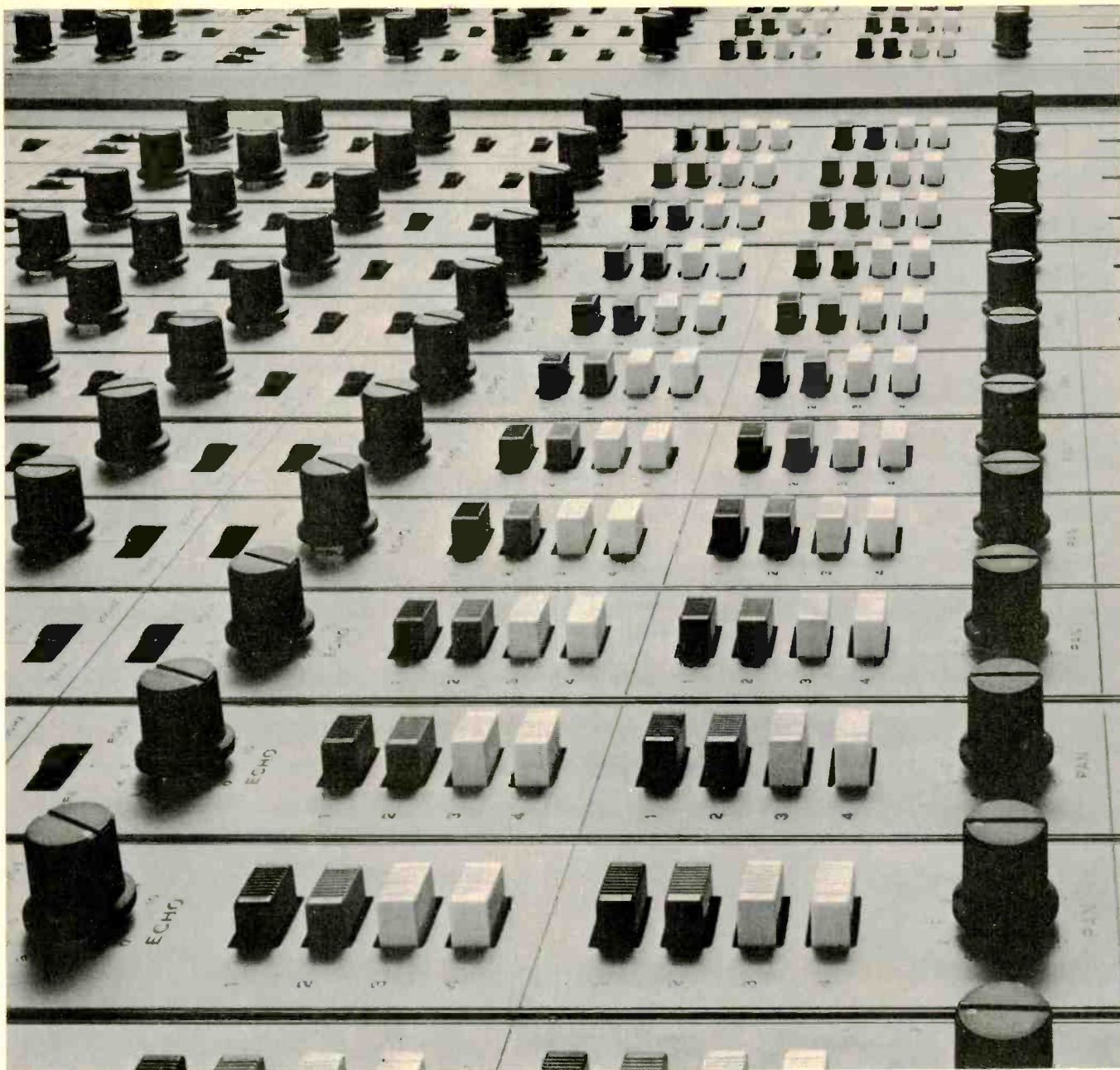
## Tape Hiss

*Q. I am plagued with tape hiss of my cassette recorder. The hiss switch on my recorder doesn't nearly do the job. I would like to know why someone doesn't make an external frequency limiter which could be used between the recorder and amplifier. Isn't tape hiss limited to fairly limited specific frequencies? I am thinking of getting an Advent system; do you think this would be useful for limiting the hiss?—Robert Scott, Lawrence, Kansas*

A. Tape noise is fairly well distributed through the range of audio frequencies. Since there are more frequencies in the treble range, the noise has a hissy character. An apparent reduction in hiss can be achieved by attenuating frequencies in the area of about 3,000 to 5,000 Hz. The Advent system may achieve a noise reduction of up to 10 dB.

If you have a problem or question on tape recording, write to Mr. Herman Burstein at AUDIO, 134 North Thirteenth Street, Philadelphia, Pa. 19107. All letters are answered. Please enclose a stamped, self-addressed envelope.





## The Model 10 Mixing Console

### When you've got more talent than money

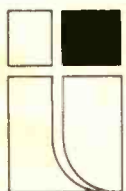
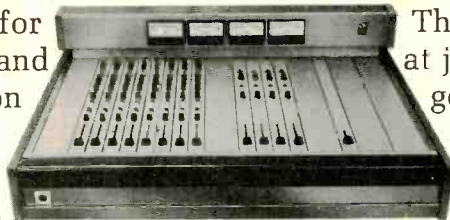
Any mixing console is simply a creative tool. Getting the most out of it calls for imaginative insight into music and skill in the practical application of sound.

If you've got the talent but you don't have the money,

you're exactly who we built this board for.

The basic 8-in, 4-out board starts at just \$1890. From there you can go to 24-in, with options and accessories enough to fill a studio.

The TASCAM Model 10. It gets your inside outside.



**TASCAM CORPORATION**

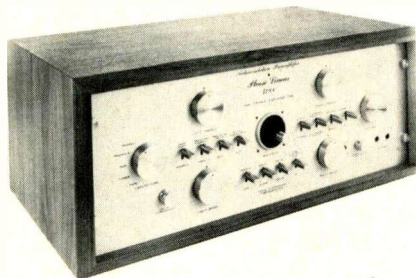
5440 McConnell Avenue  
Los Angeles, Calif. 90066

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# Incredible.

How else would you describe a preamplifier with:

- A **Peak Unlimiter** that restores dynamics lost in recording to closely approximate the original.
- A **Downward Expander** that reads "gain riding" and expands dynamics down to precisely the intended level.
- An **AutoCorrelator** that makes record/tape hiss and FM broadcast noise virtually vanish without affecting musical content.
- **Plus** an Active Equalizer that gives you flat energy distribution over the full audio spectrum, Joystick Balance and Step Tone Controls that allow precise music tailoring to your listening environment and SQ\* and Phase Linear differential logic for Quad Sound.



The 4000 is an advanced stereo preamp that actually puts back in what recording studios take out... lets your music (at last) reach life-like levels without distortion... lets you (for the first time) hear your music from a silent background. It is, in a word, incredible. Ask your dealer for an audition.

**Price:** \$599

**Cabinet:** \$37

**Warranty:** 3 years, parts & labor.

## Phase Linear 4000

THE POWERFUL DIFFERENCE

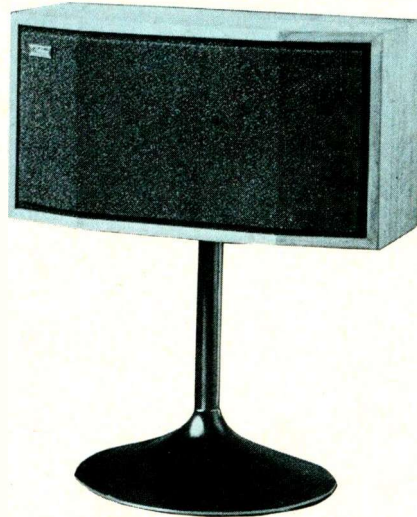
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\*SQ is a trademark of CBS Labs, Inc.

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# What's New in Audio

## ADC Speaker System



The WDDS-12 features a 12-in. woofer and four beveled dome tweeters to achieve maximum wide dispersion without losing a discrete source of sound. The dispersion angle is said to be 120° throughout the audible spectrum. Two of the Mylar dome tweeters are 1½-in. in diameter and the other pair ¾-in., claimed to optimize sound radiation in different parts of the spectrum without the need of a 3-way crossover network. Also featured is a 4-position "Contour Control Switch" allowing adjustment of the treble response. The WDDS-12 is designed as a floor-standing unit (pedestal unit optional, \$25.00), but may also function as a shelf speaker. Impedance is 6 ohms; frequency response, 30 Hz-25 kHz ± 2 dB; crossover frequency, gradual between 600 Hz and 5 kHz; cabinet, oiled walnut; weight, 50 lbs. Price: \$350.00.

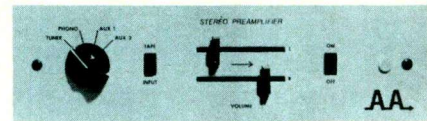
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## Books

The 444-page *Handbook of Semiconductor Circuits* contains 124 examples of standard transistor circuits, complete with operational data for amplifiers, oscillators, logic and switching circuits, power supplies and various nonlinear circuits. This source book features a design philosophy section with each group of circuits, providing a basis for understanding circuits other than those selected as examples. The broad range of circuits was chosen on the basis of application and practicality. Each circuit description includes data concerning any unique design or operational data along with large, clear schematic diagrams. Hardbound: \$8.95. Paperback: \$5.95. Specify book #G-30 from Tab Books, Blue Ridge Summit, PA 17214.

8

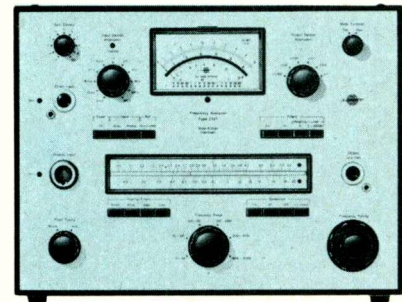
## Ace Audio Preamplifier



The Zero-Distortion Preamp is a low-cost unit designed without tone controls specifically for use with an equalizer. All tone controlling and other response filtering should be accomplished through the equalizer. There are no non-linear elements since the preamp contains no high-level amplifiers, and the circuitry is passive (resistive) at all settings of the controls. Specifications include unity-gain on high-level inputs, flat frequency response to d.c., phono noise of -76 dB, equalization accurate to within ± 0.5 dB, and phono distortion of 0.05%. The preamp can drive any equalizer or amplifier with an input impedance of 50K or greater. Kit price: \$69.95; wired, \$87.50.

Check No. 51 on Free Information Card

## B&K Audio Frequency Analyzer



Tuneable band pass, band stop, low pass and high pass filters can be push-button selected on the Type 2121. The unit features active filters with four bandwidths, selectable between 1% and ⅓-octave, that can be tuned through the frequency range from 20 Hz to 20 kHz. When connected to a B&K condenser mic, the Analyzer becomes a precision sound level meter to international standards. Connected to a vibration transducer, accurate vibration analysis can be performed. The voltage measuring range is from 10 μV to 30 V rms. Other features: an A-weighting network; automatic frequency sweep when controlled by a Level Recorder Type 2305 or 2307; and interchangeable meter scales for direct reading with B&K ½-in. and 1-in. condenser mics. Price: \$3848.00.

Check No. 52 on Free Information Card

AUDIO • APRIL 1974

(The Ortofon M15 E Super)

# THE ONLY CARTRIDGE WE KNOW OF THAT WILL DO FULL JUSTICE TO A NEW GENERATION OF STEREO RECORDS.



For the first time in many years, all that can be put onto stereo records by professional disc-cutting equipment can be gotten off them by a cartridge—the new Ortofon M15 E Super.

It is the only pickup we know of that not only can handle the peak levels and full dynamic range now possible on records, but while doing so can operate below the wear threshold of modern discs, preserving their full quality for playing after playing.

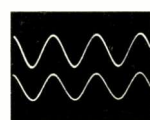
As makers of studio record-cutting equipment (Ortofon supplies equipment to recording companies and studios around the world), we know the capabilities of the newest generation of cutters, which for the first time can clearly put onto records a dynamic range approaching that of master tape. The maximum high-frequency levels these cutters will record also permit the first real approximation of the full “live” intensity of cymbals, brass, snares, and other demanding instruments.

On the test record that best reflects these new capabilities (#2 in a series recorded by the German High-Fidelity Institute), most other pickups begin to reveal audible (and, on an oscilloscope, visible) shatter at a recording level of 70 to 80  $\mu\text{m}$ . Only the Ortofon M15 E Super goes to the record's 100  $\mu\text{m}$  limit (and beyond) with *no* audible or visible indication of difficulty. The photos of oscilloscope traces at right are an accurate indication of the new Ortofon's superior performance.

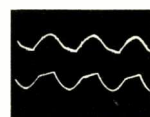
That test is a decidedly accurate reflection of audible differences in the real world of the listener's living

room. What it means is that on the most demanding stereo records that can now be made, exactly the records that someone with really excellent equipment and a habit of listening closely is likely to buy, only the new Ortofon is likely to handle *everything* with no sign of strain or “fuzzing.”

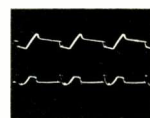
The M15 E Super was designed specifically to achieve this performance while tracking (at a force



A) Essentially undistorted lateral tracking by the Ortofon M15 E Super of a 300-Hz test tone recorded at a peak amplitude of 100  $\mu\text{m}$ . Tracking force: 1 gram.



B) A more expensive cartridge shows significant distortion at an amplitude of only 70  $\mu\text{m}$ , tracking at 1½ grams in the same tone arm.



C) The same cartridge (same arm and tracking force) indicates unlistenable performance at 100  $\mu\text{m}$ .

of 1 gram) below the modulus of elasticity—the threshold beyond which the vinyl of a record groove doesn't immediately spring back into shape after the stylus passes. (It is an absolute must to track below this point if permanent damage is to be avoided.) To make this possible, the Ortofon's unique VMS (Variable Magnetic Shunt) design combines very low moving mass (0.5 milligram), very high structural strength in the moving system, and very high stylus compliance — 50 x 10<sup>-6</sup> cm/dyne in the horizontal plane, 30 x 10<sup>-6</sup> cm/dyne vertically.

The new Ortofon is the latest product of a company involved with records and professional studio recording equipment for more than fifty years. Manufactured and tested at Ortofon's factories in Denmark, the M15 E Super is also rechecked in the United States after shipment.

We will be happy to send you full specifications, descriptive material (including reviews), and a list of Ortofon dealers if you will write us at the address below.

# ortofon

9 EAST 38TH STREET, NEW YORK 10016

Check No. 23 on Free Information Card

# Behind The Scenes

Bert Whyte

FOR THE PAST SEVERAL months I have had the privilege of using the production prototype of the new Ampex AG-440C professional audio recorder. The model furnished to

me was the 440C-4, a four-channel recorder using 1/2-in. tape. I have been using its illustrious predecessor, the 440B, in the same configuration for some years now, so I had a handy

reference for comparison. After endless hours of testing, probing, measuring, after trying to confuse and abuse the tape transport logic, and after "nit-picking" my way through the various electronic and mechanical parameters, I can state unequivocally that the Ampex 440C is a "state-of-the-art" recorder in the truest sense of that overworked term and the finest professional tape machine I have ever used.

Progress in the world of professional audio is generally evolutionary in nature, and so it is with the Ampex 440C. The truly *revolutionary* tape recorder will utilize digital techniques, and in spite of some recent progress, it still appears to be a long time off in the future. There are, to be sure, some important innovations in the Ampex 440C. For the most part however, it is the updating and painstaking refinements of existing performance and maintenance features that makes the 440C such a high quality tape recorder.

Basic to the 440C and all Ampex professional tape recorders is the very heavy die-cast and precision-milled top plate. Die casting is expensive, but if you are to have the tape transport components rigidly mounted in an accurate and unyielding plane, this is the way to go. This heavy plate makes possible the interchange of tape head assemblies for quarter-inch and half-inch tape. There is a finely milled area on the top plate, with two machined guide pins and two screw holes. The heads are contained in a cast housing, the base of which has been milled and holes drilled which align perfectly with the machined pins, and which accept screws and lock washers to secure it to the top plate. The leads from the heads terminate in a flat fiberglass board and are connected to a series of pins. The board/pin assembly plugs into female receptacles which are mounted at the back end of the milled head area on the top plate. This arrangement makes the 440C available with full-track, half-track, two-track and four-channel heads for quarter-inch tape, and for a four-channel head with half-inch tape. There is a special Ampex 440C-8, which is an 8-track version utilizing one-inch tape. To accommodate both the quarter- and





# way out!

Tape cassettes and cassette recorders were once regarded pretty much as novelties. Sure, they were great for voice recordings, but they weren't taken seriously by hi-fi buffs. Then along came TDK's Super Dynamic, the tape that started a revolution in the industry. It gave the cassette true high-fidelity capability for the first time, thereby stimulating the development of improved cassette recorders.

As a result, manufacturers of both tape cassettes and cassette recorders started turning out better and better products. So today the question is "how well do they match each other in performance capability?" And with the devel-

opment of TDK's great new Dynamic-series of cassettes, the whole world of sound reproduction has changed.

When it comes to matching or exceeding the performance capabilities of present-day cassette recorders, TDK's new Dynamic series is way out front. Extra Dynamic (ED) cassettes offer an entirely new dimension in recording fidelity that is vastly superior to any other cassette now on the market. Super Dynamic (SD), the tape that started it all, still has better-balanced total performance characteristics than any other brand made and is available in cassette or open-reel format. And Dynamic (D) is an entirely

new hi-fi cassette offering excellent quality at moderate prices, with characteristics superior to most "premium" cassette tapes.

So, if you want to be sure of using cassettes that provide the best total performance on any recorder . . . for performance capabilities that are and always will be ahead of the industry . . . discover the dynamic world of TDK!

the new dynamic world of

**TDK**

TDK ELECTRONICS CORP.  
755 Eastgate Boulevard, Garden City, New York 11530  
Check No. 35 on Reader Service Card

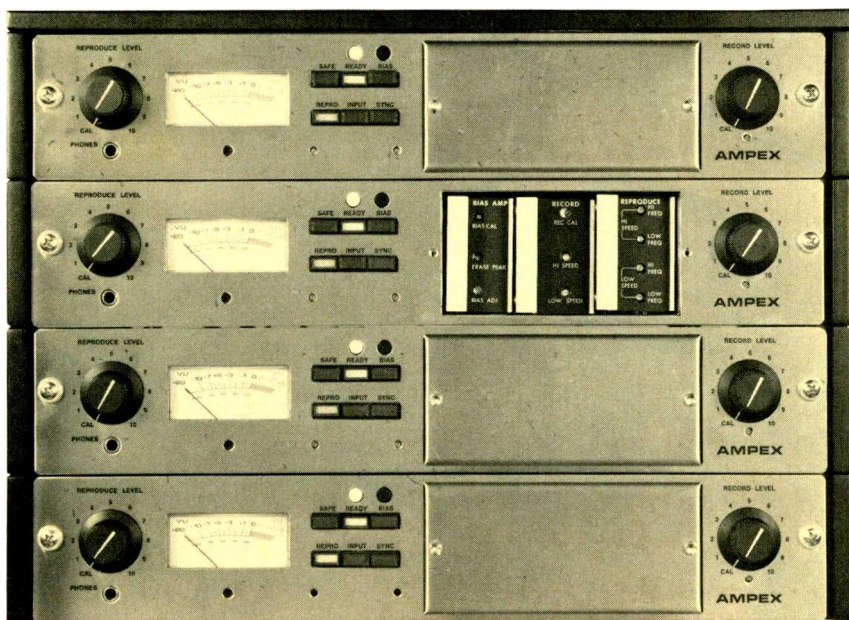
half-inch tape, the tape guides at the supply and take-up sides of the recorder have a clever spring-loaded mechanism, which, when pulled upwards and given a half turn, presents a choice for either tape width. Mounted on the head area on the top plate and coming up into the head casting is the scrape flutter filter. The filter is mounted in jeweled bearings as in earlier models of the 440, but in the new 440C, the idler has a groove cut into it at mid-point which is claimed to further reduce friction. The half-inch head assembly of the 440C features sapphire tape guides which reduce tape skew to a very low figure and translate into greater phase shift stability as well as high frequency amplitude stability. This phase shift stability is extremely important in multi-channel head configurations. The

heads in the 440C are of a new design, with thinner laminations giving less iron loss. There is a new adjustment in the reproduce electronic module for head resonance which compensates for gap loss. These improvements in the heads and in the associated electronics result in a remarkable frequency response of 30 Hz to 25 kHz  $\pm$  2 dB at 15 ips. To round out the features in the head housing, the automatic tape lifters come up through the top plate into the housing and they may be overridden manually, electrically or by remote control for cueing or editing.

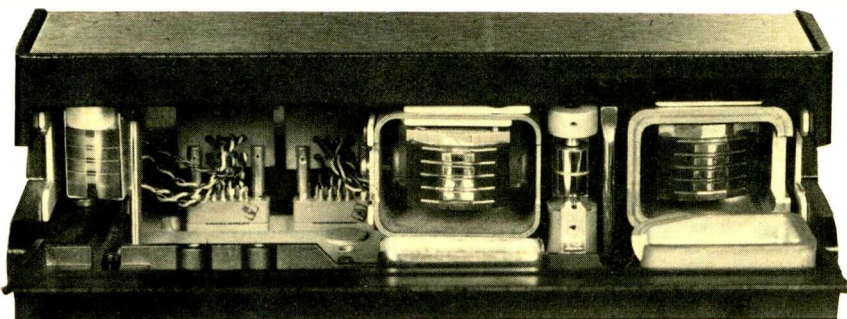
The Ampex 440C may be ordered with the hysteresis synchronous motor common to previous models, but in my opinion most users should opt for the d.c. motor with servo control. The 440C I had was so equipped and to

me this is one of the most worthwhile and significant features of the new recorder. The capstan servo system consists of a d.c. power supply, a motor drive amplifier, a high torque, direct drive d.c. motor with a magnetic tachometer, crystal reference oscillator, a selectable frequency divider, a phase comparator and a low-pass filter. Except for the d.c. power supply and the motor, all electronic circuitry is on a printed circuit board mounted inside the servo chassis at the rear of the recorder. This is a position servo and, in essence, the tachometer pulses are compared with the selected reference frequency and any frequency difference between them causes the comparator to produce a corresponding output voltage. Thus, tape speed is entirely independent of power line voltage and frequency variations. There is a provision to use an external reference oscillator which in special applications affords tape speeds from 3 ips to 45 ips. Another advantage of the servo system is that it doubles the number of speeds available on the 440C. By a simple change of jumper pins on the servo printed circuit board, you may choose speed pairs at 3 $\frac{3}{4}$ /7 $\frac{1}{2}$ , 7 $\frac{1}{2}$ /15, or 15/30 ips. Of course, you must also change the record and playback equalization cards in the electronics for the speeds you choose. The servo motor system affords excellent tape speed accuracy and stability. There is no drift, and the wow and flutter figures are impressive. Unweighted NAB is 0.05% at 30 ips, 0.06% at 15 ips, 0.08% at 7 $\frac{1}{2}$  ips, and 0.1% at 3 $\frac{3}{4}$  ips. High torque assures fast start-up time. When necessary, an instant start, with no delay whatsoever, can be achieved by pressing both the STOP and PLAY buttons simultaneously, then releasing the STOP button, at which time the capstan is up to speed. A relay, which can be plugged into the servo control chassis, sets up a condition where the capstan will not start until the tension arm is in the ON position and the TAPE button is depressed. This is of value in broadcasting work where long stand-by periods often occur.

As in previous 440 models, tape motion is controlled by pushbutton solenoid operation. Response is virtually instantaneous, and with no clicks or pops either through your loudspeakers or on the tape. In the 440C, motion sensing has been added. A tachometer on the supply-reel table furnishes information to an LED/photo transistor sensor. With this system, it is possible to be at full speed in the fast forward or rewind modes, press the PLAY button, and the tape will slow and then stop and go immediately into play mode. This

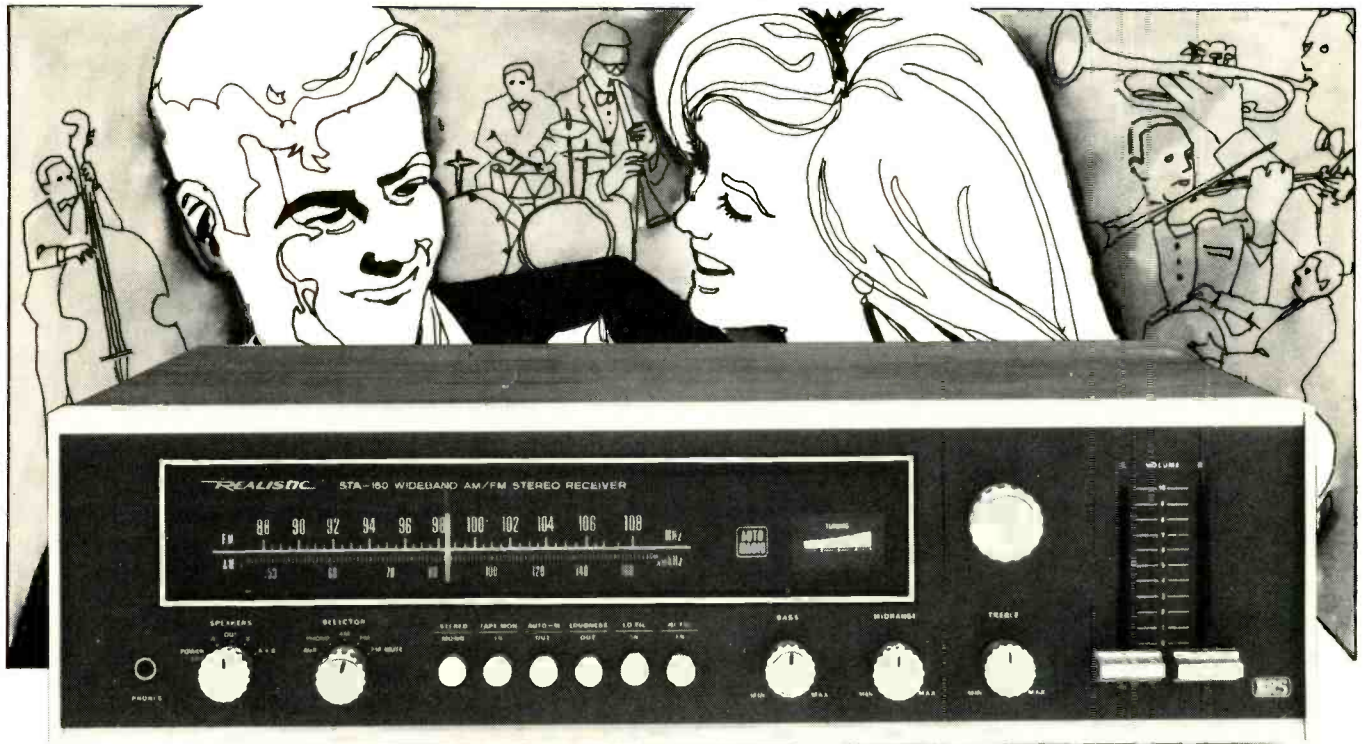


Manual controls on the AG-44C include indicator pushbuttons used for operating functions. Calibrate positions have been incorporated on the reproduce and record level controls for easier adjustment and maintenance.



Closeup of the head assembly. AG-440C recorders feature sapphire guide in their tape guidance systems.

# Auto-Magic™ is only the beginning of the Realistic STA-150 story.



But what a beginning! Touch the tuning knob and Auto-Magic deactivates the AFC for easy FM station selection. Release the knob and Auto-Magic fine-tunes the station and locks it in. But it isn't Auto-Magic alone that makes this a great receiver.

There's dual gate FET FM, along with 7 integrated circuits for reliability and superior sound, plus flexible bass, treble and midrange controls and transformerless audio circuitry. And tape copying facilities, too.

Then there are those "little things" that make Realistic receivers big values: Glide-Path™ volume controls, wideband AM tuner, high and low filters, FM muting, tape monitor, main and remote speaker outputs, a luxurious walnut case and more. It's U.L. listed, of course.

The happy ending is the price: **349<sup>95</sup>**

**SPECIFICATIONS. FM TUNER. Sensitivity:** 1.6  $\mu$ V IHF. **Stereo Separation:** 45 dB at 1 kHz. **Signal-to-Noise Ratio:** 70 dB. **Selectivity:** 56 dB. **AM TUNER. Sensitivity:** 20  $\mu$ V (at terminals for 20 dB S+N/N). **Selectivity:** 30 dB. **AMPLIFIER. Power:** 160 watts  $\pm$ 1dB at 4 ohms, 100 watts IHF at 8 ohms, 65 watts RMS at 8 ohms. **Frequency Response:** 20-20,000 Hz. **Power Bandwidth:** 15-70,000 Hz. **Harmonic Distortion:** less than 1% at rated output.

## Complete STA-150 Stereo System



LAB-36A with Base & Magnetic Cartridge, Reg. 79.95.

Two Optimus-1 Speakers, Reg. 89.95 each.

Save 59<sup>85</sup> **549<sup>95</sup>**



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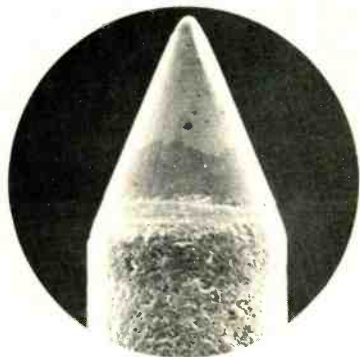
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**Radio Shack**®

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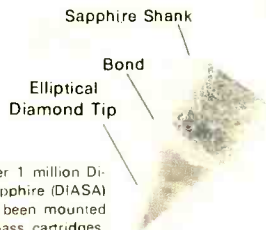
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A brilliant idea  
realised to  
perfection:



## DIASA

Our patented  
Diamond Phonograph Point  
on a Sapphire Shaft.



So far over 1 million Diamond Sapphire (DIASA) styli have been mounted into top-class cartridges.

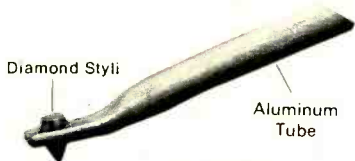
Due to the low specific weight of sapphire (3.9) we are in a position to produce a phonograph point—elliptical or conical design—with exceptionally low dynamic mass.

—The very narrow tolerances in diameter and length render the setting of the styli into the holder possible with a maximum of precision.

We are also in a position to offer the following high-quality articles produced in our own works:

Diamond Phonograph Styli with a stainless steel shank—

Holders for styli manufactured out of the lightest possible aluminum tubes, mounted or unmounted.



Our standard measurements for phonograph styli are:

Ø .010" x .020" long	R .0007"
Ø .012" x .025" - .040" long	R .0007"
Ø .016" x .040" - .060" long	R .0007"

For samples and offers please contact:  
Benz Micro-Diamonds,  
Landstrasse 20,  
CH 8450 Andelfingen, Switzerland,  
or our representatives in the USA:  
Arthur C. Agazim & Son,  
P.O. Box 129, Lake Forest, Ill.  
60045  
Phone: (312) 234-4314.

system is also fail safe . . . any interruption of power, even when running in fast forward or rewind, will simply stop the reels without spilling miles of tape. For easy serviceability, the record control and transport logic circuitry are on plug-in etched boards. In addition to the fully opening head gate, editing is simplified with a feature that relaxes the brakes without the need of holding up the takeup tension arm, as in earlier Model 440 units. Tape may be spilled without the tape being threaded through the tension arm and without movement of the takeup reel. A small but important new feature on the transport is that when the recorder is in the standby mode, tape will not rub on the capstan shaft.

Now that we have covered the heads and the 440C transport, let's take a look at the electronics. New on the 440C are calibrate positions for reproduce and record controls. When turned fully counterclockwise, the controls click into a detent position. While in this position, access holes to screwdriver gain adjusters (located underneath and to the left of the VU meter on the electronics module for reproduce, and a similar one underneath the record control) permit the setting of various standards. For example, in conjunction with my Dolby A361 units, I adjust the reproduce calibrate control for Dolby level at 0 VU.

All plug-in circuit cards now have gold-plated contacts for greater reliability. Overall improvement in the electronics have resulted in improved signal-to-noise ratios and less hiss in standby mode. Sel-Sync response has been improved at 15 ips, now typically 30 Hz to 12 kHz  $\pm$  2 dB. Sel-Sync signal-to-noise ratio is now equal to reproduce S/N. In the 440B, Sel-Sync gain adjustments had to be made from the rear and were a real pain. Now the adjustment is on the front panel of the electronics. Also, automatic switching has been incorporated in the Sel-Sync mode. When a channel being reproduced in Sel-Sync is put into record, the output switches from monitoring Sel-Sync to monitoring input. Instead of rotary switches for recorder functions as input, repro, ready and Sel-Sync, there are indicator pushbuttons with colored shadow masks. Meter sensitivity is now easily selectable by switch from +8, used mainly in broadcast work, to +4, the standard of the recording industry in this country. A minor point, but good thinking, is that the VU meters are now flush with the electronics modules to minimize breakage. Another small point, but again helpful if you have either struggled with a small

Allen wrench (or didn't have the right size), is that the access panel to the circuit cards is now fastened with knurled coin-slot screws. Record and ready lamps are now replaceable from the front instead of at the rear, as on previous 440 units.

After five or six hours of use, the 440B recorders used to get a pretty warm top plate. In the 440C, an auto transformer has replaced a power transistor, so this is no longer a problem.

The usual spate of accessories are available for the 440C, including remote control. An unusual one, however, available only with servo motor units, is the sync lock, which provides constant lip sync with film or video, or sync with another recorder.

That is pretty much the make-up of the new Ampex AG-440C. The specifications resulting from all these various improvements are very impressive. As noted previously, frequency response at 15 ips, using Ampex 406 tape, was  $\pm$  2 dB, 30 Hz to 25 kHz; at 7½ ips  $\pm$  1/-2 dB, 30 Hz to 18 kHz; 3¾ ips was  $\pm$  1/-2 dB from 30 Hz to 7.7 kHz. At the 30 ips speed, the response was  $\pm$  2 dB, 50 Hz to 20 kHz. My frequency response and alignment tape only goes out to 20 kHz, but I measured 16 kHz as exactly flat, while the 20 kHz was down but a half of a dB!

Signal-to-noise ratio for full track 440C recorders using the ASA weighted curve is claimed to be an awesome -73 dB! With the same curve, the 440C four-channel unit I used was rated at -68 dB at 7½ ips, and -66 dB at 15 ips. With Dolby A361 units adding another 10/15 dB, this is truly astonishing. I made various types of recordings, including some live material through a mixer, and in all cases, noise ceased to be a factor.

Using the Ampex 440C was truly a delight. All controls are logically disposed and easy to use. The operation of the recorder becomes virtually instinctive. Tape handling is quite outstanding, very positive starts and stops, extremely smooth spooling, including while in fast forward and rewind modes. The sound of my half-inch Dolby A quadraphonic master tapes was "hound's tooth" clean. I changed heads from the four-channel half-inch to the two-channel head from my Ampex 440B recorder. Because the heads were not of the new design, the frequency response run on my alignment tape wasn't as impressive, but being down 2½ dB at 20 kHz ain't exactly suffering! All in all, my experience with the Ampex 440C bolsters my opinion that if you can afford the best . . . this is unquestionably it. **AE**



# See son... there really is a 4-channel 8-track record/playback deck!

Perhaps that surprises you, son. But it's true. You see, there's been a lot of excitement lately about 4-channel stereo. And, like most people, you probably thought that all 4-channel recorders are open-reel.

Well AKAI will change your mind.

You'll discover a whole new world of 4-channel recording when you see—and hear—AKAI's exciting new CR-80D-SS... a remarkably engineered 8-track 4-channel/2-channel compatible record/playback deck.

The CR-80D-SS is compact... easy to operate. And conveniently placed front-panel controls make professional 4-channel discrete recording a breeze.

Which means that you'll be able to make your own 4-channel tapes. And also enjoy the increasing availability of pre-recorded 8-track 4-channel music.

What's more, the CR-80D-SS is equipped with professional features such as Automatic Stop/Continuous Play... Fast Forward... Automatic 4/2-channel Stereo Selector... Illuminated Program Selector... 4 VU Meters... front panel 4-channel Headphone outputs... and much more.

So don't assume that all 4-channel recorders are alike. They're not. My son.

See your AKAI dealer. He'll give you a new outlook.

From

**AKAI**<sup>TM</sup>

The Innovators

AKAI America, Ltd. / Dept. M

2139 E. Del Amo Blvd., Compton, California 90220 / (213) 537-3880

# Dear Editor:

## More on Heyser

Dear sir,

Although I strongly feel that prior to purchasing a speaker system it must be carefully and critically listened to, I also believe that thorough and objective laboratory test results should be made available to the prospective buyer by the manufacturer. If test results are to be utilized in the selection process, then standardization of test methodology becomes imperative if meaningful comparisons are to be made.

The average audio buff and even the serious audiophile is often relatively naive with reference to modern testing methods and equipment. Being in this category, I enjoyed Richard C. Heyser's article (AUDIO, Nov. 1973) because it made me aware of some of the technical complexities involved in testing contemporary loudspeakers. The article also enabled me to clear up some technical misconceptions.

The style and type of information included in the article is of the type that is of concern to a considerable number of AUDIO's dedicated readers. Too few publications are presently available which emphasize the important role of the method by which specifications are arrived at. I am looking forward to reading more articles of this nature in future issues of AUDIO.

Arturo T. Rio  
East Lansing, MI

Dear sir,

Hersey! Your publication has always had a tendency to publish frequency response curves that looked dangerously like a speaker sounded, subjectively speaking, and now you've gone and reinforced those curves with a full testing procedure that shows a complete lack of respect for hype, Madison Avenue and the American Way. For Shame! As if that wasn't bad enough, you've got this upstart Heyser who has

the gall to summarize the results in English without drooling. Doesn't he know that he could antagonize your advertisers by being a poor politician? Keep it up.

Paul M. Karagianis  
Charleston Heights, SC

## A Complaint . . .

Dear sir,

Attention is called to the classified advertisement by Mr. John Kountz in AUDIO, Jan. 74, page 82, column 3. This ad reminded me that I have never received my NAB adaptors requested and paid for in May 1973. This may well have been an honest error but I wonder if other readers have had the same experience?

A copy of the endorsed check is enclosed and a copy of this letter is also being sent to Mr. Kountz.

Harold W. Draper, M.D.  
Silver Spring, MD

## . . . satisfied.

Dear sir,

I urge publication of Dr. Draper's question relating to not receiving mail "ordered" goods. This question is common to both buyers and, from my point of view, sellers and raises a good issue. In Dr. Draper's case, the hub adaptors were sent first class mail on May 25, 1973—however, sending materials is no guarantee of their being received. Nor, as exemplified by Dr. Draper's situation, can the seller react unless notified by the buyer. To close this communication loop, may I suggest that the buyer contacts the seller if the cancelled check arrives before the ordered item(s).

Coincidentally, and germane, is the instance where items are shipped against a "bad" personal check. While such instances are rare, they do occur causing some mail order sellers to "age" orders to insure clearance of the buyer's check.

Fortunately, over the past three years I've been "stung" less than a half dozen times and therefore haven't resorted to "aging." And, since the bulk of those "stingings" came from dealers rather than individuals, I have concluded that either your readers are good guys or \$3.00 is too low a figure to kite a check for.

John C. Kountz  
1065 Van Dyke Dr.

Laguna Beach, CA 92651

P.S. Two more NAB Hub Adapters were sent to Dr. Draper on January 15, 1974. If anyone else hasn't received theirs, please let me know.

## Thanks from a Service Technician

Dear sir,

I just wanted to drop a note of appreciation for the article concerning the rash of complaints concerning service problems. I have been out of the States for over two years, and upon my return, have found a marked increase in the general "bitchiness" of service customers.

At first I thought it was my increased sensitivity to the attitudes of Americans that accounted for my increase of hassles. Now I realize that people really *have* gotten worse. Needless to say, I have found your article to be a tremendous boost to my sense of self-worth.

Perhaps "Naderism" has gone a bit too far in developing a general sense of distrust on the part of consumers. Perhaps consumers should also take some responsibility for their self-education in the marketplace. Perhaps a place for *quality* is developing once again with consumers.

W.R. Hester,  
Tech. Eng.  
Howard Sound  
Denver, Colorado

CLARINET



140-1.6 KHz

VIOLIN



180-2.5 KHz

PICCOLO



500-5 KHz

TRIANGLE



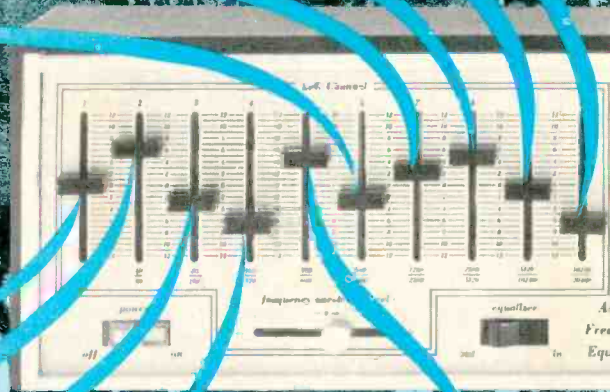
4 KHz-16 KHz

BRUSHES



5 Hz-20,000 Hz

# Soundcraftsmen Audio Frequency Equalizer



ORGAN



20-20,000 Hz

TUBA



40-320 Hz

TYMPANI



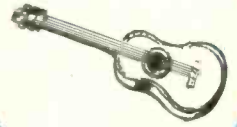
70-188 Hz

TRUMPET



80-1100 Hz

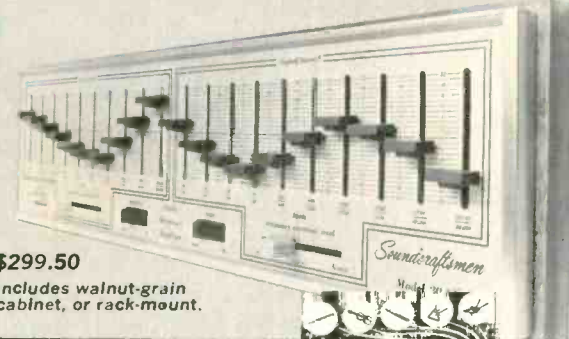
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# Editor's Review

**S**CHWANN RECORD & TAPE GUIDE has released a survey, based on the Guide's New Listings section, which shows that new record and tape releases declined during 1973 as compared with 1972. The decrease, says Schwann, is mostly in the number of tapes; there were only 22 fewer LPs released in 1973, whereas there were 916 fewer new tapes. While not speculating about possible early effects of the petroleum shortage, Schwann does point to fewer concurrent releases of LPs, cartridges, and cassettes. To quote their release:

"Last year, newly released selections were often simultaneously released as an LP, cartridge, and cassette. This year the industry has become more selective, releasing cartridges and cassettes only in fields where their appeal has been proven, such as country & western and soul.

"The 2658 non-classical listings include popular, jazz, musicals, TV, international, etc. 2003 of these new listings were in the popular section, and were produced by 1230 artists. In 1972, the average was a little less than 1½ records per artist; in 1973, it is slightly more than 1½ per artist, which denotes a growing selectivity and concentration on better-known and better-selling popular performers. This shows a reversal of the trend of recent years when popular music was produced by a greater number of artists and groups. Some of the most frequently recorded popular performers listed in Schwann during 1973 were: Kris Kristofferson, 6; 5 each, Johnny Cash, Percy Faith, George Jones, Gail MacDermot and Angela Ortega, Johnny Mathis, and Boots Randolph."

There has been some talk about the resurgence of jazz, and the Schwann statistics on new releases in this field show that such is indeed taking place. During 1972, 479 new jazz releases were made, while in 1973 there were 560. The concentration and selectivity appeared in this field too, with only 60 individuals and groups contributing the 560 releases. The most frequently listed individuals were: Duke Ellington, 8; Eubie Blake and Cal Tjader, 6 each; Ella Fitzgerald, Earl Hines, Herbie Mann, and McCoy Tyner, each with 5. Schwann also notes several important jazz releases, including Atlantic's reissue of the Commodore label material, and releases of previously unpublished material by Art Tatum on Onyx, Duke Ellington on Columbia, Atlantic, and Fantasy, and Miles Davis on Columbia.

How has quadraphonics fared amidst all this concentration and selectivity? Very well, according to the Schwann statistics. Some 813 four-channel recordings were listed during 1973, a very large increase over the 477 listed in 1972, the first year Schwann listed four-channel material.

## Classical Listings

For 1973, classical music releases totaled only one greater than in 1972, 396, but, according to Schwann, they appear to be showing greater diversity than the popular and jazz fields. Says Schwann:

"One of the new developments of 1972 was the idea of series designed to acquaint new audiences with the music of the recognized masters of classical music; for example, the 'Best of . . .' and 'Greatest Hits of . . .' series. While these are still very much a part of the market, there is a growing emphasis on the more esoteric areas of music, such as pre-baroque and contemporary music, and the lesser known compositions of the 'masters.'"

Statistics given to support this thesis show during 1972 one composition with 10 new recordings, seven with six, and four with five. During 1973, the compositions most frequently recorded were: six of Rachmaninoff's *Concerto No. 2 in C for piano*, and five each of Beethoven's *Sonata No. 14 (Moonlight)*, Grieg's *Concerto in A for piano*, Handel's *Royal Fireworks Music*, Mussorgsky's *Pictures at an Exhibition*, Rachmaninoff's *Rhapsody on a Theme of Paganini*, Ravel's *Pavane pour une infante defunte*, Rimsky-Korsakov's *Scheherazade*, Schubert's *Songs and Symphony No. 8 in B (Unfinished)*, and Tchaikovsky's *Concerto No. 1 in B for piano*.

The "Top Ten" among classical composers has the same four names heading up the list, with Mozart No. 1, Bach No. 2, Beethoven No. 3, and Tchaikovsky No. 4. Last year Beethoven was No. 1 and Mozart No. 3, while Bach and Tchaikovsky were Nos. 2 and 4 respectively. Top performers for 1973 were Ormandy with 75, Bernstein with 61, Karajan with 28, and Collegium Aureum with 21. During 1972, Ormandy had 87, Karajan 52, Bernstein 41, and Fiedler 40.

The recording of contemporary music almost doubled in 1973 over 1972, as Schwann listed 280 living composers in 1973, as compared with only 147 in 1972. There were 10 new recordings of electronic music in 1973. Important releases in the classical field include a first recording of Pfitzner's *Palestrina* on DG and a complete "live" performance of Wagner's *Ring des Nibelungen* on Philips.

## "Aw, Gee Whiz" Dept.

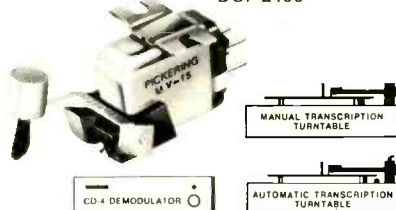
It took a Canadian to write it, and it looks like we Americans needed it what with the *Dry Well/Watergate/Trucker's Strike Blues* we've been singing lately. What am I talking about? Canadian Byron MacGregor's *Americans*, a heavy pat on the back for Ol' Uncle Sam, which has sold well over three million copies since its release December 14th. It takes a good deal to make me cry these days, but I have to admit friend Byron got to me, especially with that line about the Red Cross. Maybe you could play it while you're in line at the local filling station. E.P.

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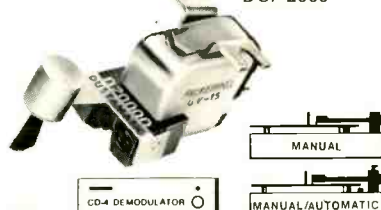
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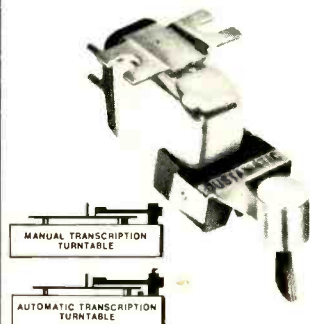


UV-15 2000 Q  
DCF 2000

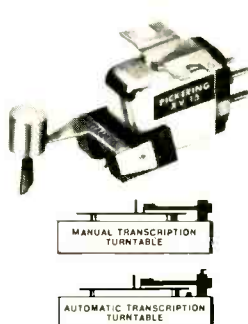


## STEREO AND MATRIX

XV-15 1200E  
DCF 1200



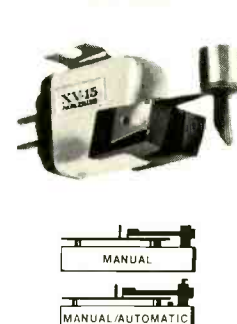
XV-15 750E  
DCF 750



XV-15 400E  
DCF 400



XV-15 350  
DCF 350



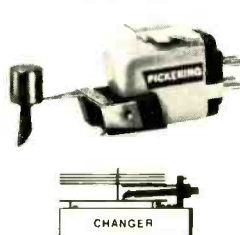
XV-15 200E  
DCF 200



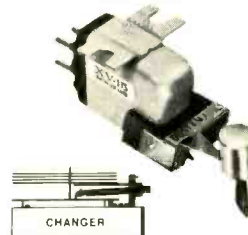
XV-15 150  
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# Rx For 78's--- Tape Them

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**Arthur Shifrin**

**T**HERE'S A LOT of interesting and entertaining stuff on those old discs and cylinders; to some collectors their contents are no less than sacred. Be they ordinary commercially pressed discs, privately recorded, or those legendary old broadcasts, there is widespread interest in listening to, collecting, and improving them. One of the frequently printed inquiries to Herman Burstein's informative "Tape Guide" column concerns this highly specialized aspect of recording. The usual presumption is that this process of improvement, or restoration as I prefer to call it, is made through the taping process. The recommendations often proposed, in the hope of diminishing highs and thereby reducing

noise and distortion, include: taping at slow speeds; deliberate misbiasing; playing back a tape of the noisy discs on a wide-gapped or worn head; recording from outputs which are affected by an amplifier's tone controls and filters; shunting capacitors to ground at the phono preamp's inputs; and utilizing any of the recently marketed consumer-oriented equalizers within recording or playback lines.

Unfortunately, there are common misconceptions about the causes and characteristics of 78 noise, and these make the above suggestions, at best, inadequate. I certainly don't intend to cast any aspersions upon Mr. Burstein; but because the field of restoration is such a narrow area of the audio engi-

# 4 for 4



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neering profession, few enthusiasts, even few professional engineers, know how to contend with the challenges presented by old, noisy discs.

Before I describe some restoration techniques, I'm going to give a primer course about the ways in which pre-tape and pre-L.P.<sup>1</sup> era recordings were mastered and manufactured. Knowing why the techniques are used should help you get the most effective results and, I hope, provide a firm foundation upon which you can experiment with your own procedures. Everybody knows that old records sound terrible; the crucial question is "why?" They can be noisy and distorted because they are dirty, worn and mutilated, mastered ineptly, manufactured out of inferior materials or played with the wrong stylus. Additionally, the presence or lack of fidelity is mostly due to the means of mastering and not those of mass production. Aside from a few photo-optical and magnetic experiments, the primary way to record sound prior to the 1920s was a purely mechanical process. Records were recorded precisely the same way in which "Little Nipper" listened to "his master's voice"—through a horn. One or several cones would collect sound waves in the studio and transmit them to a diaphragm which modulated a cutting stylus. Since the only full range diaphragm is the living eardrum, this "acoustical" process of recording could produce a dynamic range, at best, ranging from approximately 200 Hz to 3 kHz. "Mechanically" mastered records are easily distinguished by their washed-out tonality. Subsequent to 1925, most discs<sup>2</sup> were recorded electrically, as all are today. By 1924, the Western Electric process which had originally been developed to pre-record orchestrations for silent films enabled a useful frequency range from 50 Hz to 4 kHz, a substantial improvement as perceived by the ear, even when such discs were played back on acoustical mechanisms. Marketed as "Viva-Tonal" and "Orthophonic" recordings by Columbia and Victor respectively, frequencies up to 10 kHz could be mastered in wax by 1928. Unfortunately, those ultra high frequencies could not be effectively transferred to pressings. Those which were, would be quickly eradicated by playings of the gougingly heavy steel needles used in those days.

All old records are not alike. There is an obvious difference between cylinders and discs, the former being cut vertically (up and down undulations) and supposedly recorded at 160 rpm. Most commercially released discs were laterally cut (horizontal vibrations), some were vertical, and others with a hybrid characteristic which ostensibly enabled them to be played upon either kind of pick-up (in the old lexicon, reproducers). Some old commercial releases, such as those first issued by Victor in 1931, were played at 33 $\frac{1}{3}$ . Speeds other than 78 (actually, 78.26) were either standard for some firms such as Columbia and OKeh (that is the way the firm spelled its name) which cut their discs at 80, or occurred due to, perhaps, a lack of quality control. For example, referencing reproduction to the known pitch of certain artists such as Caruso, the ostensibly correct speeds of many discs have been determined to range from the low 70s to low 80s. Some Pathés and early Berliner records are said to have been recorded in the 90s rpm! Speed variances, especially prior to the use of hysteresis-synchronous motors in cutting lathes, leave little choice but to render this point to subjective analysis.

The rigid tar-like substances out of which most "78s" were pressed were not the only materials used in manufacturing discs. Some outfits such as the Durium Corporation pressed its "Hit of the Week" releases upon terrific sounding laminated cardboard bases. Aluminum (both uncoated and sprayed over with acetate), plastics, and glass comprised other kinds of discs of varying sizes and thicknesses. 78 pressings are the most commonly found old records because they were mass produced for public consumption. Most frequently

issued in 10- and 12-inch diameters, they are occasionally found in odd sizes ranging from 5 $\frac{1}{2}$  to 20 inches wide.

Prior to Emil Berliner's development of the mass manufacturing technology, which remains essentially unchanged today, each disc produced was indeed an original. The artist would be encompassed by as many recording machines as would permit proximity to the recording horns and perhaps a dozen discs could be manufactured simultaneously. These coarsely surfaced, brittle platters were inevitably noisy because the materials, techniques, and equipment simply did not yet exist which would enable etching or impressing of grooves into a surface which could be smooth yet capable of withstanding destruction by the forcefully tracked steel needles used in gramophones.<sup>3</sup> The Berliner process revolutionized the recording industry. By mastering upon impeccably smooth beeswax and then electroplating the originals, the capability of mass production was realized. A flawless, oppositely impressed metal copy of the master could be used to press playable duplicates out of whatever material was then available for that purpose. Consequently, it is a mistake to assume that most or all of the noise on old records is due to the mastering process. Under optimum conditions, the wax masters and their subsequent metal parts (mothers and stampers) are by today's standards, incredibly quiet. That is, a metal part which is neither tarnished nor mutilated will be substantially noiseless when played with a modern cartridge equipped with an appropriate stylus and without any filters! The problem was to maintain the integrity of the grooves when the final discs were stamped. The technology of plastics was embryonic and shellac was apparently the only economically (perhaps the only) feasible material out of which an adequately smooth disc could be produced. Unfortunately, a disc made of this substance would be too brittle to withstand the rigors of every day use, let alone handling on the assembly lines. Obversely, the tar-like materials which enabled a disc's durability precluded silent surfaces and accurate reproduction of the grooves in the pressing process. The coarseness of these substances meant that minute protrusions would be present within the grooves and these would produce noises running the gamut from hiss, through scratching, to popping and clicking.

The most common solution to these two mutually exclusive problems was to press into "solid stock," an homogeneous mixture of the two or more elements responsible for both characteristics. Naturally, their being mixed compromised each other's function. The qualities of pressings varied slightly or drastically, even amongst discs issued by the same company. Factors influencing this lack of continuity included plant location, availability of materials, and business conditions. A disc containing a greater proportion of shellac was better sounding and more costly. The best solid-stock discs I have heard are Brunswicks pressed by that firm after 1931, when ownership passed from Warner Brothers to The American Record Corporation, which also owned Columbia. Interestingly, both before and after its acquisition by RCA in 1928, Victor sanctimoniously discriminated against its customers of the popular Black label discs: its classical "Red Seal" pressings were usually quieter despite identical pricing schedules. Expectedly, the budget-priced labels, such as Decca and Perfect, were noisier and more distorted than the almost twice-as-costly Victors, Columbias, and Brunswicks. There were, of course, exceptions to this rule. Small independent companies, such as Musicraft and Black and White, either could not or would not use superior materials in their full-priced products. However, pre-CBS Columbia's budget labels, such as Diva, OKeh, Clarion, and Harmony; Victor's Bluebirds, and Brunswick's Melotones, usually had as fine quality as their more costly counterparts. Regardless of label, most



# Vector Switch for Pick Ups

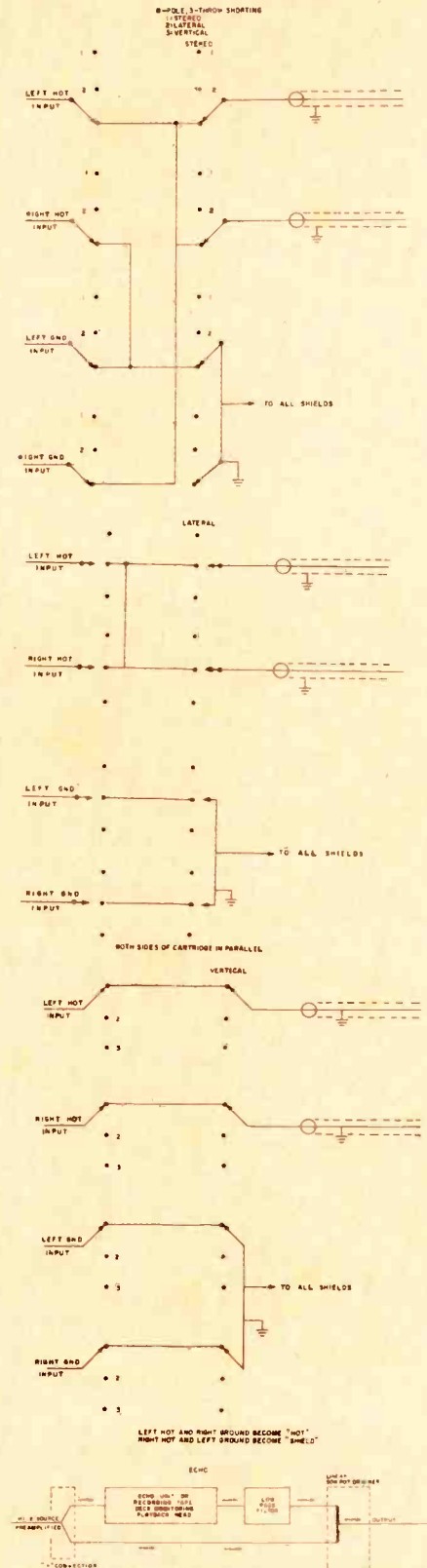
You might protest that the circuit between the phono cartridge and preamp's inputs is "hands off" territory and for good reason. Excessively long leads will introduce hum and cause loss of highs to the precarious, unamplified signal. This switch can be added to your system without jeopardizing its integrity. A miniature rotary switch, such as Centralab's PA 1026 or PA 2026, should be mounted as closely as possible to the base of the tone arm. Since most tone arm boards are too thick for standard switch and pot mounting shafts, you will probably have to countersink the hole so that the switch can be mounted securely to the base. A hex driver for the 1/2-in. nuts which can be used on these switches is usually about 3/4-in. wide: a wood drill bit of that width is the least costly and neatest way to make this kind of hole. The dull black Mallory dial plate #373 or gloss black Centralab P-178 are marked 1-2-3 and will clearly indicate the three positions as well as conceal the mounting hole. If the turntable's base is too shallow to accommodate these four wafer switches which protrude about two inches, then the three wafer PA 2028 or subminiature PSA 228 will be required. Exact dimensions for these are detailed in their Industrial Distributor Components Catalog.

The wires leading out of the tone arm and into the shielded phono cables must be interrupted so that they can be fed into the four input poles of the switch. This would necessitate cutting open the leads to the kind of multi-conductor cables which plug directly into the base of the arm. So that this circuitry cannot be damaged by accidental tensioning of the cables leading to the preamp, provide strain relief. An additional safety precaution is the installation of RCA type phono connectors so that moving the unit will, at most, disconnect the cables harmlessly at the turntable's jacks. Should the switch induce hum, mount a small can over the underside of the assembly and ground it.

For the less adventuresome who prefer not to operate on their hard-earned equipment, the same switch can be externally mounted. Its placement within a metal cabinet is recommended because, when grounded, the enclosure tends to act as a shield. For vertical vectors, the two ground leads of the cartridge must be isolated from each other on the input side of the switch, so on the cables leading from the turntable to the box, use connectors (e.g. microphone type) which will not lead the two grounds into conversion on the switch's chassis. Conventional RCA or phone jacks can be used on the box's outputs because the two channels' grounds are common at that point. (Refer to the text about the suitability of your arm's wiring.)

Proximity of the box to both the turntable and preamp is crucial: it must be placed so that the total run of cable between the cartridge and preamp does not exceed the pickup's requirements for capacitance. If possible, sever the tone arm's original leads and insert the four new connectors so that the phono cables' lengths are not increased.

Should either project seem too complex, the author's services are available commercially!





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discs pressed during World War II were inferior to their predecessors because the supply of shellac was terminated by the Japanese embargo of India. Scrap drives were instituted to collect any old solid-stock discs which were mixed in with whatever pure shellac was still on hand. As time progressed and the supply of shellac became depleted, the discs became progressively worse. They are amongst the most difficult types of discs to restore.

Another facet of the early recording technology was responsible for the noisy surfaces. Carborundum, a mineral almost as hard as diamond, was deliberately introduced into the record mixtures so that the needles would be ground down to conform to the geometry of each disc's grooves. Even with the advent of electrical recording, it was not economically feasible to market a lightweight magnetic cartridge with a semi-permanent stylus as we know them today. Other than Edison's enduring diamond styli which could not be used for lateral discs, all phonographs utilized a reproducing mechanism which required the insertion of a new needle for each playing. As you'll see later on, the concept of customized needles was in fact precocious. If a 78 from that era is not virgin, then it will contain the ground remnants of the needles which had previously played it. These obviously contribute to the disc's noise and even if a method were developed to remove them, the impressions they made within the grooves would still add to the noise problem.

Prior to its acquisition by CBS in 1938, Columbia undoubtedly made the most superior mass-produced discs. Around 1910, the firm pursued technological advances to offset the marketing blitzkrieg achieved by Victor, then the world's largest recording company. One of these was the two-sided record which had the advantage of two selections for the price of one—a concept which Victor at first steadfastly resisted. The other was probably the world's first flexible and almost non-breakable record. Marketed as the "Marconi-Velvetone" line<sup>4</sup>, these were shellac laminated upon some kind of paper base. They were only slightly abrasive and, despite their superiority to any other discs at that time, failed in the marketplace. Sales resistance might have been due to their thin, flimsy appearance and relative lack of durability. In mid 1923, Columbia again attempted to market a superior "New Process" record which was a conventionally thick, lavishly manufactured platter. Essentially two "Marconi-Velvetone" discs mounted upon a common tar base, these five layered discs outperformed any others in their day. Whether pressed as 78s or 33 $\frac{1}{3}$  radio transcriptions and film soundtracks, their easy superiority is conspicuous as soon as they are heard.

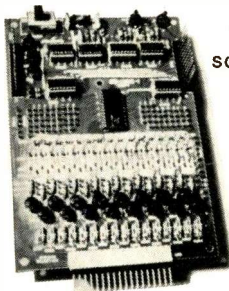
If your fields of interest extend to working with recordings of old broadcasts, and you succeed in gaining access to the actual discs, then you will encounter those which may differ radically from the 78s with which most people are familiar. "Electrical Transcription" described a pre-recorded commercial or program. "Aircheck" denoted a recording whose source was an actual broadcast signal picked out of the air. "Line-check" indicated that the recording was made from a point on the studio or network line prior to the transmitter. Eventually, the three terms became synonymous, and I mention this because the labels on many of these discs might not accurately indicate the nature of the recordings' origins. A broadcast recording might be pressed or an instantaneous disc. A pressed transcription was manufactured as were commercial releases, except that few were usually made due to a limited number of possible customers. Manufactured out of plastics, solid or laminated stocks, these could be cut outside-in or inside-out (i. e. the first groove being the inner-



# Heathkit® Digital Color TV...

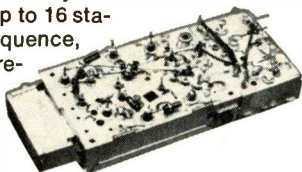
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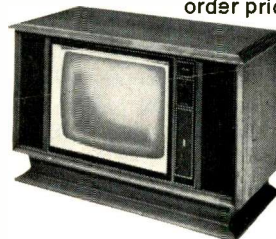
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most one). Their speeds and sizes were often determined by program formats. For example, a 16-in. side cut at 33 $\frac{1}{3}$  could contain 15 minutes of programming. Both sides could contain two quarter-hour shows or one half-hour show, with pre-recorded provisions for a locally made live announcement while the disc was being turned over and cued. If sequential sides were pressed on two different discs, then a segue was possible without any live-micing. Contrary to popular belief, most radio stations in those days depended upon pre-recorded programming; live entertainment originated mostly from the networks. Interestingly, the people credited with creating the syndication business are Freeman Gosden and Charles Correll, creators of Amos 'N Andy. In the late 1920s their NBC shows were heard from discs in certain markets. 12-in. wide and recorded at 78, each side could hold up to five minutes of material. Locally originated openings, closings, and mid-show breaks enabled the simulation of a complete 15 minute program.

By contrast, the "instantaneous" disc was analogous to present day tape and designed for the capability of playback without having to resort to the time and expense of the pressing process. The first such discs were highly polished aluminum platters into which the grooves were directly inscribed. They were improved upon by the late Cecil Watts by the addition of acetate coatings into which the grooves were cut. Higher frequencies could be recorded with less noise on the more modern blanks. Ironically, the older uncoated ones are *today* easier to restore than those acetates used during the transition period from about 1932 to 1935. Given that an unmutated sample<sup>5</sup> of both types is available, the acetate, due to chemical deterioration, will sound worse despite its originally having a wider dynamic range. The early coated blanks were poorly manufactured; they had relatively bumpy surfaces and excessive instability. If it has been stored properly, without exposure to excessive heat or humidity, an acetate dating back to the middle thirties has the potential for impressive, brilliant sound.

During World War II, recording blanks as well as pressings, were affected by changes in the availability of materials. Defense priorities included aluminum, so most of the blanks produced from 1941 through 1945 had glass bases. Yes, fragile, easily-destroyed glass! These are extremely difficult to work with and, even if not already cracked, might be so delicate that merely carrying them to the turntable results in their destruction. They are usually stamped "glass" and should obviously be handled with extreme care. Never carry them with support from only one point and never subject them to stress by weight: they should be stored vertically and not permitted to lie diagonally within shelves amongst other discs. As a precaution, I "criss-cross" the backs of single sided ones with masking tape. Additional support is thus provided and should a crack occur, breakage does not result. Cracked glass discs can be salvaged if the acetate layers are still intact. Should you observe a crack beginning to form, a narrow piece of masking tape placed over it at the rim and corresponding area between the label and innermost groove will usually hold the disc together—at least long enough to withstand handling while you're trying to get it on tape! If a disc has fallen apart, only the most enduring patience might reclaim it. If you suspect that a disc might be glass, its base type can be determined safely by scraping the insides of the center or eccentric stabilizing holes. The centers of many glass discs had cardboard inserts which prevented the formation of cracks by missing the spindle when placing the disc on the turntable. Consequently, when any paper from the labels is scraped away, you will observe either glass or cardboard surrounding those holes. Additionally, you can see a strong light through the blue, red or green acetate coatings.

The most extraordinary equipment requirements will occur if you intend to tape cylinders because (I assume!) there's

just no audio dealer who stocks state-of-the-art cylinder players. The least effective way to transfer them is to place a microphone in front of an old phonograph's reproducing horn. Remember that in those days, the technology of recording was always superior to that of playback and you'd be restricting the results to the primitive capabilities of the device. What is required is a player which enables use of modern stereo cartridges. There are two ways that this can be accomplished, building a completely new mechanism or cannibalizing an old one. What results is probably the most curious-looking sound instrument which any reader of AUDIO has ever seen. A straight tracking arm such as the one made by Rabco can be mounted in place of the old reproducing head. Whether or not this can be affected without permanently mutilating the old mechanism depends upon your mechanical talents. Prior to making the investment, the arm's manufacturer should be consulted to verify that the mechanism will permit the cartridge to travel across the length of your longest cylinder. A possibly less expensive alternative is to use a conventional tone arm, preferably the longer ones used for 16-in. discs. Minimal tracking error will be achieved by mounting the arm so that at the record's center grooves, the rear-front axis of the cartridge is perpendicular to the length-wise axis of the cylinder.

A turntable with the 78 speed is obviously required for most old commercial discs. Automatic changers will often jam up due to inconsistent hole diameters and prove very trying when you're attempting to play an inside start platter. The tedium of easing the arm into that first groove without it defiantly flying back up can tax the most patient personality. Discs larger than 12 in. require an oversized turntable and arm. Geometry dictates that optimal tracking can only be achieved with the longer arm. Variable speed control is necessary for old discs because the heavier, larger ones can slow down some turntables. Stylus drag, a slowing down due to the friction produced by exceptionally heavy tracking, also requires speed correction capabilities. Turntables which enable limited or infinitely variable speed adjustments are widely available and can be selected to fulfill the requirements dictated by the kinds of discs you collect. Units such as my semi-fixed Thorens TD-124II can be internally adjusted to achieve radical speeds, so an occasional offbeat disc might not necessitate the borrowing or purchasing of another machine. Should a disc cover a turntable's built-in strobe device, the only way to verify a correct playing speed is to place a strobe disc over the record and check it while the stylus is actually tracking the grooves. Different surfaces produce varying degrees of friction and this technique eliminates any guesswork.

You might occasionally be able to acquire an old, massive studio turntable, such as those once made by Gates and RCA. If you are mechanically inclined and feel that you can service it and shrewdly dress the inevitable holes from its previous arm(s), then buying it would be worthwhile. They are less susceptible to slowing down effects due to their great inertia, and the giant platters eliminate overhang with 16-in. discs and afford more protection to the large glass discs. The old arms, frequently without variable tracking force and always lacking anti-skating facilities, should be replaced. If you're curious, I use a Thorens TD-124II turntable equipped with a Shure SME 3012 arm.

The initial step in restoration of discs and cylinders is cleaning those which might be dirty. We all know that styli interpret dirt as unnecessary noise and distortion, non-abrasive, non-ammoniated soaps and warm (not hot) water will suffice for both pressings and acetates. A forceful, diffused flow of water will wash out any soap and lint which should have been rubbed ONLY in circular motions corresponding to the groove patterns. Once acetates have been washed, they should be played while still wet. In some cases, substantial noise re-

# Heathkit AR-2020 4-Channel AM-FM Receiver



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#### AR-2020 SPECIFICATIONS

**AMPLIFIER SECTIONS** — Dynamic power output per channel (Music Power Rating): 25 W (8 ohm load)\*. 30 W (4 ohm load), 14 W (16 ohm load). Continuous power output per channel: 15 W (8 ohm load), 20 W (4 ohm load), 10 W (16 ohm load). Power bandwidth for constant .5% total harmonic distortion: 5 Hz to 30 kHz. Frequency response (1 W level):  $\pm 1$  dB 7 Hz to 50 kHz.  $\pm 3$  dB 5 Hz to 70 kHz. Harmonic distortion: Less than 0.5% from 20 Hz to 20 kHz @ 15 W output. Less than 0.25% @ 1000 Hz with 1 W output. Intermodulation distortion: Less than 0.5% with 15 W output. Less than 0.25% @ 1 W output. Damping factor: Greater than 30. Input sensitivity: Phono: 2.2 mV. Tuner, Aux, Tape: 200 mV. Input overload: Phono: 35 mV to greater than 5 V. Tuner, Aux, Tape: Greater than 3.0 V. Hum and noise: Phono: -60 dB. Tuner, Aux, Tape: -70 dB. Tape output: 0.4 V out with 0.2 V in. **TUNER SECTION — FM (mono)** — Frequency response:  $\pm 1$  dB, 20 to 15,000 Hz. Sensitivity: 2  $\mu$ V.\* Selectivity: 60 dB.\* Image rejection: 50 dB.\* IF rejection: 75 dB.\* Capture ratio: 2 dB.\* AM suppression: 50 dB.\* Harmonic distortion: 0.5%.\* Intermodulation distortion: 0.5%.\* Hum and noise: 60 dB.\* Spurious rejection: 70 dB.\* **FM (stereo)** — Channel separation: 40 dB typical. Frequency response:  $\pm 1$  dB from 20 to 15,000 Hz. Harmonic distortion: 0.75% @ 1000 Hz with 100% modulation. 19 kHz and 38 kHz suppression: 60 dB. SCA suppression: 55 dB typical. **GENERAL** — AC outlet sockets: 2, 1 switched and 1 unswitched. Dimensions: 5" H x 20" W x 14" D. \*Rated IHF Standards.



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ductions will be observed. If an acetate is so chemically deteriorated that it is covered with a white, frost-like coating, residue buildups will occur so quickly that within minutes the stylus will be incapable of tracking the grooves properly. Only in such cases should you resort to full-strength ammoniated cleaning liquids which will eliminate the troublesome coating temporarily. Unfortunately, these chemicals also have the capacity to jar the acetate layers from their base. Only experience will enable you to predict the advisability of this measure. If you have developed a talent for editing, a more conservative way to attack this problem is to track the disc in short sections, cleaning the stylus at frequent intervals and then splicing out the interruptions. Uncoated aluminum discs can be effectively cleaned by a remarkable substance known as Aluminum Jelly. (It is not to be confused with Naval Jelly.) Both are non-abrasive and the former makes aluminum oxides and dirt, such as those which mar old storm doors, water soluble. If you are concerned about the possibility of ruining labels, there is usually enough ungrooved area around the centers to mask them with waterproof adhesive tape and any household plastic wrap.

Other treatments which you might have to perform upon old discs are de-warping, groove scraping, and hole centering. Creased acetate-coated discs whose surfaces have peeled away from the base are usually impossible to repair. Bent ones can be straightened out by the continual application of weight over long periods of time. Pressed records are most easily flattened out by heating them uniformly (in an oven) to NO MORE than 200° Fahrenheit. The plyability of the warming discs can be tested at their rims. Once in this state, they should be removed at least as carefully as you would extract a prize-winning pizza from its oven! Clean, non-textured Formica sheets, which extend over the total area of the disc, will protect the softened record from damage. The heated disc should be carefully slid onto the face-up bottom piece, covered with the second, and then weighted down long enough to permit gradual cooling.

Hole eccentricities, which are usually due to manufacturing errors should be corrected to minimize wow. Discs may be reamed, filed or even drilled to establish their centers. Should locked grooves or loud clicks be encountered, they might be due to coagulated foreign substances which could possibly be scraped out manually with the assistance of a powerful magnifying lens and steel needle. Practice these techniques on unimportant discs before performing them on the irreplaceable ones!

### Phasing Out Noise

Vector isolation with magnetic stereo cartridges is the first electronic step in noise reduction of records. From a stylus' eye view, the surfaces of all old records are rough and produce movement in unwanted and irrelevant directions. Vertical grooves will have lateral noise and lateral grooves will have vertical noise. By phasing out the unwanted signals, an optimal S/N can be obtained (minimal noise prior to any filtering or expanding). With selective wiring, a magnetic stereo cartridge can play four kinds of grooves: stereo, lateral, vertical, and hybrid. A pure lateral vector is produced by wiring both channels in parallel; the two hots are jumped together and these become the hot leads into the phono preamp's inputs and the two grounds are jumped together, becoming the shields. A pure vertical vector is extracted by jumping the left hot to the right ground, this pair becoming the hot leads into the phono preamp's inputs. Similarly, the right hot and left ground are tied together and these become the shields. Hybrid grooves are neither vertical nor lateral. Supposedly cut at 45°, discs such as these will require some experimentation for each case. A characteristic that is a perfect 45° should be played out of

either side (but not both) of the cartridge. A groove cut more towards the lateral characteristic will play better with lateral wiring. Similarly, a characteristic resting between 45° and 90° might play better with the vertically wired configuration. Additionally, an arm, such as the SME 3012, which enables the cartridge shell to be rotated about its axis can be immensely valuable. Turning the stylus towards the rim or center of the disc can also improve the tracking of these peculiar grooves.

Vertical vectoring requires *isolation* of the two ground leads coming from the cartridge. An arm whose wiring provides common grounding of the left and right shields will short out when vertical circuitry is introduced. Therefore, a check with an ohm-meter or consulting the arm's manufacturer would be in order prior to making any wiring alterations.

The thin, delicate leads in tone arms and cartridge shells can obviously not withstand continual changes; sometimes they don't even survive original installation! A mechanically efficient and safe way to provide a choice of isolated vectors is to set up individually wired shells and cartridges, three of which could handle any kind of groove: stereo and hybrids, lateral and vertical. Fitted with a microgroove stylus, the lateral shell would improve S/N on monaural LPs and 45s. Similarly, the stereo shell would serve the dual functions of playing both old and the most modern discs. If your tone arm does not provide interchangeable shells or you wish to work with only one cartridge, then a switched circuit which would enable all three wiring configurations can be inserted between the cartridge and the phono preamp's inputs. The functional advantage of this switch is that it enables instantaneous comparisons against the three possibilities without tedious cartridge or shell changes.

### Styli Considerations

If 60 years ago it was recognized that the customizing of styli was necessary, then the drastically increased transparency of modern equipment intensifies the importance of that approach. No filters, equalizers, noise gates or other signal treating devices can compensate for less than perfect tracking. Not only are the discs' grooves sized differently from the 2.5 mil "standard," but justifications exist for using styli which barely conform to them at all! For example, if in a lateral groove mutilation has occurred towards or at its bottom, then a stylus which has the capacity to ignore that region would presumably produce better results and, in fact, it does! Analogous to trying to avoid potholes when driving, the idea is to select a stylus which can offer a smoother ride through those spiral-shaped Grand Prix courses we call old records.

There are two kinds of stylus alterations which are effective for improving the tracking of grooves: truncation and extraordinary sizing. For these techniques I am in debt to Robert B. Carneal, Acting Chief Engineer of the Record Music Division of The Library of Congress, and Martin L. Kite of Woodbridge, Virginia. The ensuing recommendations are based upon Kite's assiduous research into original technical data and Carneal's stereo-microscopic evaluation of grooves. The Library, having had the budget to purchase the necessary experimental equipment and expensively priced (e.g. \$80 per stylus!) customized Stanton styli, proved the importance of this aspect of restoration.

A truncated stylus is one with its tip ground down so that its height is disproportionately shorter than its diameter. As if a ball having a given diameter were placed in a slightly narrower hole, a truncated stylus which perfectly fits a lateral groove will not reach the bottom. Resultantly, less offensive information is fed into the system. An obverse demonstration of this effect can be evaluated with most 78s by comparing their sound when played with both microgroove and "standard" styli. The former, due to their small size, will emphasize lower altitude information and produce more distorted, noisier,

and lower level signals. (With a small number of discs, the microgroove stylus will produce a better sound.) On vertical grooves, a truncated stylus will function as a noise gate by tending to ignore the more minute indentations which cause high frequency noises. Careful observation of this effect must be made to insure that an incorrectly chosen stylus is not ignoring low level passages as well!

Extraordinary sizing further enables the audio archaeologist to discriminate against parts of grooves and to contend with unusually wide, narrow or mutilated ones. For example, the most useful parts of a particular groove might be so close to the surface that even normally sized truncated tips will not produce optimal results. Returning to that ball in the hole, given that the ground rules induce us not to alter the size of the opening, the only<sup>6</sup> alternative is to change the sphere. Some discs' grooves are so wide that normal styli play too much of their floors: these are over-modulated (too loudly recorded) signals made by conventional sized cutter heads and correctly leveled signals inscribed by abnormally large cutter heads. Over-modulated discs rarely occur among commercial pressings and abnormally wide grooves seem to be most common amongst acoustical discs. Exceptionally narrow grooves are usually found amongst transcriptions, including Victor's notoriously noisy long playing records issued in the 1930s. Contrary to most collectors' assumptions, they were not cut with the conventionally wide grooves of that era and will sound unnecessarily noisy when played with "standard" styli because too much of the usually mutilated groove ceilings are picked up by them. Edison discs and cylinders, especially those elusive 12-in., 20-minute high speed Diamond Discs also have particularly narrow grooves.

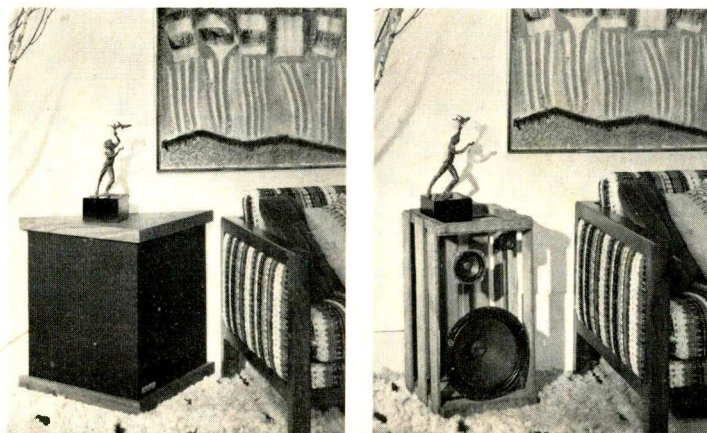
A variety of styli is often necessary to play one recording. Mutilation, over-modulation, or sub-velocity grooving<sup>7</sup> will

mean that as the recording is played, the characteristics of the grooves are changing. The object of having a choice of styli, whether to play one disc or an entire collection, is to establish a compromise amongst noises, distortions, and signals. International Observatory Instruments<sup>8</sup> sells special styli from stock on Shure assemblies for the M44 cartridge body (they seem to work equally well on the M90 series). I.O.I.'s offerings include a truncated Shure N44-3 2.5 mil diamond as well as assemblies for Edison vertical grooves and the "ball cut" Pathés which have wide, shallow modulations. Their workmanship is impeccable, but I question the advisability of supplying these useful styli in assemblies which start to collapse as tracking forces are set to exceed three grams. Perhaps heavy by contemporary standards, this weight is too light to resist the inertia developed by styli speeding along those bumpy grooves at about 78 rpm. What results is continual launching of the stylus not out of, but just enough above the grooves' correct playing altitude to cause inconsistent noise. Due to psycho-acoustic reasons which prevent us from adjusting to rapid and continual noise fluctuations, this kind of interference is, at least to me, unbearable.

The Stanton 500 cartridge fitted with their D5127 stylus assembly is a stereo unit which tracks satisfactorily up to 7 grams. Splendid for playing new or old discs, its only drawback is that the 2.7 mil stylus produces too much noise on every kind of old groove on which I have tested it. Similarly, G.E.'s monaural VR11<sup>9</sup> cartridges have heavy tracking capabilities which extend up to 30 grams. The intimate tracking capabilities at such high weights produce spectacular results with older acetate recordings and are required in cases which dictate manual manipulation of the arm through and past points where grooves have become locked due to mutilation. No other stylus assemblies I have worked with can withstand



## Tri-Planer Speaker Systems<sup>\*</sup> The alternative to the "Orange Crate"



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that kind of abuse. Additionally, the G.E. 4G-02D and 4G-03D 2.5 and 3.0 mil diamonds are particularly useful in both conventional and truncated formats. The terrific aspect about the G.E. single or dual stylus cartridges is that they are so inexpensive. Priced at about \$5.00 without styli, their cost makes feasible a truly professional cartridge set-up: one stylus assembly per cartridge per shell.<sup>10</sup> I have learned the painful lesson that even with cartridges designed for this capacity, continually changing stylus assemblies jeopardizes their delicate structures and wears out the cradle parts into which they are inserted.

Since no cartridge manufacturer I know of will cooperate to the extent of supplying stylusless assemblies, we are required to pay an expensive premium for the ability to order customized styli. The Stanton 2.7 mil assembly (the last time I purchased one) costs \$12.00. G.E. assemblies can be purchased for about \$2.00 by ordering the cheapest sapphire points; G.E. or Recoton replacements are equally acceptable. For vertical and lateral discs, the minimum library of sizes should be 2.5, 3.0, and 3.5 mil truncated. Should you work with transcriptions, then a 2.0 mil truncated will often be useful. Frequent encounters with old acousticals will probably warrant styli ranging from 4.0 to 5.0 mil. Increments in size by tenth mils, instead of half mils, conceivably would be justified but economics of cash and time leave me inclined to settle for the sizes I have listed. Vertical discs which are not mutilated might require non-truncated versions of the indicated sizes. Custom mounting and grinding of all the styli I have

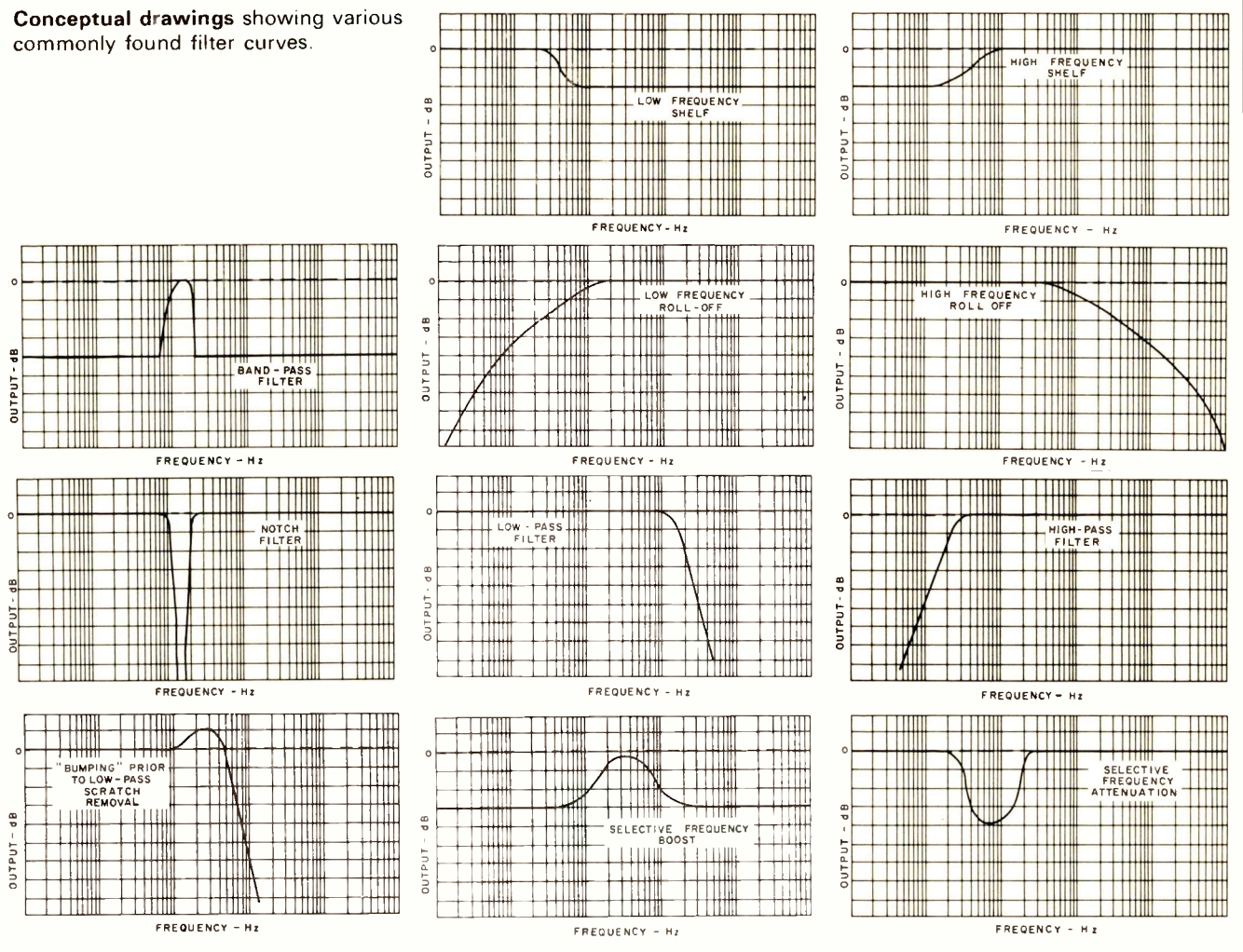
discussed is available from either I.O.I. or Expert Pickups Ltd.<sup>11</sup> I suggest that prior to placing any orders, you obtain comparative estimates for the same items. The costs for these services are reasonable. Expert Pickups charges approximately \$9.00 for a first-class diamond installed in a customer's assembly. I believe that both firms' rates are competitive.

### Signal Treatment

Whether working from your own originals or taped duplicates from other sources, equalizing and filtering are the least difficult aspects of restoration. The results you achieve at these stages are predicated upon what you have first done to prevent noise and distortion (i.e. optimal tracking). Additionally, factors such as the effectiveness of your signal treating equipment, the transparency of your playback equipment, the listening environment in which you work, and the state of your hearing will affect the caliber of your endeavors. Psycho-acoustic factors such as masking and phase re-enforcement also affect your perception of signals. Interestingly, when high frequency noises are superimposed upon programs, the recordings sound more crisp. Resultantly, their removal unnecessarily accentuates muffling effects. Similarly, noise is not so easily perceived in a noisy environment and there are days when due to illness or attitude, you find yourself "not hearing right" and unable to make qualitative audio evaluations.

Broad and narrow band noises are the two fundamental categories into which most sonic disturbances fall. Unfortu-

**Conceptual drawings** showing various commonly found filter curves.





nately, most occur (are loud enough to be heard) amongst the same frequencies which contain the recorded sound. Clicks, scratching, rumbling, and multiple harmonic distortion are broadband noises. Hums and whistles are usually very narrowly banded. Regardless of their type, the objective is to diminish them with as few adverse side effects as possible. With varying results, both equalizers and filters can be used to reduce broadband noises. The distinctions between these two kinds of devices are conceptual and, I think, subjective. When their characteristics are plotted, filters are usually identified by straight graphs as compared to the curved ones of equalizers. Indeed, some devices are capable of producing either kind of pattern. The terminologies used to describe filter and equalizer effects are derived from geometric descriptions of their response curves. An equalized characteristic is also defined by the frequency at which it is most pronounced. Curiously, much of the industry labels filter coordinates by the frequencies at which they are down 3 dB from a reference level: rather anachronistic considering the 50 dB attenuation capabilities of the new generation of filters! A slope of X dB/octave is also a vague means of reference: I think that filtering functions are more easily understood by citing the attenuation achieved at the frequencies with which one is concerned. The diagrams demonstrate the kinds of frequency effects which are produced by filters and equalizers.

Theoretically, the device most ideally suited for contending with any kind of noise and equalization problems is a third-octave equalizer which is actually a set of narrow band-pass filters whose effectiveness can be individually adjusted. The third-octave-wide bands are approximately the most subtle frequency widths whose changes can be detected by the human ear<sup>12</sup>. When devices such as these are manufactured with adjacently mounted sliding potentiometers, they are often

called graphic equalizers because the control's knobs simulate a graphic representation of the response curve produced by the unit. Certainly more glamorous, interesting and expensive than units with rotary pots, their *only* advantage is the instantaneous plotting capability. A graphic equalizer is not necessarily more effective or desirable simply because of its mode of operation. The value of such a device depends upon the filtering capabilities of its filters and the durability of the pots used in its construction. The functional depth of a notch is measured from its bottom to the system's reference level, so each filter's output should be set to maximum. Resultantly, the greatest possible filtering effect will occur. Once an optimal set of adjustments for all noises and distortions has been made (these will usually be narrow notches for hums and whistles, and severe low passing after certain frequencies), then additional corrections for tonality should be attempted. Most of the tonal adjustments you will find necessary are due to the old discs having been recorded with curves which do not correspond to modern RIAA standards. Depending upon the characteristics of noise and signal, some settings for optimal noise reduction will preclude correct tonality and some kind of compromise will have to be established. For example, bumping the curve on the left side of a notch or prior to a low pass slope will help to minimize muffling when contending with severe amounts of noise in the 5-10 kHz range. Narrow band disturbances can usually be eliminated by this kind of device without affecting tonality. A newly touted application for these units is the flattening out of the response characteristics of listening environments. That kind of adjustment is made very infrequently; after original installation it is only necessary when the environment has been changed. The caliber of pots used in some of these units acknowledges the fact that you don't redecorate your room as frequently as you



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Heavy 12-inch acoustic-suspension woofer with massive magnet and low-resonance cone produces powerful true bass to the very lowest regions of musical sound.

3/4-inch Mylar dome tweeter projects uppermost highs with exceptional clarity over broad arc, resulting in "open" sound with accurate stereo space image.

Contour control with four distinct settings permits precise acoustic matching of the WDDS-12 to the acoustic requirements of almost any listening room.

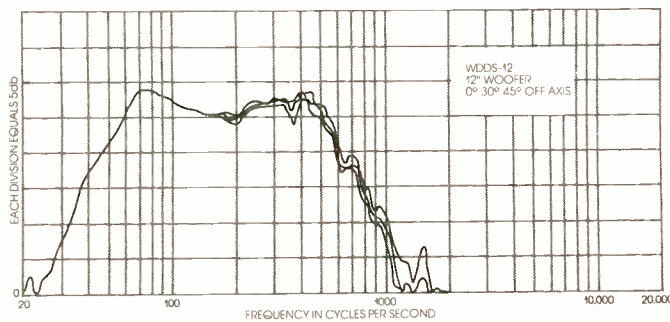
1 1/2-inch Mylar dome tweeter assures smooth frequency transition into midrange while providing wide dispersion and crisp transients in the crucial "presence range."

Optional base in handsome matte black

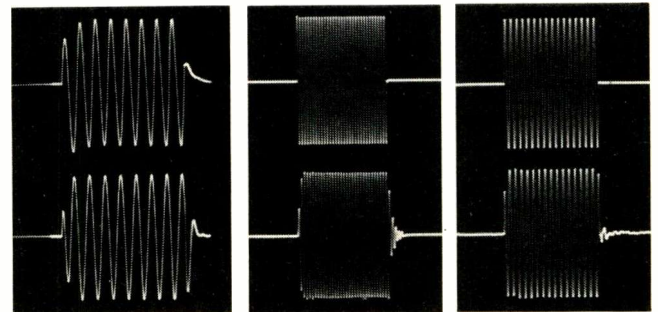
Angled dome tweeters generate a uniform sound field over 120° dispersion. Location of all drivers in the same curved plane, creates a Wide Dispersion Discrete Source (WDDS), vital for realistic stereo location and making the most of the speaker's outstanding transient response. WDDS avoids spurious sound scatter and infuses the sound field into the listening room in a pattern virtually analogous to that of a stage or auditorium performance. As a result, the listener remains unaware of the speaker — the music seems "simply there!"

### WDDS-12 SPECIFICATIONS

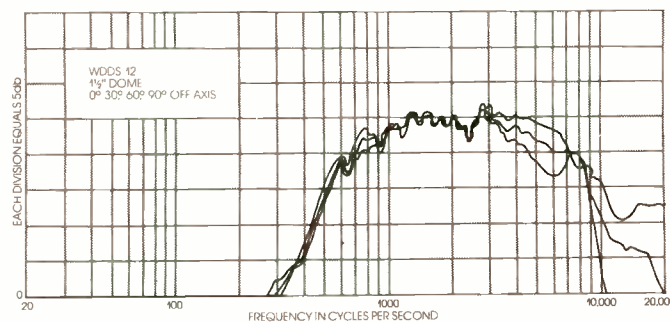
- NOMINAL IMPEDANCE:** 6 ohms
- FREQUENCY RESPONSE:** 30Hz - 25KHz  $\pm$  2 db. Average over 120° lateral radiation field and anechoic conditions above 300Hz.
- LOW FREQUENCY DRIVER:** 12" high compliance, heavy duty.
- HIGH FREQUENCY DRIVERS:** Two 1 1/2" dome radiators and two 3/4" dome radiators.
- CROSSOVER FREQUENCY:** Crossover takes place gradually between 600Hz and 5KHz.
- DISPERSION:** Frequency Response varies by no more than 3db from the "on axis" response over a 120° lateral field.
- GUARANTEE:** 5 years, as detailed in our guarantee form. All service to be carried out by authorized dealer or agent, eliminating need to return speaker to factory.
- PRICE:** \$350.00



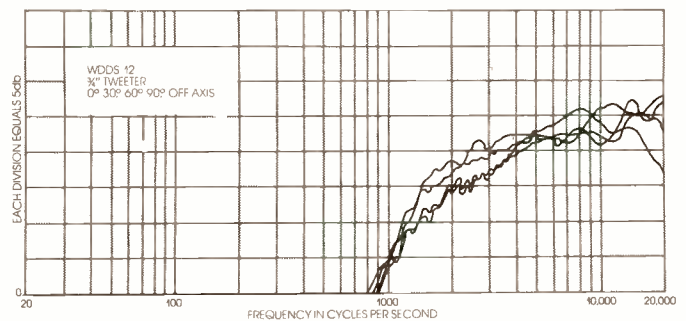
Woofer response, on and off axis, shows effective output below 30Hz, reaching the lowest range of musical sound.



Woofer tone burst at 45Hz and supertweeter tone burst at 16 and 4 kHz attest remarkable clarity of transients throughout audible spectrum.



Tweeter response curves on and off axis almost coincide, proving uniformity of sound spread in listening space.



Supertweeter response curves off axis also closely parallel on-axis response, showing superior sound dispersion.

Introducing the WDDS-12 Pritchard Loudspeaker System

# More confusion?

There are literally hundreds of speakers on the market. There are 2-way systems, 3-way systems, omnidirectional, rearward sound projection, et al. All, according to their makers, are outstanding. And, frankly, several are.

Small wonder the public is confused. And good reason why serious listeners rely on expert opinions, as well as recommendations from knowledgeable equipment owners.

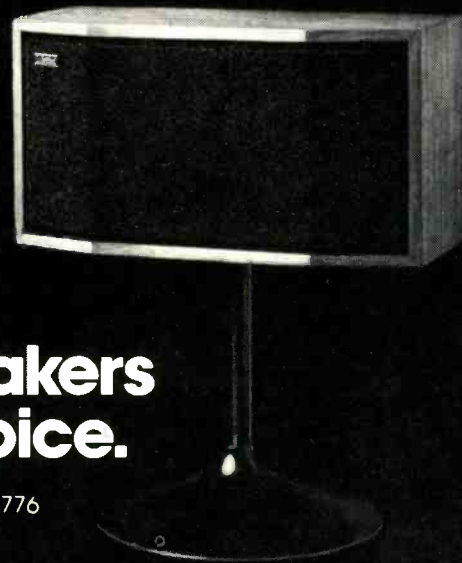
Our new Pritchard system will surely add to the confusion. And our claims will fall, unfortunately, on many deaf ears.

But among those people who, over the years, have learned to separate fact from fiction...who trust their own ears...and who respect "inside" opinions, this new speaker will be a revelation.

If you're a serious listener, unfamiliar with ADC speakers, we urge you to talk to people familiar with our products. They know that, among the relatively few outstanding speaker systems on the market, ADC's line ranks among the best. And, now, with the introduction of the Pritchard System, ADC's probably number one!

For most, the confusion about speakers will continue. For some, the WDDS-12 Pritchard System will shout "hello."

**ADC speakers  
-the insider's choice.**



 AUDIO DYNAMICS CORPORATION, Pickett District Road, New Milford, Conn. 06776

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change recordings. Thus, units marketed for this application rarely hold up under the continual use to which they'd be subjected in daily restoration. One-third-octave graphic equalizers capable of 50 dB attenuations, such as B&K's<sup>13</sup> luscious model 124, cost over \$2,000 per channel. Units which are not equivalently priced usually contain less durable pots but are perfectly acceptable for environmental equalization.

Now that you've fallen off your seats, I can assure you that you don't have to sell the family's jewels, or your car (with the gasoline shortage, maybe you should!) in order to accomplish such extensive noise reduction. In fact, the myriad of possibilities offered by such sophisticated devices are often impediments to efficient operation because too much experimental time per recording is required. Segregation of filtering and equalization functions are easier to adjust. Equalizers whose controls are less selective (e.g. one octave) are more useful, especially when taping performances which occupy more than one side of a disc. Be they inside or outside start records, equalization must be continually adjusted as the disc is playing so that when juxtaposed, the tonality of one's outer grooves matches that of the other's inner ones. Formerly marketed as "record compensators," new, more sophisticated equalizers with rolloff, shelving, and selective boosting and attenuation are now readily available to consumers. Usually with  $\pm 10$  dB ranges, they are satisfactory for most purposes, although not as versatile or effective as the very costly "professional" units such as those manufactured by Pultec<sup>14</sup>, Lang Electronics<sup>15</sup> and Martin Audio<sup>16</sup>.

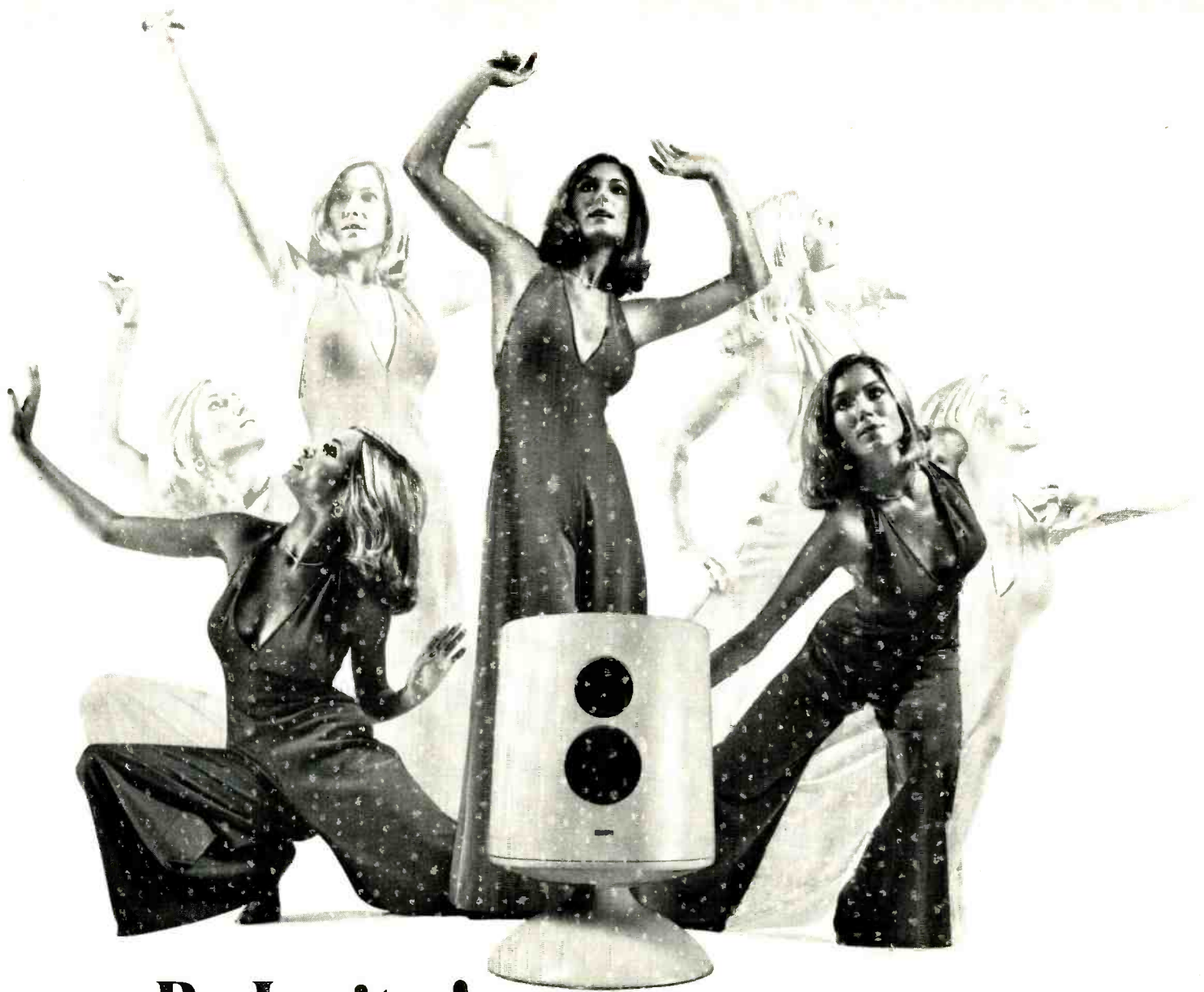
Cost and effectiveness considered, the most precious instrument you can acquire for restoration is Universal Audio's Little Dipper filter set<sup>17</sup>. Priced at about \$425, this remarkable device is so versatile and so effective that my first exposure to it was a revelation. A single-channel unit, it consists of continuously variable high- and low-pass filters, both with 18 dB/octave slopes. More spectacularly, there are two independently operable, frequency-selected filters, each with six functions. Functional from 20 to 22 kHz, these can act as narrow-, medium- or wide-notch or bandpass filters<sup>18</sup>. Additionally, the entire unit can be used as a selectively boosting equalizer. Tuning out obnoxious frequencies is as easy as tuning a radio; the notch controls are adjusted until the disturbances are least conspicuous. Capable of attenuation down 40 dB from reference levels, one Little Dipper can provide two of the same or different notches simultaneously.

Although two are frequently inadequate, terrific results can be obtained by a simple technique. For example, I prefer not to rely upon tape encoding systems. Therefore, the records intended for restoration are taped in anticipation of filtering the master upon playback. Resultantly, those frequencies amongst which both tape hiss and 78 noise predominate are not filtered when the disc is recorded. Instead, the first pass through the unit contends with narrow band noises and, in the case of severely scratchy surfaces, middle highs. When the tape is subsequently played back after repatching, the rest of the noises are then treated and with them, any tape hiss. The tape master's S/N is then so low, that hiss in any silent sections cannot be distinguished from a tape which is not moving at all! Expectedly, this two-stage filtering technique enables first generation quality on any dubs made from the tape master. If due to that perennial problem of money, you are compelled to choose between *any* equalizer and this device, sacrifice the equalizer. Once you have heard a whistle or hum disappear with no adverse effect upon tonality, you will agree that my enthusiasm is justified.

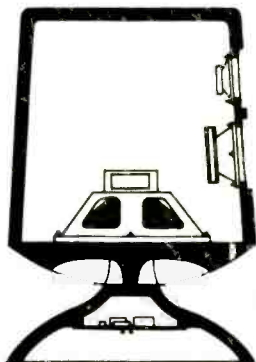
Given that you might not be able to indulge in a Little Dipper, I respectfully suggest that the less expensive consumer equalizers alone are not useful compromises, good as they are for room and speaker equalization, because they lack a range of effectiveness necessary for dealing with 78 noise. Prior to my becoming "professional" and not being able to afford studio caliber equipment, I experimented with filter and equalizer circuits and developed the Sonic Attenuator. A passive device containing a severe low-pass filter (i.e. calibrated in 2 dB steps down to minus 22 at 5 kHz), the unit has an insertion loss of about 16 dB due to the inclusion of an equalizer circuit. Adjustments for 100, 1 k and 10 k curves are independent of the filter, and I am convinced that for restoration, it is disproportionately effective for its price. Its price, you collectors, leaves you free to continue purchasing those old discs! The two-step taping technique which I described earlier is equally applicable. The equalizer section is used to make the master tape, and the low-pass filter is used to play it back. Should you already have made an investment in an equalizer such as those sold by Soundcraftsmen, JVC, Frazier, Metrotech and Allied-Radio Shack, then their value in restoration can be greatly enhanced by a steep low- and high-pass filter set. I even use these to supplement my "professional" equipment and would like to have a chance to sell you one. A full-track demo tape containing before/after comparisons and commentary is available for \$2.00, cost deductible from any purchase. Hope to hear from you!

Editing is an effective but tedious, expensive and often painful way to eliminate skipping, locked grooves, and the loud pops and clicks which persist despite applications of all other techniques. It can be done either by cutting the tape or removing sections of oxide. Both approaches have serious disadvantages. While removal of oxide maintains the integrity of pace, the trial and error nature of this procedure can be very costly in time and material. Should a mistake be made, the tape cannot be reused to re-record that section of the program. Conversely, cutting into the tape can jeopardize timing. I prefer the latter technique because removed sections can be reinstated. With painstaking shaving of the open splices, they can usually be made undetectable upon playback. Whichever technique you prefer, this sort of complex work must be performed at no slower than 15 ips because quarter-track or narrower spliced signals usually "blip" when they pass over their playback heads. Additionally, the taped signals must be sufficiently dispersed throughout the tape so that the sections to be eliminated can be exactly isolated. I personally cannot envision a serious recordist editing within sounds at





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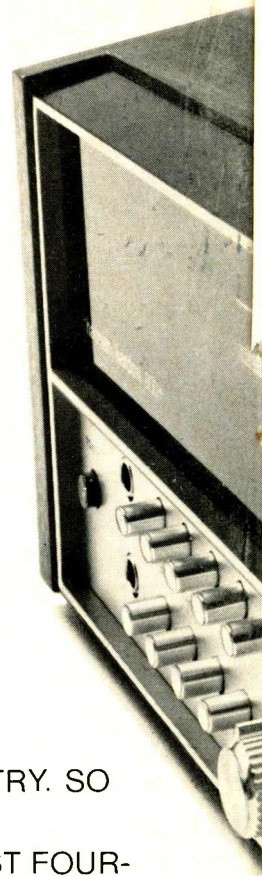
THIS 900+ IS THE CREAM OF THAT LINE.

IT CARRIES BOTH DISCRETE AND MATRIX FOUR-CHANNEL CIRCUITRY. SO  
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THE 900+ PUTS OUT AN ASTONISHING 32 WATTS PER CHANNEL,  
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INSTEAD, IT USES A UNIQUE PHASE SHIFT NETWORK TO PRODUCE AN ENHANCED  
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WILL SOUND BETTER THAN EVER.

BUILT INTO THIS REMARKABLE MACHINE IS AN ANALOG COMPUTER THAT  
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speeds less than 15 ips. The consumption of tape in this process is extreme, and it is often necessary to duplicate a playing copy to avoid jeopardizing a master which might have hundreds of splices in it.

There are a few techniques which you might want to try that are indigenously tied in to the taping process. Since most 78 noise predominates the same frequencies which modern tape machines easily record even on cassettes, slow speed taping is not one of them. Similarly, mis-biasing is not desirable because a severe reduction of highs will be accompanied by inadequately low levels. Substantial high-end rolloff can be achieved when recording by deliberately misaligning the record head's azimuth. Since the performance of the playback head is the criterion against which the recording functions of a machine are evaluated, it is prudent to restrict this practice to the record head. By feeding a high frequency (e.g. 10 k or higher) tone into a recorder, the head can then be easily reset to produce the highest possible levels as read by the untampered-with playback head. Frequent performance of this operation is not advisable because most head hardware is not designed to withstand the stresses of continual adjustment. It should be conducted only as a last resort.

Some tape machines incorporate a completely safe and effective way to roll off highs. If their controls separately adjust motor speeds and recording equalizations, then all that is necessary is to record a tape with an equalization intended for a higher speed. Tapes recorded with 15 ips equalization will be down 10 and 20 dB respectively at 7.5 and 3.75 ips. Conversely, a tape recorded with a lower speed's equalization will have an accentuation of highs. Of course, there are internal adjustments for recording equalization on any recorder, but as with the head hardware, the delicate coils, capacitors, and pots cannot survive frequent adjustments. Mastering at less than 7.5 ips on track widths narrower than 1/2-track is ill-advised because sound dropouts abound on slow-speed, narrow tape tracks.

Most collectors consider the addition of echo or reverberation as an inexcusable travesty of good taste and integrity. Without getting involved in the philosophical aspects of the matter, I would like to at least suggest a correct way to do it. If a tape has not been thoroughly declicked, then all of these singular noises will be accentuated by such effects. Therefore, it is advisable to treat only the middle and lower frequencies. Echo circuits built into tape decks cannot be so selectively operated. Some units, such as Fisher's "Spacexpander," are easily switched to act in that manner. Should your echo unit (an auxiliary tape machine with separate playback and record heads can be considered to be an echo unit in this application) not have this capability, then you can achieve this effect even without a mixer.

The remaining electronic techniques which are useful for restoration involve the manipulation of dynamic range. From simple riding of gain to the most expensively designed limiters, compressors, and expanders, this is an important aspect not only because it helps produce correctly leveled tapes, but also contributes to improved S/N. A volume expander (which makes loud passages even louder) will reduce background noise because overall listening levels have to be diminished. Using these to record tapes is quite difficult because volume peaks become frequent and intense. When used in playback circuits either directly from an original source or a tape, an expander operating at about 8 dB will reduce background noise by that much. If the restored recording contains substantial levels of background noise which, due to any consideration, is clearly heard, then the breathing or "swooshing" effect of that noise being pumped in and out of audibility will be particularly obnoxious. The expandability of

a recording is determined only by trying it. An expander which operates in the area of 40 dB is a noise gate which ignores signals whose levels fall below that, or any other preset threshold. Unless a restoration has background noise levels comparable to modern recordings, noise gates will produce peculiar and undesirable effects with them.

Whereas most electronic recordings will benefit from expansion, most acousticals require compression or limiting. Recording artists' proximities to the recording horns were adjusted according to the volume they produced so as to avoid overloading the cutting mechanism and breaking the groove walls. Vocalists and soloists would lean towards and away from the cones as a further means of dynamic control. Despite those primitive efforts at volume control, these old records frequently have peaks which should be diminished for correct taping levels and listening comfort. DBX's 117 "decilinear" system not only enables expansion and compression, but tape noise reduction as well. One other device I should mention is the old Fairchild "Compander," which requires an auxiliary amplifier to drive its sensing circuits. It can be driven by your monitor amplifier, but that would make its efficacy dependent upon your listening levels.

I hope that I have shown the feasibility of more sophisticated technical approaches to playing old recordings. Too often collectors do not derive full enjoyment from their discs and even more frequently, the old radio buff is saddled with pathetic, inept transfers. Depending upon your available time and funds, there are obviously many ways in which restorations can be pursued and I think that this information can help anyone interested in the subject.

## Footnotes

1. "L.P." denotes Columbia's microgroove process and is not synonymous with "long playing records" (e.g. Victor catalogues began listing 33 $\frac{1}{3}$  "long playing records" in 1931).
2. Firms which specialized in "budget" labels recorded acoustically until the late 1920's.
3. In their original contexts, "gramophones" played discs and "phonographs" played cylinders.
4. At the time of this writing, I have not yet been able to determine if "The Father of Radio" actually participated in the development of this kind of record or simply leased his prestige to the company.
5. Coated and uncoated aluminum discs were not designed to be played with steel needles which, due to their hardness, would grind down the playing surfaces. Many of these were subjected to that kind of abuse.
6. Technicians, i.e. artisans, used to hand polish wax masters and metal parts to reduce noise. The discs with which we work could conceivably be so treated, but only at great expense of time and considerable possibility of ruining them.
7. Innermost grooves of a disc have a slower velocity than those at the rim and therefore have more restricted dynamic range; grooves cut too close to the center will have substandard characteristics.
8. International Observatory Instruments, Inc., 5401 Wakefield Drive, Nashville, Tennessee 37220.
9. According to Martin Kite, the G.E. stereo VR11 cartridges have unacceptably high distortion characteristics.
10. The G.E. "dual" cartridges can accommodate two styli and this makes them even more economical to use. Most cartridge shells will have to be drilled to allow use of the turn knob.
11. Expert Pickups Ltd., P. O. Box 3, Ashted, Surrey KT21 2QD, England.
12. I.S.O. center frequencies for these component filters are, in Hz: 20, 25, 31.5, 40, 50, 63, 80, 100, 125, 160, 200, 250, 315, 400, 500, 630, 800, 1k, 1.25k, 1.6k, 2k, 2.5k, 3.15k, 4k, 5k, 6.3k, 8k, 10k, 12.5k, 16k, and 20k.
13. B&K Instruments Inc., 5111 West 164 Street, Cleveland, Ohio 44142.
14. Pulse Techniques Inc., 1411 Palisades Avenue, Teaneck, New Jersey 07666.
15. Lang Electronics Inc., 14 East 39 Street, New York 10016.
16. Martin Audio Inc., 320 West 46 Street, New York 10036.
17. United Recording Electronics Industries, 11922 Valerio Street, North Hollywood, California 91605.
18. Defined by UREI as 3 dB down at 5%, 10%, and 50% of the center frequencies of each notch or bandpass configuration.



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## Reflections on the Disc (II)

**T**HIS IS REFLECTIONS (II) because my thoughts on Total Everything last month turned out to be mostly about the good old disc. Couldn't help it. The disc Marches On, as Time, Inc. used to say. Around 1950, people began asking me if tape recording would put the phonograph record out of business. (I wasn't old enough to get asked concerning radio, back in the twenties.) Putting forth my most important prognostication voice, I would say, NO, I don't really think so. Sounded prophetic. I'm still saying it, and it sounds as fatuous as it did then, even if true. Just so long as there is any home sound reproduction there will be some form of disc at hand for the playing to choice, i.e. a flat recording that turns on its own axis and is furnished with a spiral sound track, visible or invisible. So that's that. Next question?

Well how long, then, will the present continuously compatible disc system exist, in all its partially compatible variations from 78 to 33 and mono to quadraphonic? Summoning up my most pompous expression, I announce to you that it will last quite awhile, yes indeedy. And I betcha I'm right. What with all those new TV whirling-dervish discs, the limp cellophane platter with the astronomical bandwidth, the overhead travelling-crane pressure-cartridge, the radar this and the magnetic that, even the seeing eye itself, laser-style, for trackless tracking? (I'm getting my species a bit mixed but no matter.) Yes, with all of this at hand, I still opt a future for the present disc. Too good a thing to lose, just yet.

Our discs are like our cars. Both are now outdated by fast moving circum-

stances. Yet both involve immense vested interest in continuity, not only in the whole area of design and manufacturing but, dovetailed in with this, in the ownership end as well. The product in its environment! Even more important, both the disc and the auto represent *culminations*, the fruit of three-quarters of a century and more—in both cases—of long, intense experience in production and in the feedback of correctives that can only come through widespread *use*. (Why do I talk about these things? Because this is the way it is, too, in music, in any art.) A sudden replacement—any replacement—for either of these paragons of our industrial development is absolutely bound to be fouled up and full of bugs (I didn't say beetles) for at least a decade, and maybe twenty-five years. It'll take that long before the parameters of the new design and production and the smooth mores of public usage work out once more to the present enviable sort of perfection. Pick nits if you will. Today's cars/discs are almost irreplaceable.

It is always that way. (And in art too, of course.) The new and untried has all the glamor, and the *potentiality* to represent the present age far more directly than the old. Yet the familiar product, increasingly unrepresentative, continues to gain weight and impressive forward inertia to a degree (in automobiles, discs and Bach) that is awe inspiring. So—if we are to have electric vehicles and fuel cell buggies or, maybe, nothing but mass transport in every back yard, if we are to have wholly new forms of disc that will outmode present home equipment, then won't we lose more

than we will gain? This is the stuff that revolutions are held back with! Eventually, the biggest inertial force can't stop change, but in the face of such challenges we all go conservative—we have to. Too much is at stake. Therefore: The automobile will survive awhile longer, mildly modified and in the tradition. So will the present disc. No miracle-technology except the Bomb will dislodge either one of them tomorrow morning or next month.

So saying, let us move on to a more pettifogging look at the continuing disc, sidestepping quadraphonics (a mild modification), for the moment.

The disc may be a culmination, but we get a lot of complaints. Evidently some discs are unworthy of so great a tradition and the people who buy them are annoyed. These gripes center in two areas and it might be worthwhile to speculate on them from a consumer's point of view. No use blowing off steam up the wrong trees, if you see what I mean. For some people it is poor disc material—too much noise, ticks and pops and intermittent hisses, the normal ills of less-than-perfect vinyl. For others it is the physical aspect of the disc itself, warps, off-center holes and so on. Today indeed is a bad time for quality standards, as it always is in a period of inflation, which tends to induce sagging quality as prices soar.

Funny, then, that the records I receive for review have never been better. I have no complaint. Only wonder. No ticks, no pops, no warps, no wows. Very seldom, anyhow. It appears that review copies sent to magazines are of better quality than at least some of those sold in the stores. Nefarious?

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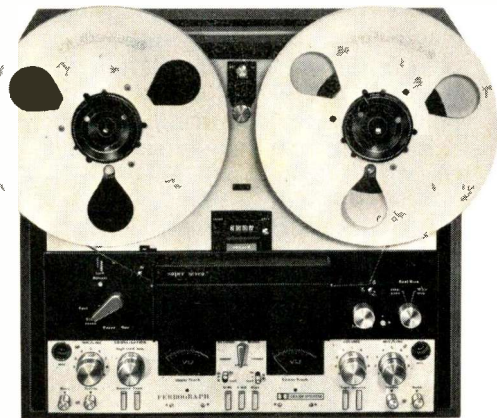
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I think not. First, review copies are necessarily early pressings, straight off the first and the best stampers. Second, consider that no company has the manpower to *select* good pressings to send out perhaps to 300 magazines and newspapers and hundreds of radio stations. Not individual discs, anyhow, and how else can one avoid warps, unusual noise, and so on? The most that even a big company could do would be to select individual runs or batches known to be of good quality—but as I say, this is automatic in any case. It's the occasional bad run that is the exception, and that doesn't get to reviewers on purpose, you may be sure.

Yes, I'd say that in general, and in the large, U.S. pressings are inferior to those pressed in Europe, with individual exceptions of course. This is my strong impression, over the years and very much still today. Why? My guess is that it is mainly a matter of manufacturing attitudes, not economics. European manufacture continues to be constructively conservative, slower moving, more concerned with high standards in a smaller market. (Or, for that matter, in a larger market.) Why else are Philips, Deutsche Grammophon Telefunken discs so wondrously smooth and shiny and quiet? They want them that way.

We are not quite so concerned, on the average. We can always make it up in advertising. If it isn't good enough—correct the public relations. That habit seems to me the most dangerous one that Americans have ever devised, because it allows us to undercut our own production standards. The worst of it is that it works, superficially, and works well. Here. So . . . to get back, it would seem that (a) our overall quality standards do tend to lie lower than those which subtend in Europe and (b) things being what they are, even these standards are involuntarily slipping a bit, here and there, under present pressures and worry.

Note that in tell-tale fashion the finest discs made in this country now come from small companies, via many an independent pressing plant. They care more. They have to. And they have every bit of technique they need. Note also that flagrantly bad discs show up most often in pop records, though *some* pop records are miracles of loud volume, high cutting level *and* clean sound. Of course we can do it when we want to. We very often don't. And you may read this as you wish. After all, we have to tailor the product to the market, don't we? All those cheap machines, kids, nobody cares. (Ah yes—but the cheap-machine people talk about all those cheap records.) Cynically, what's the diff if a few clunkers get into the stores.

Surface noises, specifically? First, the vinyl itself. But some noises are induced by the pressing process, bubbles and the like. Either way, oddly enough it is the small companies again who put more pressure on their (small) pressing plants for the good stuff and the right job. Alas, the big outfits can't do as well with their own built-in pressing plants. They are prone to that insidious inner lack of self-criticism—who dares endanger his job?—which is the bane of big business. Sometimes I am shocked at what can get by in these outfits, huge as they are, and I am sure their responsible officials are well aware of the problem. Then, too, a big company can sink for a long time and yet still swim. A small company does it right the first time, or else. Funny world.

Warps? That would seem to be all in a different area, the actual pressing process. If I am right, most such deformities are directly concerned with time and temperature, not with the vinyl mix itself. Somebody isn't keeping his machine up to scratch (!). Or could it be a discontinuity in the character of the vinyl—different melting temperature or such? I wouldn't know, but I suspect the pressing cycle is the prime fault maker. Warps, I should note, would not get into envelopes and out to the public if caught in time—but that brings up another possibility. Shellac records used to "pour" if left too long in even a moderately warm place. Fluid. Vinyl will pour too if heated and, I think, if deformed for too long a period. Shipping? Storage in the record shop? I still put my bet for most warps on the pressing cycle itself.

Wrong-sized center hole? Here we have to do simply with a matter of industry agreement. Both the record makers and the record player makers. Even the tiniest looseness at the spindle can cause an audible wow in your music and it is right to have a taut fit with no "play." But not *too* taut. The dividing line, or circle, is microscopic and complicated by the automatic turntable, where the disc must slip all the way down every time or foul the whole operation. Obviously there is minor disagreement, and we err (rightly) more often on the side of the too-tight fit than the too-loose one. Remember that this agreement on size is world wide, not merely American. Remarkable that it is as close as it is. I shudder when I remember the quickly-worn 78 holes that slipped back and forth with hideous wowing! I used to mark the rims of each record, where you should push so that the wow would to some extent cancel out. It was that bad.

We'll still make a profit. Give 'em a replacement if they insist. That's one local philosophy, anyhow.

Off-center holes? How do you determine the mathematical center of an irregular spiral? A nice question, and it used to be solved manually by a little man in the processing shop—I once saw him in action at Columbia. An elaborate whirligig and at the crucial moment, when all the gauges said OK (no eccentricity) you PUNCHED something. I forget what, and that was that. Now I gather it is done automatically. Anyhow, we used to have agonizing quantities of eccentric discs that wowed, even into LP times, but now a disc that wows is as rare as a bird that barks. An off-center hole, then, is a basic defect and the record is a dud, if ever there was one. I do note, however, that warping and stretching of the vinyl, out of a true spiral, can produce a wow even without the center hole being off. Another cause, and see above.

A last thought—don't blame the record for a fault that is elsewhere, and notably in your own playing equipment. It's often done. I have a fine flutter at the moment on piano records (it is masked in most other music) which I have traced to the tiny spindle on the phono motor. It wobbles precisely in time with the reproduced piano. Got bent somehow. A bent turntable can make a good wow, until you realize that all records have it, not just a given disc. Distortion, groove jumping (see Shure's ads) and other record faults are not necessarily in the record; you must be selective, at all costs. Few people are. And, as you can see (if you don't already know), you must also be very selective in assigning specific blame for faults in the discs you buy on the open market. Sometimes it isn't easy to pin them down, and not only the sales people but the record company officials may be mystified as to how it could have happened.

Oh yes—one final characteristic, obvious enough but not often kept in mind in the heat of disappointment. Some faults are *serial*—they go through a whole set of discs, a run, a batch, a carton, maybe an entire pressing. Others are in the individual disc, mainly warps, with no two alike. If you get a replacement, try it quick, for you may have exactly the same problem all over again, and no blame at all on the salesman.

I would say that it pays everybody, all the way along, to report all faults of this sort or that—but in every case the letting off of steam should be informed and constructive. Hence these modest reflections, and I expect we would welcome any sane contributions you may have to offer us, either to confirm or deny what I have said.

After all, it's feedback that makes the disc go 'round. Æ

# The Folk Process

Ira Mayer

WITH THE ADVENT of high quality portable recording equipment, and with the relative ease of present day travel, the concept of "oral tradition" in folk music—or what is sometimes known as "the folk process"—has undergone many changes. Bruno Nettl, in his *Introduction to Folk Music In the United States*, writes, "People learn some things through reading and other things by being told or shown. . . . Information which is passed from one person to another through speech is transmitted in oral tradition; songs, tales, methods of sewing, decoration, boat building, beliefs, proverbs, riddles may be transmitted in this way, and if so, they are classed as folklore."

In recent years, however, speech in its various forms, folk song being one, has been carried by ever more sophisticated media. Alan Lomax, one of the foremost American folk song collectors and scholars, once wrote in the *American Anthropologist*, "Previously the student (of folk and primitive song) had to depend upon acoustically poor recordings or upon musical transcriptions which were admittedly skeletal. Today the tape machine gives us a high-fidelity record of the folk performance in all of its tonal nuances, with none of its color lost or distorted."

Though the impact of the record on a primitive tribal society is, at best, minimal—having more to do with getting permission to record (or even



Photo: Suzanne Szasz

Sandy and Caroline Paton



Photo: Sherry Rayn

Pete Seeger



Leadbelly

observe) a particular ritual or ceremony than with the final tape itself—certainly its role in industrialized (especially urban) societies can be felt, if not scientifically measured. Consider the following situations:

\*Dr. Rose Brandel, an ethnomusicologist at Hunter College, begins each of her semester-long courses in Folk and Traditional Music, and Musical Cultures, with a lengthy discussion of the definition of folk music. For most of her students the term has meant Simon and Garfunkel, Peter, Paul and Mary, and for those interested in blues, perhaps Leadbelly. Dr. Brandel is quick to point out the difference between professional folk song interpreters (and writers in the folk genre) and folk music as it exists in its natural context.

\*Tom Paxton, present day singer and songwriter who has been labelled by the music industry as a “folk singer” once asked of his own compositions, “Are they folk songs?” His reply was that it “depends on your definition, really. Personally, I think it takes years to know for sure. Maybe a couple of these songs will hang around for a little while at least.”



David Bromberg

Photo: Columbia Records

B. A. Botkin, in an article on the folk song “revival” of the 1960s, summed up the problem as being “the substitution for ‘oral’ transmission of the ‘aural’ transmission of the phonograph, radio, and television.” The significance of this McLuhanesque play on words is not unfounded, however, for one will often hear a professional folk singer (of traditional music) introduce a song as “one I learned off a record by . . .” Thus, though the professional may have learned the song from a recording of, say, a work song as it was being sung in the fields, or a lullaby recorded while the mother was literally rocking her child to sleep, he will still have learned it outside of its natural context. By hearing it repeated in precisely the same fashion each time, his learning of the song may be more a matter of rote memorization than of the natural assimilation one generally associates with the passing on of a cultural trait.

\* \* \*

The development and significance of growing numbers of professional interpreters of traditional music, and of writers in the folk idiom, have also been effected by the phonograph record. Traveling minstrels, with their lutes and lyres, are common characters in stories of medieval court life. They, too, sang of people and events, relaying bits of information as they moved from one area to the next. But the modern day minstrel, because both he and his records can so readily travel, is likely to be reaching far greater numbers of people than one could have in the Middle Ages.

(It should be noted here that there are some performers in this professional category who make every effort to shun the tape recorder’s microphones. Bruce “U Utah” Phillips, one such person, can be heard in college concerts and in coffee houses, but since the days of a Prestige recording he now breaks when he finds a copy, even if he must buy it first, he has managed to appear on record only under an assumed name as an accompanist for a friend.)

Many of the professional folk singers in this country come from families with “legitimate” folk backgrounds—families that go back for several generations in a given area, and which have passed on their traditions from one generation to the next. Jean Ritchie and Hedy West, of Kentucky and Georgia mining families respectively, travel and record today, singing the songs they learned as children from their relatives and neighbors. Others, such as Michael Cooney, are

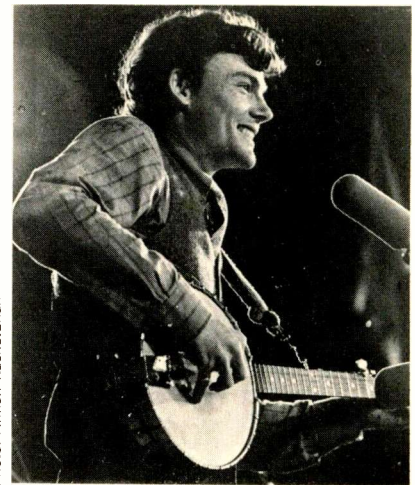


Photo: Armen Kachaturian

Michael Cooney

“not raised in, or bound to, any particular tradition,” as it says in the liner notes to his *The Cheese Stands Alone* album (Folk-Legacy). Cooney’s repertoire, as a result of his wide traveling and of his desire to pick up on various aspects of the folk culture, is so broad as to allow him to give long concerts on three or four consecutive days, never repeating a song. Ritchie and West sing primarily of the lives and troubles of the miners.

\*\*\*

Authentic folk recordings, or what are often called field recordings, are primarily coming from the Folkways label (though the Library of Congress has a substantial collection as well). The major record companies have at various times had “ethnic” labels, but the relatively small audience for them has forced the big companies to discontinue these lines. Moses Asch, the founder of Folkways, among other small record companies, fears what will happen to the library he has amassed over the years when he is no longer there to run things. “My competitors concentrate on what moves best,” says Asch. “I can’t do that.” He insists on keeping his entire catalog (now numbering about 1500 titles, including everything from *Folk Music of Rumania* to *Handwriting Analysis* in print, and worries that in his absence someone would simply eliminate the obscure things and offer only the Pete Seeger and other fast moving LPs to the public.

Seeger is another example of the impact of recorded folk music. As a professional interpreter of traditional music, and as a songwriter, he has probably done more than anybody in spreading the folk culture of the

(Continued on page 57)

United States around the world. His **Favorite American Ballads** series on Folkways is perhaps the most comprehensive collection of recorded Americana by a single artist available. His Columbia LPs highlight his role as a songwriter and as an interpreter of contemporary material. Again, however, with Seeger's widespread popularity, we find the problem of people learning music from a record—out of context, and with a tendency to imitate as closely as possible. The flexibility of rendition usually characteristic of folk songs is absent.

\*\*\*

None of this is meant to denigrate the value of studying folk music from records. Indeed, the medium has exposed us to a variety of styles and influences with which we might otherwise never have become familiar. Records have also increased the possibilities of detailed analysis by serious musicologists without their having to insist on someone or some group repeating a particular song or ceremony until a transcription or understanding of what is going on can be attained. Imagine trying to analyze African polyrhythm on the basis of a single hearing of a song (unless it happens to be one that lasts several hours).

David Bromberg, a guitarist and songwriter who has made his mark both in traditional and contemporary folk circles, often recalls what happened when he first studied guitar with the Pete Seeger Guitar Guide—a set that includes record and booklet. The song was *Railroad Bill*, a simple popular piece for beginning guitarists. He was able to master the song as it was in the book's tablature (a system of notation for stringed instruments), but was unable to make that correspond with what was on the record. Bromberg finally realized that the last two lines of tablature had been reversed in the printed booklet. Had it not been for the record in this case, he (and possibly thousands of other guitar students using this method of learning) might still today be trying to figure out why the song seemed to end in the middle and then pick up when it should have been over.

Unfortunately, the imagination required to allow oneself to become so at one with the music, and the culture it represents (something Bromberg and many others do have), is rare. Thus we have an abundance, for instance, of young blues-style imitators in this country who can play precisely what's on a record, but whose own personalities are always kept at a distance. Oral tradition is definitely not a matter

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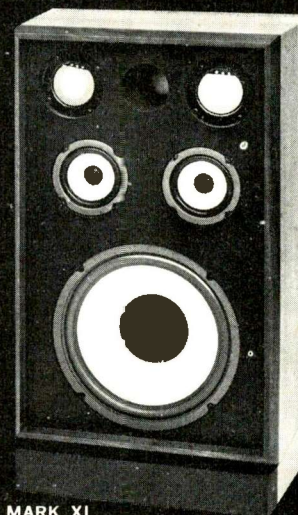
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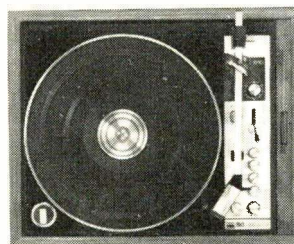


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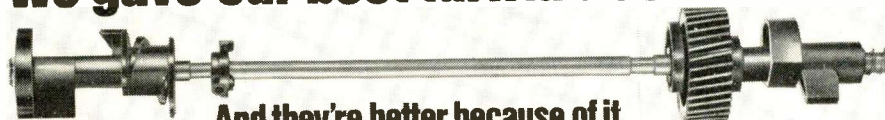
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of parroting others. It is a matter of absorbing, ingesting and fusing.

\* \* \*

There is yet one more element in the folk process which we shall consider briefly: the creation of new material. Old theories of "communal creation" of folk songs are no longer generally accepted. But even if one grants that folk songs are composed—though not necessarily written down—and only then become part of an oral "tradition," the question remains as to how we differentiate between a new folk song and any other kind of new song.

Mike Seeger (Pete's half-brother) once wrote in *Sing Out!*, a folk song magazine, that "the making of new songs is a most necessary part of our folk music activity," provided it is coupled with "involvement in traditional music." He also insisted that "creation does not take place in a vacuum. It must build on something. It will be our loss," he continued, "if we fail to learn from the hundreds of brilliant folk artists who have poured creativity into their music." Seeger then cites English folk singer and songwriter Ewan MacColl as an example of the fashion in which he feels the folk process should be carried on! "With a knowledge of folk song from his earliest days, and being a born writer, he has further versed himself consciously in the folk idiom so that his songs, often an extension of tradition, are even occasionally being learned by traditional singers in his own country." And though MacColl rarely visits the United States, his songs have crossed the waters—with friends and fellow folk musicians, and on record.

Sandy Paton, one of the founders of Folk-Legacy Records, recently summed up his feelings as to why the emphasis in traditional folk music (specifically in the United States) has shifted from field recordings to those of interpreters as being basically economic in nature. Field trips, he said, are expensive and time consuming, and the resulting tapes are not of as high a technical quality, or as exciting either in rendition or material, as those which are made by professionals in a studio. Paton also pointed to the moderate interest (in terms of sales) in traditional music. "The interpreters," he said, "who perform around the country, will sell records because people will buy what they've heard—with the exception of blues recordings."

The interpreters, however, and many of those presently writing in the folk



idiom, are forming something of their own folk tradition. They are learning songs from one another as they travel, adapting them to their particular styles and needs, and passing them on to new audiences both in person and on record. It is true that copyright procedures may encourage some not completely natural changes, since the securing of a new copyright on an old song, by changing a few lines, offers a considerable royalty potential. For whatever reasons you care to accept, though, there can be little doubt that the phonograph record has become a significant factor in the modern-day folk process.

### A Guide to Folk Music Labels

For those interested in traditional American folk music, either as it has been recorded "in the field" or by interpreters, some familiarity with small record companies is helpful.

Folk songs and ballads, in both the above mentioned forms, are best represented by the releases of Folkways and Folk-Legacy, and in some cases on records available from the Library of Congress. Folk-Legacy's *New Golden Ring*, available in two volumes, will serve as an excellent introduction to the performers (mostly interpreters) represented on many of that company's other albums. Folkways' 3-record *Anthology of American Music* serves a similar function, as well as being a unique collection of Americana. Some of the better blues labels include Arhoolie, Biograph and Yazoo, all of which try to document the performances as completely as possible. Country and bluegrass are available on County and Rebel and from the Galax and Union Grove conventions (the latter are small festivals which issue their own recordings).

Distribution of these labels in major record stores is not very common, but a young new collective named Rounder, which itself issues excellent LPs of all different kinds of folk music, has a mailorder service called Roundhouse for these and about 90 other small record companies. Writing to them at 186 Willow Avenue, Somerville, Mass. 02144 will get you a copy of their catalog. (Just send 25¢ for postage and handling.) A complete listing of Folkways' releases can be obtained from their offices at 701 Seventh Avenue, New York, New York 10036. For information concerning what's available from the Library of Congress write to the Archive of Folk Song, Music Division, Library of Congress, Washington, D.C. 20540. **Æ**

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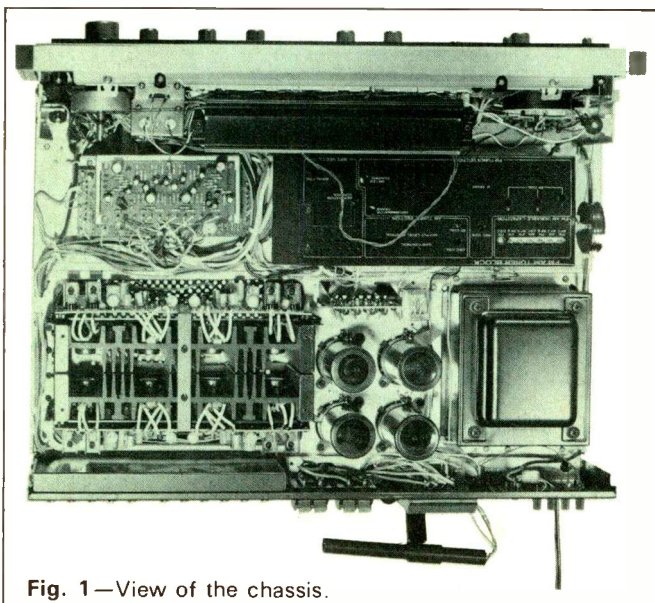


Fig. 1—View of the chassis.

**Sensitivity:** Phono 1, 2: 2.5 mV; Aux, Tape Monitors: 150 mV. **Frequency Response:** Phono, RIAA  $\pm$  1 dB; Aux, Tape Monitors, 7 Hz to 25 kHz, +0.5, -1.0 dB. **Hum and Noise:** Phono, 70 dB (IHF, A network); Aux, Tape Monitors, 90 dB. **GENERAL SPECIFICATIONS:** Power Consumption: 250 watts maximum. Dimensions: 22 $\frac{1}{16}$  in. W x 6 $\frac{5}{16}$  in. H x 17 $\frac{5}{16}$  in. D. Weight: 49 lbs., 5 oz. Price: \$699.95, including walnut cabinet.

U. S. Pioneer Electronics was not the first popular maker of high fidelity components to offer so-called "everything-in-one" four-channel receivers to the American quadrophile, but from all indications we have been able to get from dealers in this area, their introduction of three such units in mid-1973 was met with almost immediate acceptance and success. The QX-949 is the highest-powered of the three and turns out to be one of the most impressive receivers (visually and technically) we have ever tested.

Its long, elegant, three-dimensional gold and black front panel has enough controls on it to delight the most demanding knob-twirler and yet, when viewed overall, is executed without imposing a cluttered feel. The upper portion of the panel projects forward slightly, its blacked-out dial area illuminated in blue when power is applied. At the left is a most unique visual display that looks like an oscilloscope tube but is, in fact, a four light-beam display for direct viewing of each of the four audio channel levels. Green light beams radiate at 45-degree angles from the center outward, increasing their length with increased audio level. Surrounding this display are four small level controls which serve to balance or equalize levels of all four channels. Sensitivity of the display is adjustable over a 30 dB range, using a pair of pushbuttons (-10 dB and +20 dB) located nearby, so that the visual pattern is useful for channel balancing at almost all listening levels. Besides the display sensitivity buttons, the line of buttons below the dial scale area includes a power on/off switch, four speaker selector buttons (which afford individual control of front and rear speakers, both local and remote), the loudness switch, tape monitoring selectors (one for a 2-channel deck, and two more for a pair of 4-channel tape machines), an additional switch for yet another circuit-interruption circuit (for connection of Dolby noise reduction or other accessories), an MPX noise filter and an FM muting on/off switch. The dial area of the receiver also contains center-tune and signal strength meters combined in one meter face, a large tuning knob and ten separately illuminated lights which indicate program source, the various 2-channel and 4-channel modes

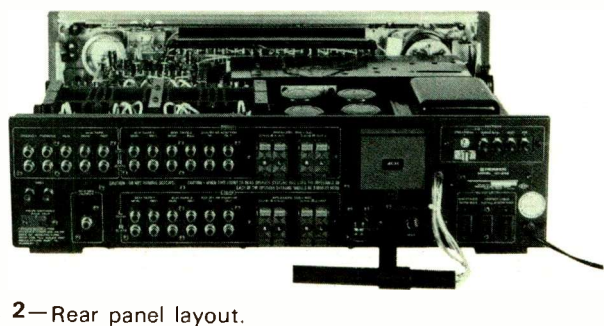


Fig. 2—Rear panel layout.

and reception of a stereo FM broadcast. Next to the CD-4 indicator light (which merely denotes selection of the CD-4 mode switch setting), a red pin-point light glows whenever a CD-4 record is played.

The lower portion of the panel includes a master volume control, a pair of bass and treble controls for front channels, plus a separate pair for adjusting response of rear channels, low and high frequency filter pushbuttons, a four-position mode switch (with settings for 2-channel, CD-4, Regular Matrix and SQ Matrix decoding) and a six-position program selector switch. Flanking the master volume control are a pair of separation adjustment controls used to optimize front-back separation when first installing the CD-4 cartridge. The location of these controls directly below the visual channel level display makes this one-time adjustment extremely easy to perform, using the 7-inch test record supplied with the receiver. There are also a pair of phone jacks in this area which will accept four-channel headphones (or, of course, stereo phones). Directly below the selector switch, under the receiver chassis, is another calibration control used to adjust 30 kHz carrier sensitivity of the CD-4 demodulator circuitry when first installing the cartridge, using the aforementioned test record.

The rear panel layout, shown in Fig. 2, should give you some idea of the extreme versatility of this product. There are two sets of phono inputs (either one of which or both can be used for CD-4 or stereo cartridge inputs), tape monitoring in and out jacks for the varieties of two- and four-channel tape decks mentioned earlier, plus what amounts to yet a fourth monitoring circuit in and out jacks (for all four channels) useful when connecting a separate Dolby unit or any other device requiring a circuit insertion point plus circuit interruption. Piano-key speaker terminals for two full four-channel speaker systems permit connection of all speaker wires by simple insertion of stripped ends into a small hole when "keys" are depressed. An AM ferrite bar antenna is pivotable in two planes for best orientation. 300-ohm and 75-ohm FM antenna input terminals are provided, with the latter terminal thoughtfully augmented by a screw-down clamp for grounding the outer conductor and retaining the coaxial cable securely in place. At the extreme right are a pair of unswitched and one switched a.c. receptacles for connection of other components and a line fuse arrangement permits changeover of power supply to accommodate a variety of domestic and overseas power line voltages from 110 volts to 240 volts.

Between the antenna terminals and the front speaker terminals is a small covering bracket with a slot disclosing the printed notation "4 CH." When this bracket is loosened and lifted up, a multiple pin connector is disclosed. The connector can be unplugged, inverted and replugged for "boosted power" 2-channel operation of the receiver which we shall discuss presently. Unscrewing the cover automatically turns off power to the receiver and, when the cover is refastened, the notation "2 CH" now shows through its opening.

### Circuit Features

Figure 1 shows the internal layout of the QX-949 chassis. Extensive shielding is used over the entire r.f. and i.f. sections, with designated alignment holes available for factory and service alignment without having to remove major shielding structures. Construction is modular, with a minimum amount of interboard wiring in an extremely orderly layout, considering the vast amount of circuitry involved. The output circuitry is direct-coupled complementary, with no output capacitors required, and operates from dual positive and negative 36 volt supplies (+45, -45 Volts in the two-channel boosted power mode), filtered by four 10,000  $\mu$ F filter capacitors. The FM front-end employs two dual-gate MOS-FET's and a four-gang variable capacitor. The i.f. section includes three

2-element ceramic filters, a three-stage differential amplifier, diode limiter and a quadrature detector circuit and a multi-purpose IC forms the heart of the stereo-FM decoding circuit. The AM tuner section also employs ceramic filtering, plus an IC i.f. system and a three-gang variable capacitor. RM, SQ and CD-4 circuits and we counted no less than twenty-three transistors, eight FET's and three IC's in the CD-4 sub-carrier section alone! A phase-lock-loop circuit is incorporated in the CD-4 circuitry. Total semi-conductor complement of the QX-949 is 14 FET's, 7 IC's, 113 bi-polar transistors and 69 diodes.

### Power Boosting Feature

The idea of boosting power for two-channel operation (both as a sales feature for the prospective customer who is not ready to invest in two extra speakers and as a practical consideration of maximum acoustic energy in the listening room under both stereo and quadraphonic listening conditions) in a four-channel receiver has become popular with many manufacturers of four-channel receivers. Most of the receivers we have tested up to now accomplish this increased power in the two-channel mode by utilizing a circuit which has been called "strapping." This technique involves the parallelling of pairs of power amplifiers and the addition of an extra phase inverter stage to supply proper drive to the combination. When strapping is used, speaker terminals are no longer referenced to common ground. In fact, the use of a common ground in such instances results in immediate fuse-blowing or activation of circuit protection devices and this has posed a problem in some instances (particularly in dealer displays which often use common ground wiring in their demonstration panels). Pioneer has approached the problem differently in the QX-949. Instead of parallelling output amplifiers, when the rear connector is re-inserted for 2-channel operation, power supply voltage is removed from the output stages of the back channel amplifiers and the voltage is increased on the front channel amplifiers from about 36 volts (plus and minus) to about 45 volts. By using conservatively rated output devices which can operate safely at this higher voltage, signal output swing can be increased substantially, increasing power output per channel from its nominal 40 watts to 60 watts. Because the back channel output circuits are no longer drawing current, the power supply is more than capable of supplying the extra current needed for the higher powered two-channel mode. This system has an additional advantage, in that speaker connections can remain intact when switching from two- to four-channel power mode or vice versa. It should be pointed out that the front panel mode switch does permit two-channel (front speakers only) listening without having to alter the rear connector plug for A-B comparisons of stereo versus quadraphonic effects, but under those circumstances the front channel power is limited to its nominal 40 watts per channel value.

### Laboratory Measurements

Figure 3 graphs some of the FM performance characteristics of the QX-949. Mono IHF sensitivity measured 1.7  $\mu$ V, against 1.8  $\mu$ V claimed and sensitivity was extremely consistent at all frequencies. 50 dB of quieting was reached with a signal input of only 2.7  $\mu$ V while ultimate S/N at stronger signal inputs reached a highly acceptable 72 dB. Mono distortion was actually lower than the very excellent published figure of 0.2%, measuring a minute 0.18% for all signal input levels above 10 microvolts. In stereo, ultimate THD was 0.38%, again a bit better than the 0.4% claimed, while stereo S/N measured 66 dB. Stereo separation, plotted in Fig. 4, was the best we have measured on any receiver tested, reading 50 dB at mid-band frequencies and 40 dB or better from 50 Hz to 10 kHz and 36 dB at 15 kHz—the highest audio frequency transmitted in FM. Mono THD remained well below 0.5%

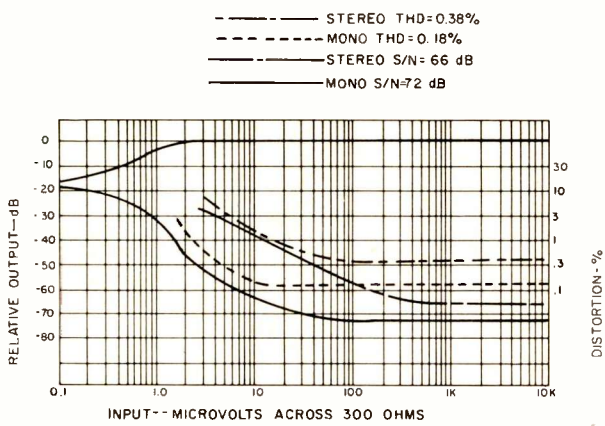


Fig. 3—FM quieting and distortion characteristics.

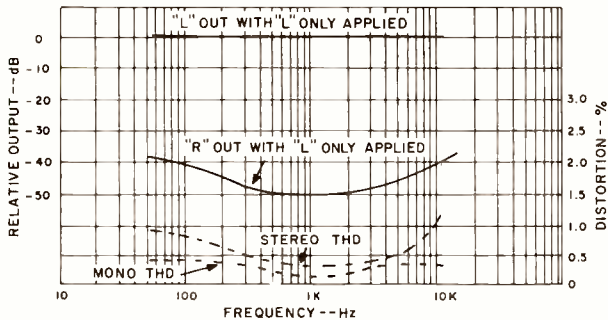


Fig. 4—Separation and distortion vs. frequency.

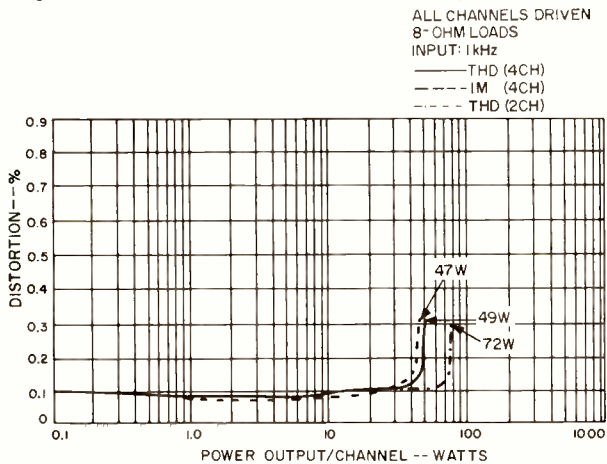


Fig. 5—Harmonic and intermodulation distortion characteristics.

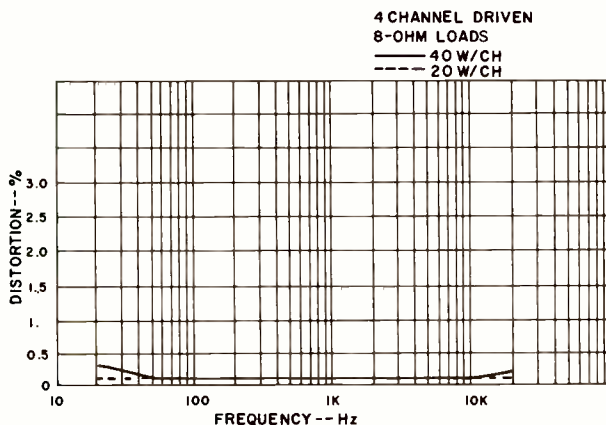


Fig. 6—Distortion vs. frequency.

for all audio frequencies measured, while stereo THD reached a maximum of just under 1.0% at the frequency extremes, remaining well under 0.5% for mid-band frequencies. The low THD figure at high audio frequencies in stereo is particularly significant because it confirms the virtual absence of "beat frequencies" so often observed on competitive products in the stereo decoding mode.

Amplifier measurements were performed in both the four-channel and the "power boosted" two-channel mode and an indication of power output capability is plotted in Fig. 5. Pioneer's published specs have traditionally been very conservative, and the QX-949 is no exception. The manufacturer is careful to specify 20 Hz to 20 kHz power output per channel as well as 1 kHz mid-band power and in both cases, our measurements turned out better than their claims. We measured 49 watts per channel at 1 kHz before reaching rated THD of 0.3% in the four-channel mode, and 72 watts per channel in the two-channel mode. At all power levels below clipping, THD was well below 0.1% with absolutely no evidence of rising "crossover" or notch-distortion at very low power output levels. At the nominal 40 watt power level, THD barely reached 0.1%. Rated IM distortion of 0.3% was reached at 47 watts per channel in the four-channel mode.

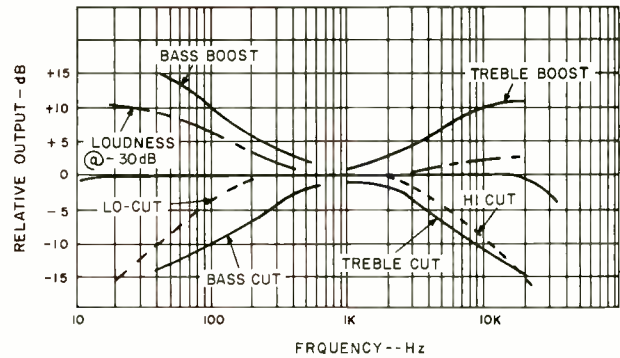
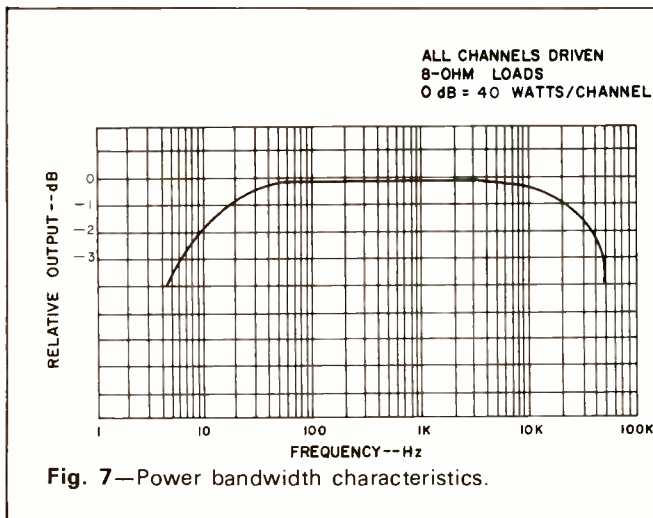
Proof of the QX-949's power output capability over the entire audio range is shown in the graph of Fig. 6. Even at 20 Hz, THD for 40 watts/channel output is still just under rated THD of 0.3%, while at the high frequency extreme, THD measured about 0.2%. At half power level, the THD versus frequency plot is virtually a straight line hovering well below 0.1% for any frequency measured. Power bandwidth, shown in Fig. 7, extends from 5 Hz to 50 kHz—again substantially better than claimed while tone control range, high and low cut filter action and loudness control action, plotted in Fig. 8, all conform nicely to expected results.

Additional measurements made on the receiver included muting threshold and stereo threshold, both of which were  $3 \mu\text{V}$ . Capture ratio measured exactly 1.0 dB as claimed while selectivity was 82 dB and AM suppression measured 58 dB against the 55 dB claimed. RIAA equalization was accurate to within 0.5 dB from 30 Hz to 15 kHz in the stereo mode (we could not measure this parameter easily in CD-4, but since the same equalizer circuits are used for both services we can presume equalization is equally accurate for CD-4 record playing). Phono overload occurred at an input level of about 120 mV (rms) which, related to the 2.5 mV input sensitivity of both phono inputs, should (and did) provide enough dynamic range for even heavily modulated records.

### CD-4 Circuit Performance

Adjustment of CD-4 separation was positive and precise and we noted in particular that the 30 kHz carrier adjustment was not at all critical. Distortion-free results were obtained for all but about one-quarter of the most counterclockwise rotation of this control. Chances are you would never have to lift the set to get at this control at all (which may be why it was placed in such an out-of-the-way place by Pioneer's designers in the first place). In listening to several newly obtained test records (aside from the calibration record supplied) we were impressed not so much by the excellent front-back separation (which was better than 25 dB and probably limited by cartridge capability), but by the fact that what little crosstalk we did hear was very free of audible distortion—an important quality not altogether true with some other CD-4 products we have had an opportunity to use.

The SQ and Regular Matrix decoders performed well, though the spatial effects achieved when listening to these types of records weren't up to the "discrete" separation of CD-4 (both matrix circuits are basic types, with no logic or



gain riding circuitry provided). The four-channel light display is a tremendous aid, not only in establishing correct channel balance but in helping the listener to really “see” what’s going on in all four channels at a single glance. In its own way, it is probably easier to view and understand than four side-by-side meters which are actually harder to “read” all at once.

The Pioneer QX-949 is equipped with an electronic-plus-relay protective circuit and the relay also serves to delay turn-on by about three seconds, so there are no pops or thumps when power is applied. Muting circuitry on FM is positive and with its 3 microvolt threshold, its continued use does not exclude the reception of very weak signals. We logged no more FM stations with the mute switch defeated than with it activated and yet we were able to enjoy silent interstation tuning—the true mark of a good and properly designed muting circuit. Audio quality of the QX-949 was superb, and there was ample power available for our inefficient air-suspension speaker systems at any listening level. We did some listening in the two-channel power-boosted mode, too, and there was no difference in tightness of bass or overall listening quality from one mode to the other. Hours of continued high-level listening

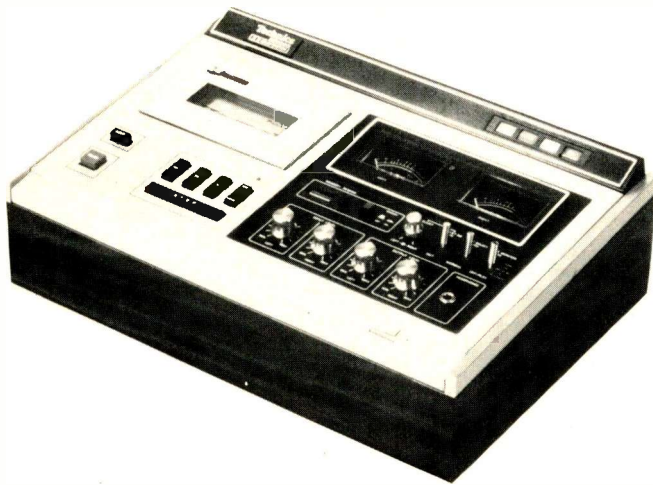
resulted in a very moderate increase in cabinet temperature in the vicinity of the output circuit heat-sinks, all of which are vertically mounted directly under the ventilation grille of the walnut enclosure. During our bench tests, we deliberately overdrove the amplifier (all four channels) for several minutes into four-ohm loads and the only thing that happened was a “click” of the protective relay after several minutes. We removed the input signal but left the power turned on. After about five minutes, the relay clicked again and we were back in business. No musical input, however loudly played, was able to trigger the protective circuitry though the circuit does offer full protection in the event of speaker cable shorts or other high output current conditions.

Having tested and lived with the Pioneer QX-949 for several weeks now, it is easy to understand why this receiver and its lower powered, lower priced companion units, QX-747 and QX-646, have gained such favor with the knowledgeable audio enthusiast who is looking for an “everything” receiver. It would be very difficult to come up with any features in a four-channel receiver that Pioneer hasn’t already thought of in this powerful unit.

*Leonard Feldman*

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### Technics RS-279US Cassette Recorder



#### MANUFACTURER'S SPECIFICATIONS

**Frequency Response:** 20 to 15,000 Hz with normal tape, 20 to 16,000 Hz with CrO<sub>2</sub>. **Wow and Flutter:** Less than 0.10%. **Signal-to-Noise:** Better than 50 dB, 59 dB with Dolby. **Heads:** Three, 2 HPF, 1 double gap ferrite for erase. **Motors:** Two, 1 direct-drive for capstan, 1 d.c. for reel drive.

**Headphone:** 8 ohms. **Dimensions:** 5 3/8 in. H x 16 3/8 in. W x 13 1/2 in D. **Weight:** 19 lbs. **Price:** \$499.95.

I suppose most readers know by now that Technics is the name for the audiophile range of products made by Panasonic; the same kind of styling and general design but with a performance to satisfy the most critical—to use a well-worn cliché. Model RS-279US is another addition to the new generation of cassette recorders incorporating the Dolby noise reduction system, provision for CrO<sub>2</sub> tapes and so on. It is a trifle larger than some other recorders in this class and it boasts an extra feature—a monitor head. There are two motors, one for the reel drive and the other for the tape—a Pabst type with the rotor on the outside. The shaft itself forms the capstan that moves the tape—in other words, a direct drive. The tape selector switch is marked CrO<sub>2</sub> and NORMAL, which puzzled me until I read the instruction sheet. Normal means low-noise tapes, at least for this machine!

The two buttons at the extreme left are for RECORD and EJECT. To the right of these is a group of four tape controls: STOP, REWIND, FAST FORWARD, and PAUSE, which has a lock position. Then comes a row of four aluminum knobs for INPUT and OUTPUT levels. Just above is the MEMORY REWIND switch and digital counter, a dual concentric control for Dolby calibration, a Dolby switch, tape selector and then a MONITOR switch. Under the latter is the HEADPHONE socket and power

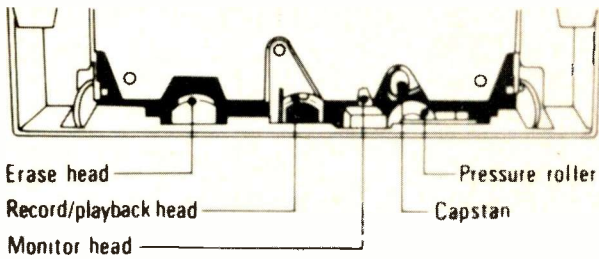


Fig. 1—Head configuration.

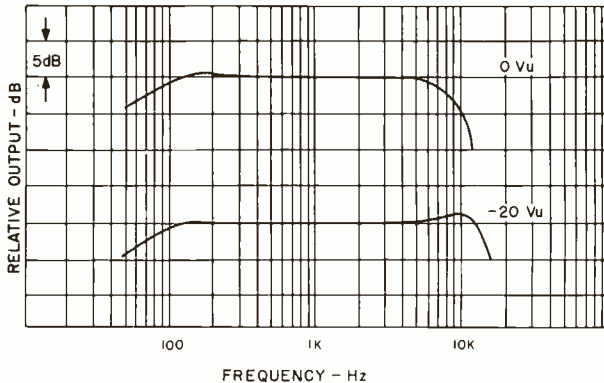


Fig. 2—Record-replay response with Maxell UD tape.

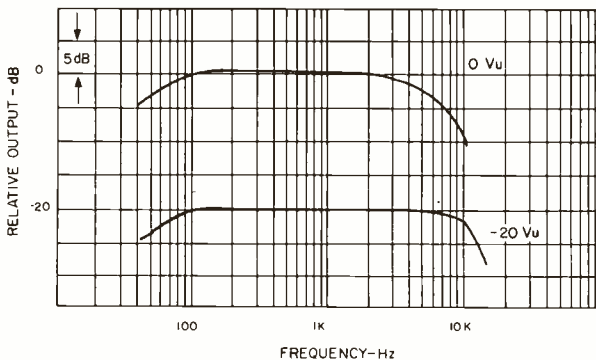


Fig. 3—Record-replay response with Capitol LN tape.

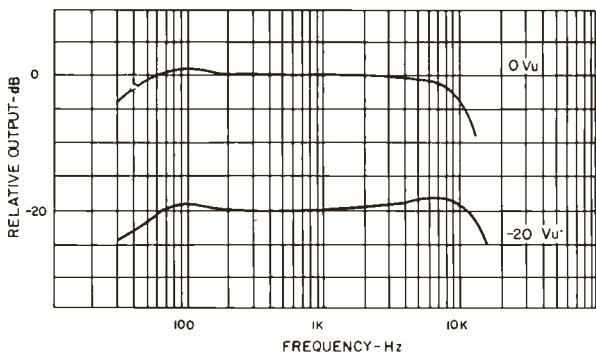


Fig. 4—Record-replay response with CrO<sub>2</sub> tape.

ON/OFF button. The two large VU meters are at the back and behind them is an inclined panel with four neat, illuminated indicators for RECORD, PLAY, DOLBY and CrO<sub>2</sub> functions. Input and output sockets (all RCA phono) are located at the back together with a microphone switch. Also at the rear is a socket for a remote control unit.

### Measurements

Figure 2 shows the record-replay response using Maxell UD tape and Fig. 3 shows the results with Capitol 2 LN. The third graph, Fig. 4, gives the response with CrO<sub>2</sub> tapes—Advocate, TDK KROM and Norelco, the differences being insignificant. The high frequency 3 dB point for low-noise tapes was about 13 kHz and 14.5 kHz for CrO<sub>2</sub>. Other tapes giving good results with the 279 included Certron "Gamma," TDK LN, Sony C60 and BASF SK. Figure 5 gives the playback response from a standard test tape and the distortion characteristics can be seen in Fig. 6. Distortion was lower than average being only 1.3% THD at 0 VU increasing to 2.0% at +5 dB. Equating this with the 0 VU saturation curves, it will be seen that there is a reasonable margin against overload, especially if the Dolby system is used to increase signal-to-noise. This, incidentally, measured 53 dB and switching in the Dolby brought it to 59 dB. The signal required for 0 VU was 30 millivolts and the output voltage was then 150 millivolts. Microphone sensitivity was 0.27 millivolts (600 ohms). Erase efficiency was 68 dB with CrO<sub>2</sub> tape.

Wow and flutter was exceptionally low—only 0.10% (DIN) record-replay, a tribute to the servo direct-drive system. Tape rewind time was 98 seconds for a C60 cassette and speed was 0.3% low.

As far as I am concerned, that monitor head is a big plus. I am used to open-reel machines and one of the facilities I miss with cassette decks is this monitoring facility. I like to know what is actually coming off the tape so that corrections can be made quickly.

### Circuit Details

In most respects, the circuit arrangement of the 279 is fairly conventional. The playback amplifier is switched for recording and the signal from the monitor heads is taken to another pair of amplifiers using 3 transistors each. Eight transistors are used in the servo amplifier for the motor and another 3 are used in conjunction with a photocell to operate an automatic stop device which functions at the end of the tape. No ICs are used and there is a total of 55 transistors. A remote control box (RP-9275) is available and this gives full control of the machine from a distance of 12 feet—a useful feature.

If you were a little puzzled by the reference to HPF in the specifications, I must tell you it means "Hot Pressed Ferrite"

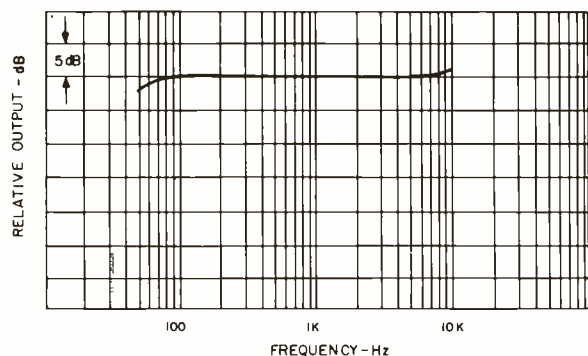
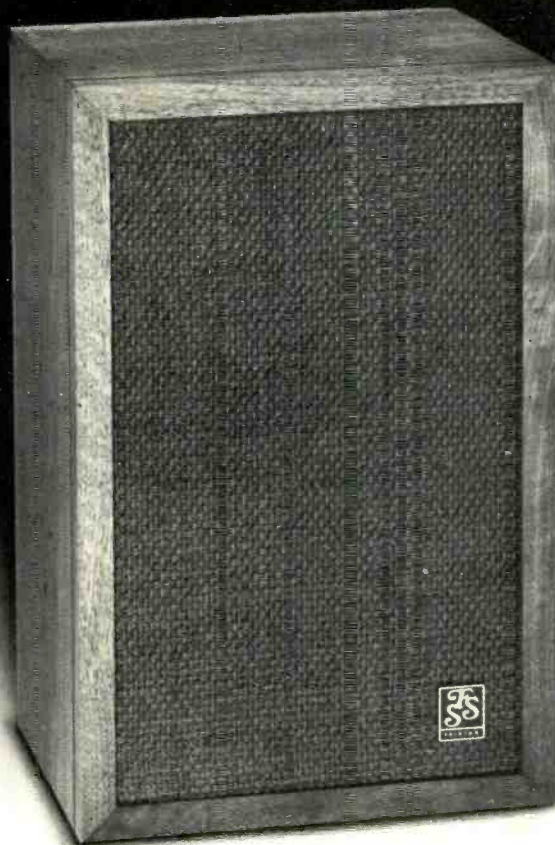


Fig. 5—Playback response from standard test tape.

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heads. The once-popular Permalloy types are now being superseded by ferrite or ferrite-glass combinations, mainly because of the greater intrinsic hardness. Even when used with the more abrasive CrO<sub>2</sub> tapes, such heads have a much longer life than Permalloy. The head gaps have to be minute to maintain full bandwidth with the narrow tapes, and any wear would cause trouble.

Now, as far as frequency response is concerned, there are several other machines with a wider range than the 279, but this is probably offset by the monitoring facility and other features. For instance, the wow and flutter is exceptionally low, so is the distortion. As for the general operation, I found this machine to be one of the best. The control push-buttons are described as "feather-touch" and they do indeed need very little pressure to operate. I also like the large, easy-to-read VU meters and the convenience of the panel-mounted Dolby calibration controls. (A Dolby calibration tape is supplied with the 279.) Several recordings were made via the Dolby system, including some with quite a large dynamic range. I still prefer CrO<sub>2</sub> tapes for the best possible results but the best low-noise tapes are awfully close! All in all, the Technics 279 is a nice machine to use and it is capable of giving excellent account of itself. Because of the monitoring facility, it is especially suitable for the novice. This is why: Tapes used in cassettes have a much narrower track width than open-reel tapes. Not only that, but the speed is far slower. The net result is a greater danger of tape saturation (or self-erase) at high frequencies. You soon get used to it, but a monitoring facility is a big help!

*George W. Tillett*

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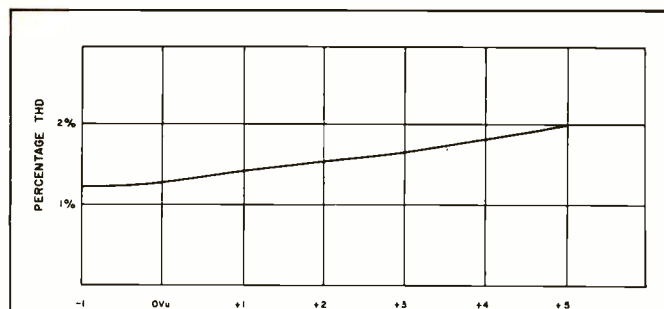


Fig. 6—Distortion characteristics.

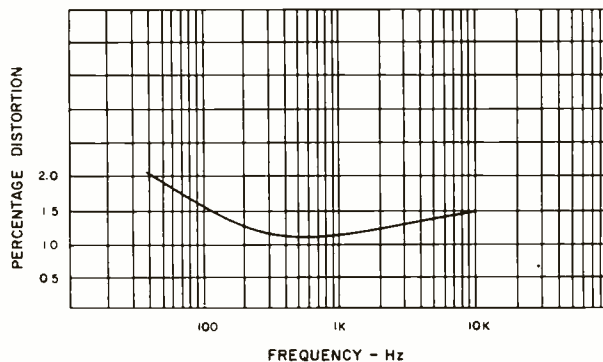
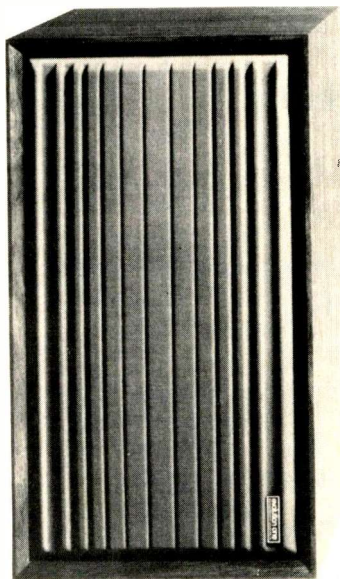


Fig. 7—Distortion vs. frequency.

## Sherwood Evolution One Speaker System



### MANUFACTURER'S SPECIFICATIONS

**Type:** Two-way system with 10-in. woofer and 1.3-in. tweeter. **Controls:** Two-position tweeter level switch, marked "Flat" and "-3 dB." **Crossover:** 1400 Hz. **Efficiency:** 0.8% average,  $2\pi$  radiation angle,  $\pm 1$  dB. **Sensitivity:** 89.3 dB SPL average  $\pm 1$  dB assuming hemispherical boundary conditions. **Impedance:** 8 ohms nominal. **Dimensions:** 14 in. H x 10 in. D x 25 in. W. **Weight:** 35 lbs. **Price:** \$99.95.

The Sherwood Evolution One loudspeaker is a two-way acoustic-suspension system utilizing a 10-in. long-excursion

woofer and a 1.3-in. tweeter. The modest physical size of the enclosure and its relatively light weight place it in the bookshelf speaker category. The enclosure is finished on four sides, and the front-mounted grille is textured to simulate a solid-sculptured appearance but is actually made from a thin, moderately compliant, molded material rendered acoustically transparent by a large number of small openings. The rear of the enclosure is unfinished but has a flat color closely matching that of the finished sides.

Speaker connections are made to binding posts mounted in a recessed cavity in the back. These terminals are well marked and sufficiently insulated so as to present no difficulties of connection or hazard under normal movement for cleaning. A two-position tweeter switch is also provided in the recessed cavity and has positions marked "flat" and "-3 dB."

In addition to supplying a good installation and operating manual, which is complete without requiring extensive technical knowledge of the purchaser, Sherwood also provides a capsule installation manual where it really belongs—on the back of the speaker itself. Where practical, this is an excellent practice, which more manufacturers should follow, in this reviewer's opinion.

Although the enclosure could be placed in either a vertical or horizontal position, the grille-mounted logo is firmly affixed so as to be seen in a properly erect position only when the enclosure is placed with the longer axis horizontal. A distaff sense of correctness might thus require such mounting even if a vertical position might be technically better in a given situation. Not mentioned by Sherwood, but important if the enclosure is thus horizontally mounted, is that the grille may be removed and reinserted in a 180-degree position relative to the way it was received. Because the tweeter is relatively close to one of the longer sides, it is better to mount the speaker so that the tweeter is away from the closest acoustical reflecting surface. Thus, if the Evolution One is placed on a shelf which



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projects beyond the front of the enclosure, the mounting should be with the tweeter on the top away from this shelf surface. The reason for this is the wide acoustic dispersion of the tweeter which could otherwise cause unpleasant, but hard to identify, interference problems.

The grille, being thin, is reasonably flexible. It was surmised, and verified by experiment, that the grille can be set into mechanical motion at bass frequencies by coupling from the woofer. A sine wave at selected low frequencies caused an audible "buzzing" of this grille at less than a 10-watt level in both of the units tested by AUDIO. This effect was not heard on the particular music material used for listening, but if it does occur, the only apparent remedy is to remove the grille.

In this reviewer's opinion, a potential physical hazard exists in the Evolution One due to the manner in which the speakers are attached to the front panel. Screws with pointed ends are

used so as to project outward and beyond the front of the woofer and tweeter. If a careless toddler were to collide with the front of the enclosure, injury could result due to these sharp projections. The flexible grille, furthermore, will not provide adequate protection in a forceful encounter. It is hoped by this reviewer that Sherwood will correct this unfortunate oversight in subsequent units if only by covering the sharp points with protective pads. The possibility of an accident may be remote, but the fact that these systems are suited for an eye-level shelf location should be considered.

The Evolution One is covered by a five-year warranty on all parts and a three-year warranty on the labor associated with the replacement of parts. The favorable impression one gets from the care of packing and completeness of information is that the customer is still important to Sherwood even after he purchases the speaker.

### Technical Measurements

The Evolution One is rated at a nominal impedance of 8 ohms and is indicated by Sherwood as having a mounted resonance frequency of 41 to 44 Hz. Both of these specifications are realistic as shown by the impedance plot in Fig. 1. The impedance is plotted for both tweeter level positions. The woofer resonance has an uncommonly sharp peak for its modest rise at 44 Hz. This may be related to the unusual low frequency response possessed by this system.

Figure 2 is the pressure-amplitude response measured under anechoic conditions. The position chosen for standardization in this measurement is one meter in front of the cabinet and exactly on the geometrical axis. Consequently, the measured response is seldom as smooth as advertising copywriters might elect to have it because some drivers will be in an off-axis position. One surprising feature of the Evolution One's woofer response is a mild bass rise at around 60 Hz and then a uniform fall-off at a slope that is closer to the 18 dB per octave common to phase-inverter enclosures than to the anticipated 12 dB per octave of a closed box. The fact that the impedance peak is near the corner frequency implies a good tight bass for an enclosure of this size. The anechoic response for both "flat" and "-3 dB" tweeter positions are plotted. Above about 3 kHz, there is in fact a 3 dB difference in level between these positions. The efficiency of the Evolution One is a bit low and a good 50-watt amplifier may be needed if these units are to be used in a moderately draped room and a fairly high SPL level required.

Figure 3 is the one-meter anechoic phase response corresponding to the SPL response of Fig. 2. The mean average acoustic position of the tweeter is about 3.7 in. forward of the woofer in the region of acoustic crossover at about 2 kHz. In order to show more clearly the smooth phase transition from woofer to tweeter, Fig. 3 includes two plots. One is made by subtracting the air path delay for the woofer and only extends to 2.5 kHz. The other plot is corrected for tweeter air path. Both the woofer and tweeter have relatively uniform phase response. The woofer, however, is exactly in phase acoustically below 2 kHz and the tweeter provides a 180-degree phase-shifted signal above 2 kHz, though the transition is quite smooth between the two speakers. The tweeter, in other words, is acoustically 180 degrees out of phase but the physical mounting is such that there is neither a phase nor amplitude "glitch" at the crossover frequency.

The three-meter "early sound" response for an on-axis and a 30-degree stereo left channel position is shown in Fig. 4. The curves are displaced 10 dB on this plot for clarity. The Evolution One was placed, as recommended by Sherwood, against a wall at ear height. The speaker was mounted in a horizontal position, which would be most likely used with a shelf placement. Ear height was assumed to be one meter, and the micro-

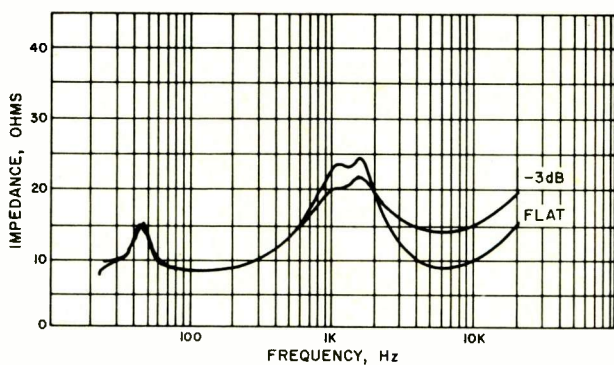


Fig. 3—One-meter pressure-phase response.

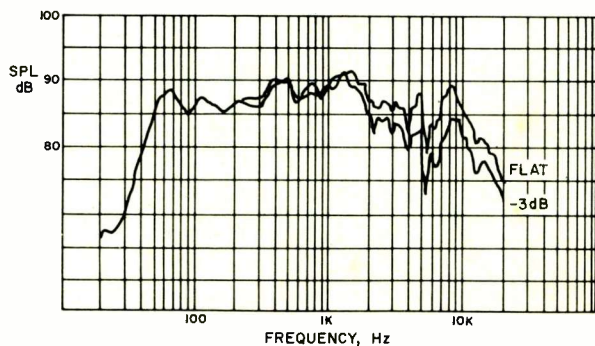


Fig. 2—One-meter pressure-amplitude response at one watt.

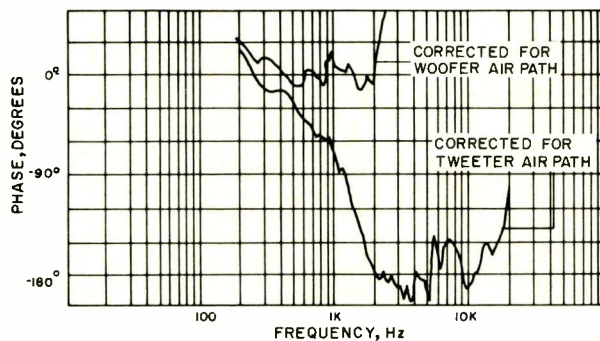


Fig. 1—Impedance for two positions of the tweeter control.

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phone was placed at that height. Only the first 10 milliseconds of sound arrival due to direct path, wall, floor, and ceiling are included in Fig. 4. The tweeter position was set to "flat" for this measurement. The wide dispersion of the tweeter caused a multiplicity of closely spaced interference dips above 1.5 kHz

which are only partially in evidence in the plotted responses. This measurement substantiates the listening test performed prior to measurement, which determined that while the mid-range is "punchy," the top end "bite" was down without equalization, though conventional treble equalization was able to restore a reasonable tonal balance.

Harmonic distortion for the musical tones  $E_1$ ,  $A_2$ , and  $A_4$  is shown in Fig. 5. Because the grille could cause an excessively high reading due to "buzzing," it was removed during this test. The curves indicate that the speaker is well behaved and shows no sign of distress for short bursts up to an average power of 100 watts.

The intermodulation of  $A_4$  by an equal level of  $E_1$  is shown in Fig. 6. Both the harmonic and the intermodulation measurements indicate that the sound will become appreciably discolored only for levels above about 50 watts. One interesting aspect of the intermodulation is that it is almost entirely due to amplitude modulation with only a small contribution of phase modulation. Crescendo handling capability of the Evolution One is good for all combinations of bursts with average power below 50 watts.

The Evolution One may be mounted with the major dimension either horizontal or vertical. The polar energy response is plotted in Fig. 7 for the vertical placement, in which the rear speaker labelling appears in a normal, erect position. Figure 8 is the response for a horizontal mounting. The unusual angular offset of the vertical mounting in Fig. 7 is due in part to edge diffraction by the tweeter on the right hand side as one faces the enclosure. A separate plot (not shown) was made to verify that some of the angular shift is due to the grille. While the grille was measured as acoustically transparent for direct sound, it can cause diffraction due to oblique sound incidence. The audible effect is present but very slight. The wide angular dispersion of the tweeter is shown quite well in the horizontal plot of Fig. 8. These curves indicate that a more balanced stereo image for direct sound will exist for a horizontal mounting. In either case, the wide dispersion shows, as measured independently in the three-meter test, that strong floor and ceiling reflections should be anticipated for the early sound.

The energy-time response measured one meter on axis is shown in Fig. 9. The equivalent pulse of applied electrical energy is less than one-tenth millisecond in duration and occurs at a time corresponding to zero milliseconds on this plot. Since sound takes slightly less than three milliseconds to travel the one-meter air path, the measured data only covers the time at which sound arrives from the speaker. Major structural features of the loudspeaker are scaled and shown for comparison. All frequencies from 20 Hz to 20 kHz are used for this data. The major early contribution is due to the direct sound from the tweeter plus some small internal scatter due to mounting structure. The woofer high frequency contribution gives rise to the subsidiary peaks in the region of 3.3 milliseconds. Back wall reflected energy is evident at around 4 milliseconds. This detail description is not meant to imply that the Evolution One is unusual or improperly designed. The data, in fact, show that good design technique was used with this system.

### Listening Test

The speakers were positioned against a wall, as recommended by Sherwood. In a room with a moderate amount of drapery, the high end was found to be a bit lacking even with the tweeter switch in the "flat" position. A listening room with relatively more live characteristics may produce a balanced sound without equalization, but this reviewer was quickly led to add some treble boost. This apparent deficiency in the treble was adequately overcome by this means, without causing any of the "spitty" response so characteristic of many smaller systems.

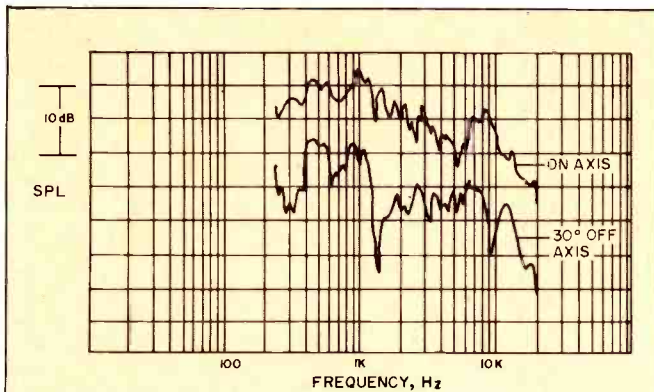


Fig. 4—Three-meter room response.

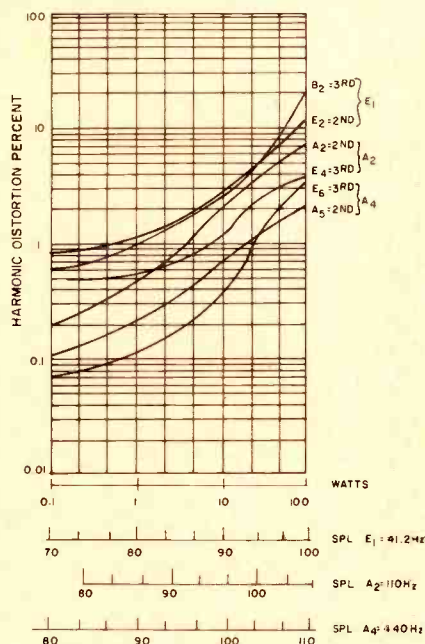


Fig. 5—Harmonic distortion for musical tones  $E_1$ ,  $A_2$ , and  $A_4$ .

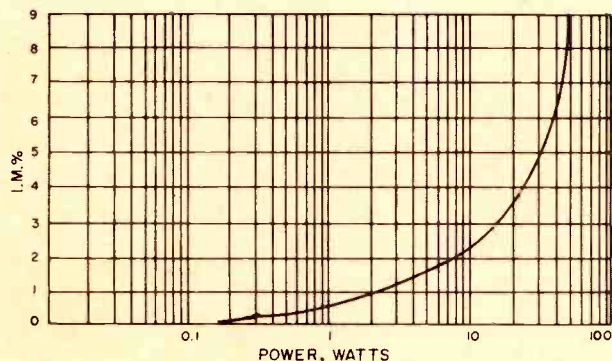


Fig. 6—Intermodulation of  $A_2$  (440 Hz) by  $E_1$  (41.2 Hz) mixed 1:1.

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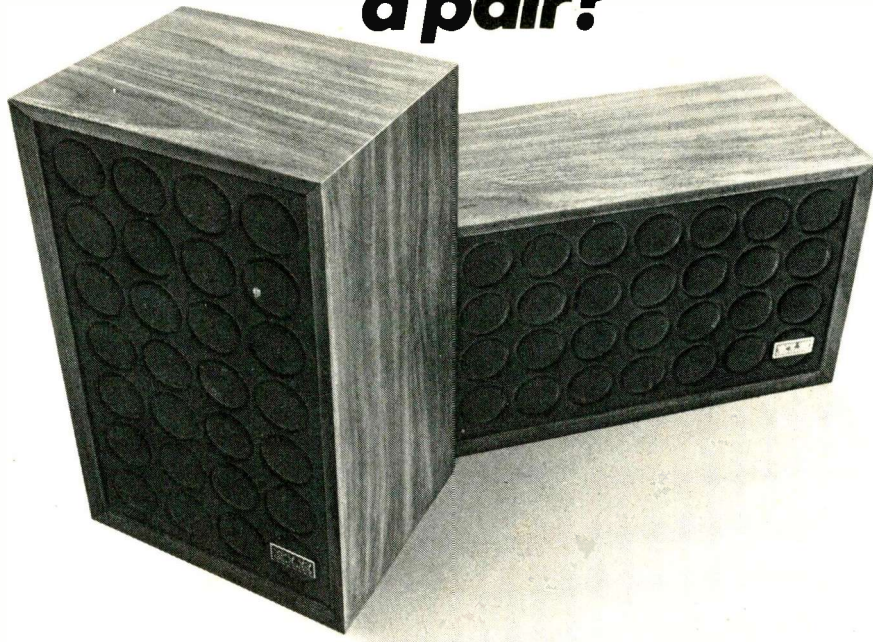
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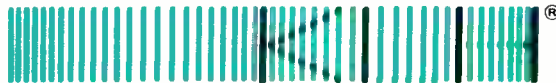
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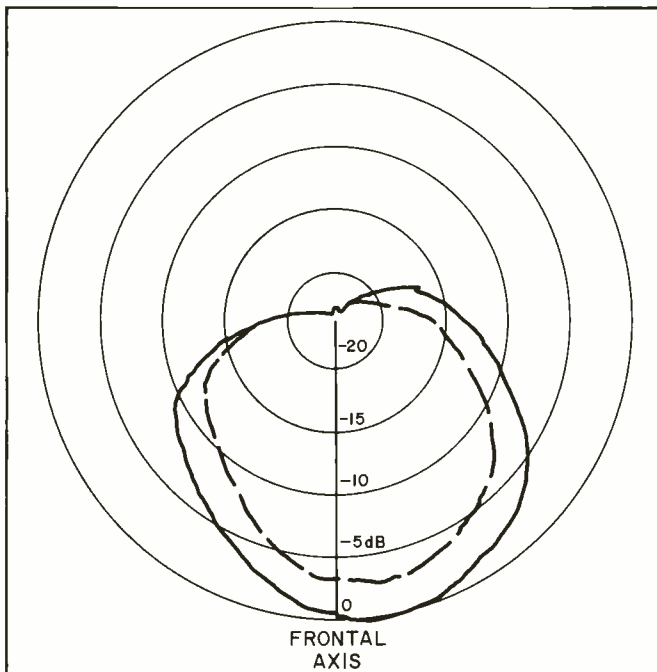


Fig. 7—Polar response for vertical mounting, two positions of the tweeter switch, view looking down on the top of the speaker.

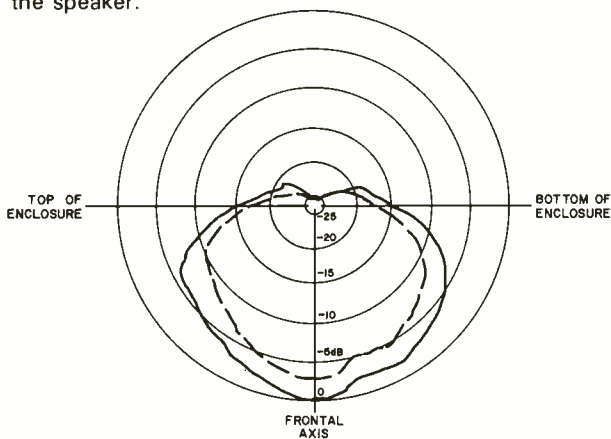


Fig. 8—Polar response for horizontal mounting, two positions of the tweeter switch, view looking down on the side of the speaker with the tweeter near the top side.

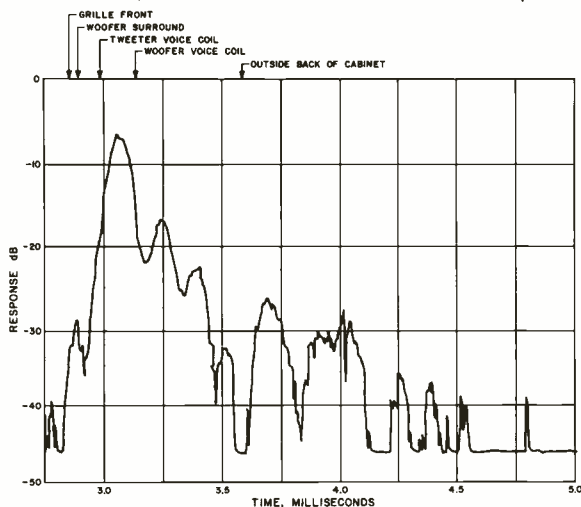


Fig. 9—One-meter energy-time response.

The bass is quite respectable for a speaker in this price range. A slight bottom-end bump is in evidence on flat material, but the audible effect is not severe, and when the low end rolls off, it does so in an unobtrusive manner.

A good stereo image is available without excessive wander when one moves about the listening area. One effect noted during the listening test, but not verified during polar measurement, was that broad-band sound material appeared to have a mild polar "fingering" as the listening position changed relative to the speaker. This sonic effect disappeared when the grille was removed and this reviewer surmised that it might be due to the sculptured "grooves" in the grille. In any event, the effect was very subtle.

A closely miced female voice sounds very accurate, though a center-channel male voice has what might be called a hollow sound. Instruments with a sharp attack, such as guitar and piano, were not reproduced to this reviewer's full satisfaction, having an effect similar to a spatial spread of the instrument.

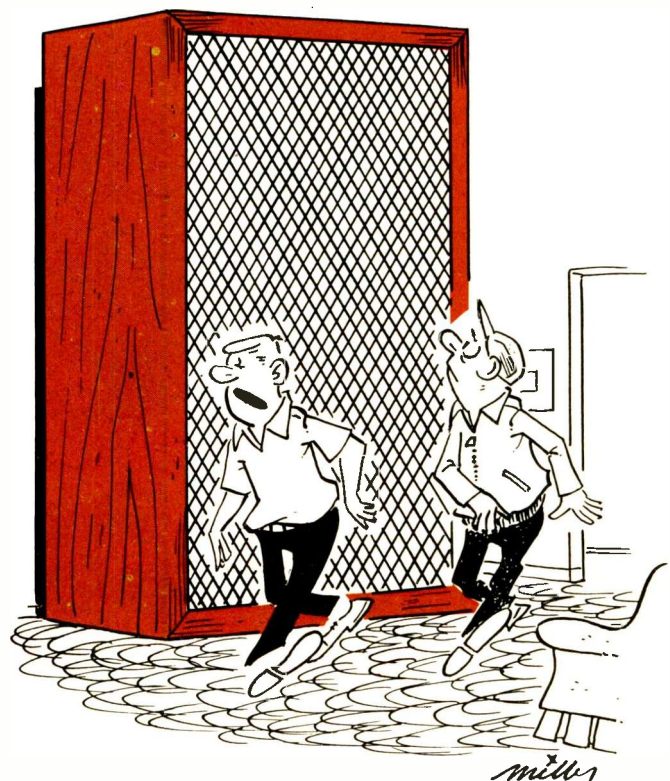
The tonal balance and general accuracy of reproduction is quite good for any sort of serious listening one might intend. The Evolution One can be recommended for either a primary system, especially when a modest investment is of prime concern, or as a good add-on quadraphonic mate to an existing high quality system if one wishes to update to four-channel sound.

*Richard C. Hevser*

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#### Addenda: Thorens TD-125 AB MkII

Our February, 1974, review of this turntable listed an incorrect price in the "Manufacturer's Specifications" portion of the write-up. The correct price for the Thorens TD-125 AB MkII is \$400.00.



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# Converting To Monophonic Sound

Gerard Rejskind

**T**HE PAST FEW MONTHS have seen the dawn of what will undoubtedly be a new age in the world of audio: the opening of the monophonic era. Though at this writing both hardware and software remain scarce, the die appears to be cast, and mono\* is without a doubt here to stay.

Of course, to the audiophile who has followed only the endless lineup of new conventional stereo equipment, the new world of mono may seem strange and confusing. Here then are some answers to the most often asked questions about mono.

## What is Monophonic Sound?

Monophonics concerns the reproduction of sound through a single audio chain. Whereas conventional stereo divides musical performers among two or more channels, mono integrates all instruments within a *single discrete channel*. Gone is the often tricky problem of localizing instruments. With the monophonic system, "wandering soloists" caused by the vagaries of acoustics are a thing of the past. Localization is perfect, each instrument remaining locked in to its correct location (the speaker), with no confusing false images.

## How Much Monophonic Equipment is on the Market?

At the moment, very little. However, many conventional stereo amplifiers can

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Long considered one of the audio world's visionaries, Mr. Rejskind was among the first to predict sweeping success for such technical innovations as the Cook dual-pickup binaural disc (1951), the 16 $\frac{1}{2}$  rpm record (1956), and stereo AM (1962). He caused some commotion at an IRE meeting in the late fifties when he explained stereo as being "treble in the left speaker and bass in the right." It was during his subsequent exile in Hungary that he met Professor I. Lirpa and they both became involved with the study of monophonic sound. They have since collaborated on a book about the Easter Island monoliths, because of their apparent notion that the carvings have something to do with sound reproduction.

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\*It should be noted that the word "mono" has been claimed as a registered trademark by a small Austro-Hungarian firm, *Monotone Records*, which has threatened usurpers with legal action. Despite their name, *Monotone* discs are stereo.

be converted for monophonic use by simply paralleling their outputs. Some solid-state amplifiers will be damaged by this procedure, and you should check with your dealer before going ahead.

Don't be put off, incidentally, if your dealer seems cool to monophonic sound. Many audio salesmen are reluctant to demonstrate monophonic equipment because they claim that mono's advantages are not evident under showroom conditions.

## Will Mono Make it Harder to Fit a Sound System to My Living Room?

No, on the contrary. A mono system will make installation easier than ever. Of course, the dissymmetry caused by the presence of only one speaker may draw some grumbles from the distaff side. On the other hand, mono's superb instrument localization means that the listener can sit anywhere in the room and still hear a correct "mono image." That makes the placement of seats and other furniture less critical.

## What's the Difference Between Discrete Mono and the So-Called "Matrix" Mono?

Matrixed monophonic sound (also known as "derived" mono) is created by "folding-in" two conventional stereo channels into a single monophonic sound source. Properly done, matrixed mono exhibits many of the directional characteristics of "discrete" or "true" mono.

A number of amplifiers are now available with a built-in monophonic synthesizer (known as a "mono switch") which can "decode" conventional stereo sources and extract the "hidden" mono information.

By contrast, "discrete" mono begins with a single sound source and keeps the source single through every step of the audio reproduction chain. "Discrete" fans charge that the matrix-mono effect depends upon a psycho-auditory illusion. They claim that random out of phase information is *cancelled* by the matrix method, and does not form part of the synthesized mono sound.

The major drawback to discrete mono is that it makes the many thousands of existing recordings obsolete. And it

should be mentioned that a number of discrete mono releases appear to be simply re-mastered versions of recordings originally made in stereo.

## Can the New Discrete Mono Discs Be Played with My Present Cartridge?

Conventional stereo pickups can give quite satisfactory results with mono discs. However, these pickups are sensitive to irrelevant vertical modulations, and their styli are too small for the larger mono groove. Your best bet is to install a pickup specially made for mono, such as the highly touted General Electric VR11. As a bonus, you'll find the VR11 more rugged and less accident prone than the pickup you're likely using now.

## Will the New Mono Pickup Play My Old Stereo Records?

Emphatically yes. In fact, you'll find that a mono pickup will lend to your stereo records much of mono's ultra-directional impact . . . especially after you've played them a few times.

## Can Discrete Mono Be Broadcast on FM?

Yes. Few centers are yet served by mono FM, but a handful of smaller and educational stations are devoting some or all of their day to monocasting. You can check your local stations easily. Tune across the band until you find a station that doesn't light your stereo indicator. It's discrete mono.

Of course, "derived" mono can be enjoyed by decoding the stereo signals of conventional FM stations as well.

## Is Mono Here to Stay, or is it Just a Gimmick?

Of course the dust of the monophonic revolution has yet to settle, but it seems that sooner or later all audio fans will want to convert to some sort of mono system. Whether this system will be "discrete" or "matrix-derived" remains to be seen. While we await the final emergence of one system or another, there's a lot of glorious mono sound to be enjoyed. And as manufacturers compete with new and better monophonic systems, the winner, as usual, is the audiophile. **AE**





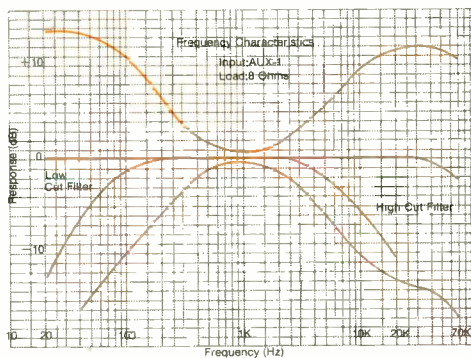
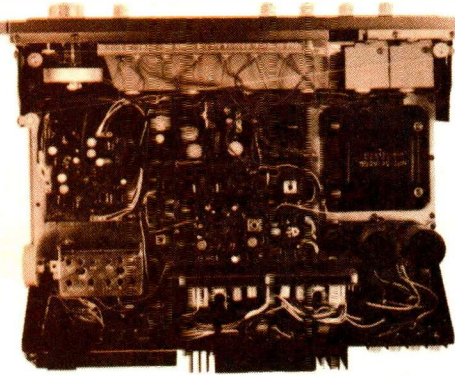
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The experts more than praise the TX-666. Hirsch-Houck (Stereo Review, March '73) calls it "A high performance receiver". High Fidelity (May '73) says it "Behaves well above average". Radio Electronics (Feb. '73) is "Highly impressed". And FM Guide (Jan. '73) calls it a "Winner"!

Prove it to yourself. Listen to the TX-666 and all the other outstanding Onkyo audio products — tuners, amplifiers, receivers, speaker systems and speaker components in every price range. You'll discover why Onkyo is audio with an important difference.



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Sherwood L. Weingarten



Ronnie Wood & Rod Stewart of Faces

I'VE HAD WHAT a good songwriter could do something with—a heavy dose of The Middle Age Blues. The most obvious sign was the standard potbelly; the least obvious was the flab that's accumulated on the brain.

It crystallized, more or less, this weekend, an almost perfect time for introspection, brooding, reevaluation of a lifestyle that has lost much of its allure. Outside, the skies were ashen gray; a pollution-laden rain fell drearily. Neither would go away. No neighbors were visible, each apparently ensconced in his four-bedroom, two-garage suburban fortress, warding off any possibility of the unthinkable, fearful change.

Or was I wrong? Were these other priests of our plastic rut also questioning the decay of their bodies and minds? No matter, they'd have to fend for themselves; mine, of course, was the consuming problem.

As I flitted from closet to closet, from drawer to drawer, I found only the ragged, rotted pieces of a hundred

unfinished projects, discarded ideas and hopes. Together, out of hiding now, they comprised a requiem for a dreamer, a montage in mixed media depicting the demise of pure optimism, a surrender to reality, to compromise.

Somewhere, sometime, I'd stopped striving for perfection, settled into an old-shoe comfort; my life had become a rerun, a sparkless, joyless dangling skeleton that mocked what might have been.

But the mind is a wondrous thing; it won't allow too much depression, excess desperation. It blocks. So by the end of the weekend, I'd dusted the cobwebs from my cerebrum, decided on a dozen new ways of infusing life into the lifeless. If any one of them works, I'll be okay.

Once I realized that yesterday was merely yesterday and it didn't have a lock on either today or tomorrow, the eureka light-bulb exploded in my head. No more mind-fornication for me. Instead, action. Somehow that mini-encounter session with me, myself

and I as participating sickies had worked. I didn't have to do the same things over and over; I was, *am*, capable of conquering new vistas, attempting new ventures even if failure seems inevitable. It's not whether you win or lose *or* how you play the game; the only important thing is getting into the lineup.

Unfortunately, as with most converts, I immediately wanted to become a missionary. And a sadness followed. For as a record critic, I've seen too many performers shackled by that same Middle Age Blues, something I now see not to be a matter of age but of perspective. How can *I* tell them to *risk*, to look to the forward danger instead of the safety behind? They won't listen to me anymore than I would have heard anyone else. So the repetition of past success will continue for many vinyl artists. But change? Hardly.

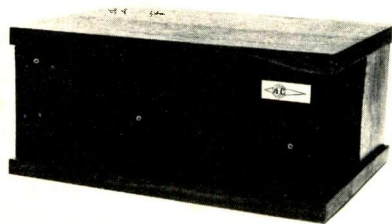
One example of this kind of stagnation is **Coast to Coast** (Mercury, SRM-

1-697), which joins *Rod Stewart*, one of the original Deep Throats, with the four-member *Faces*. There are nine cuts, including two double-song entries, culled from ostensibly live performances at the Anaheim Convention Center and the Hollywood Palladium.

Stewart, who climbed from the virtual safety of a group to try it on his own, returns to the warmth of that womb-like lead singer position despite solo success. Rumor has it, in fact, that he will no longer appear alone but only in joint shows with *Faces*.

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Goodbye innovation; so long risk; hello familiarity.

On this outing, inappropriately subtitled *Overture and Beginners*, the rockin' begins with Bobby and Shirley Womack's *It's All Over Now*, showcasing some great piano by Ian McLagan. For a moment there you believe that all the applause and shouts the record begins with is warranted. But it's mostly downhill from that point on, despite the addition of Tetsu Yamauchi on bass and trombone as one-quarter of *Faces*.

There are a couple of peaks. First is *Too Bad/Every Picture Tells a Story*, one of three tunes penned by Stewart and *Faces*' guitarist, Ron Wood (although McLagan sneaks in a credit on *Bostal Boy/Amazing Grace*, the second of the highlights). The former tends to build to a cardiac arrest pace at its end, while the latter starts with old time rock 'n' roll, moves through a Wood segment that spits fire (just prior to the *Amazing Grace* interlude in which Stewart's gravel-throated voice gives the piece an inspired aura of newness), and falls together for a hard rock climax.

Blandness, however, or an old bugaboo—the "I've-heard-it-too-many-times-before" syndrome—take up the lion's share of the LP. Jimi Hendrix' *Angel*, despite being a hit single for Stewart, is so slow it's actually boring; *Stay With Me*, another Stewart chartbuster in a different rendition that's slightly less frenetic and more polished than this, never jells; John Lennon's *Jealous Guy*, which Stewart straight-faced tells the audience is what they all really came out to play, just limps along to close the session.

The only unique aspect of the production is that two competing companies joined forces to distribute the thing, Mercury handling the discs while Warner Brothers, the *Faces*' label, pushes 8-track and cassette versions.

Stewart has five solo LPs behind him, three of them gold records; in addition, he momentarily veered from his norm by appearing on the all-star *Tommy* album. Now, however, he seems to be running for cover, back to the old-shoe home he had previously with *Faces*, and back to the material he knows so well he does it by rote. All the way back, perhaps, to the comfort of comparative obscurity.

*Grace Slick*, in contrast, has always been one to try something new, particularly if it appeared to fly in the proverbial face of convention. A former model who had performed with a group called the Great Society before becoming one of the lead singers of

Jefferson Airplane, she has now decided to go it alone, figuratively speaking, that is. For her solo debut, *Manhole* (Grunt, BFL1-0347), is anything but.

Guess who appears with her? Paul Kantner, the Airplane's driving lead rhythm guitarist; Jack Casady, the group's bass player; Peter Kaukonen, David Freiberg and David Crosby, all connected with past Airplane projects. Kantner and Freiberg, in fact, do the vocal on *It's Only Music*, while Grace attends, perhaps, to the chores of being a mother.

The RCA-distributed record, produced by Ms. Slick (and, of course, the everpresent Kantner and Freiberg), contains half a dozen cuts, including the lengthy *Theme from "Manhole."* It begins with the wordless *Jay*, a Latin-tempo tune that Gracie sort of hums along with, Mitch Miller-style. *Theme*, which intersperses Spanish lyrics with English, is filled with strings and orchestral devices worthy of a Bing Crosby extravaganza; it is a non-rocking, non-inventive piece not unlike most Airplane outings in recent years (with the exception of the *Starship LP*).

Why did the songstress compose the 15:23 piece? In a booklet accompanying the album, and making sure to allude to a long-ago success, *White Rabbit*, she writes: "... the word Spain means literally 'Land of Rabbits.' But I just found that out about a month ago, so there is no particular intent at continuity. Spanish stuff just gets me off." It's a shame that the same effect doesn't carry over to the listener, who keeps waiting, without satisfaction, for *something* to happen. Even Ms. Slick's vocal is devastatingly ordinary. Musically, the only heart exists at the tune's tail, where, for a few all-too-brief moments, it starts to rock.

The flip side of the record continues the Latin mode via *iCome Again? Toucan*, a gimmicky item filled with plays on words. *Epic* (#38) is the only electronic piece, utilizing an almost-interesting combination of synthesizer and bagpipes. Parts of it are good, parts aren't; on balance, however, #38 might be the appropriate place on a list of the Airplane's best.

One piece does stand out, *Better Lying Down*. But it's no step toward the future; instead, it's a throwback to the Bessie Smith-Billie Holiday-Janis Joplin kind of blues. Nonetheless, it's by far the best cut, a real success for Grace, who wrote the lyrics.

Overall, though, Ms. Slick, like the Airplane, seems grounded, immersed in a muddy runway to latter day nostalgia.

Still another example of going in circles, despite attempts to proclaim otherwise, is **Jerry Lee Lewis' Southern Roots** (Mercury, SRM-1-690).

His last two albums were based in rock, the kind of material that acted as his springboard to stardom almost two decades ago; this one is overburdened with an attempt to recapture the southern feel he claims is part of him.

Lewis, who also fought the good fight against society's moral whims by marrying his 13-year-old cousin, is the ultimate egomaniac. This quickly can be seen on the present vinyl by his frequently changing *me* in lyrics to *Jerry Lee*.

I have nothing against an attempt to go home again, as futile as that has proved to be for most, but a blatant try to sell it as progress is something else again. Thus, when he backs himself with the MGs (Steve Cropper on guitar, Donald "Duck" Dunn on bass, Al Jackson, Jr. on drums), when he lets a songsmith and a couple of singers (Tony Joe White, Carl Perkins and Mark Lindsay) play along on guitar and sax, he ain't goin' nowhere, even if he subtitled the album *Back Home to Memphis*.

Specifically, *When a Man Loves a Woman* becomes soul without soul,

*Hold On I'm Coming* becomes a coarse interlude (with inserted lyrics about the sexual exploits in Tennessee of Lewis, the "Killer") that rocks a bit but is basically impotent, and *Blueberry Hill* becomes a pale shade of Fats Domino.

He can bounce around all he wants, kick the keyboard with any part of his body he wishes, shout and scream that he's the best, but until he graduates from the past, he's just another often-married, tired old man.

**Blood, Sweat & Tears** was a breakthrough group, combining jazz and rock-pop via a large, big band sound; on their heels, however, was **Santana**, which broke even more barriers by adding Latin rhythms to it all. But Santana too has become a shadow of itself, shown by **Welcome** (Columbia Quadrasonic, PCQ 32445).

There are nine cuts that Carlos Santana, guitarist ordinary, has put together; their range tends to resemble bad Tito Puente, bad Xavier Cugat, bad Percy Faith or bad Stan Kenton. Too many bads to be very good.

*Mother Africa* is a fascinating track, featuring good organ work by Tom Caster and some extraordinary riffs by Jules Broussard on soprano sax—combining the oldness of Africa with the torment of today—it's the type of

piece you listen to once and hear a little, listen to again and hear a lot. *Flame . . . Sky*, also, is worth a spin or three. There are great guitar segments, jazz elements that make your mind quicken, and a touch of rock—the only real rock on the entire LP—that starts to cook (but never quite develops into the toe-tapping variety).

The rest of the album, though, runs into a blank wall. *Love, Devotion & Surrender*, for instance, is repetitious to a fault, and contains a vocal that carries as much jolt as smoking oregano. *Samba De Sausalito*, allegedly a paean to a charming town built into a hillside, is airy enough but non-substantial. *When I Look Into Your Eyes* reminds me of early, unresolved Ellington, and *Yours Is the Light*, despite some good jazz lines, is marred by vocals a la Sergio Mendes' groups that don't make me want to listen but instead sleep on a Brazilian beach. And the title tune is pure slush.

Because you've made an initial breakthrough, the point seems to be, you can't retire from the hazards of newness, unless you're willing to gamble with critiques such as this.

On Dasher, on Dancer, on Stewart, on Slick, on Lewis, on Santana. Oh, yes, on Weingarten!

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# Classical Reviews

Edward Tatnall Canby

## RCA Goes Baroque

**Vivaldi: Six Concertos for Flute, Oboe.** Jean-Pierre Rampal, fl., Pierre Pierlot, ob., I solisti Veneti, Scimone. **Erato (RCA) STU 70623**, stereo \$6.98.

**VIVALDI: The Mandoline Concertos; Concerto for Violin discordato.** Bonifacio Bianchi, Aless. Pirelli, mandolines, Piero Toso, vl., I solisti Veneti, Scimone. **Erato (RCA) STU 70545**, stereo \$6.98.

Suddenly, RCA has gone Baroque! In the first batch of direct RCA imports from Erato in France these two from the Italian I solisti Veneti under Claudio Scimone are the most interesting. The French-performed items in the same batch are a more conventional echo of many an earlier Baroque release, with some of the same performers.

Jean-Pierre Rampal is the finest Baroque-period flutist anywhere, for my ear, and music in which he participates benefits nobly—not only in the virtuoso and highly musical playing, with a remarkable amount of legitimate free ornamentation, but in an electric excitement easily communicated to the accompanying players. The semi-solo Italian group (six fiddles, three violas, two cellos and a bass) plays a fast, light Italian style, descended from the famed I Musici, once praised by Toscanini, an effect entirely minus that heavy, symphonic sound once standard—and surely wrongly standard—for this type of concerto. The flute concerti sound perhaps like a brawny Mozart (where else but in Italy did Mozart find his own light style, indirectly and directly, only a quarter century or so later!). The oboe concerti, less complex in keeping with the oboe's lesser agility, follow a similar path. All these are world first recordings—nothing unusual *chez* Vivaldi. We could have a dozen Vivaldi revivals before the new material put in order since WW II is mined out. The flute concerti are outstanding; Vivaldi seems to have had a special love of the flute and a rare understanding of what it could do.

The mandoline record is lovely. The light, flexible string group plays in a startlingly large liveness, sounding huge, yet transparent—ha! the art of microphoning at its musical best. Against this, the mandolines are perfectly balanced, very small and very seductive. A beautiful recording job and the playing is beautiful too. Side 2 offers unusual novelties, a “concertante” work with three pairs of exotic solos and a violin concerto with the violin specially tuned, one string jacked up a minor third. Wonder it doesn't snap. The mandolines and theorbos (a type of lute) are as intended in the first of these works; the pair of “salmos,” just maybe early clarinets, and the violins “in tromba marina” are represented by modern clarinets and violins for a good sense of the diversity of tone color obviously intended. (My small music library shows a picture of a tromba marina, a long, one-string box of a violin, bowed curiously at the neck, above the finger-touch point, which would seem to produce harmonics—hence maybe the effect of a distant trumpet? Some subnormal musical types have put this music on modern regular trumpets merely because of the word *tromba*.)

As for the “dis-corded” violin, its player is Pietro Toso, leader of the string group and a tremendous musician; his weirdly high fiddle sounds are out of this world, for a most unusual Baroque concerto. String players should acquire it on the spot.

**Le Canon de Pachelbel et Deux Suites pour Cordes; Le Concerto pour Trompette de Fasch & Deux Symphonies.** Maurice André, trumpet, Orch. de Ch. Jean-François Paillard. **Erato (RCA) STU 70468**, stereo, \$6.98.

**Maurice André et ses Elèves (5 Concertos for 2,3,4,6 trumpets).** Orch. de Ch. Jean-François Paillard. **Erato (RCA) STU 70685**, stereo, \$6.98.

Phew! Such a lot of nomenclature, and the contents are equally mixed-baggish. Shades of the early Nonesuch days—those who collected that label (and still collect it) will recognize the familiar performing names; it's all from the same sources. With fancier gate-fold albums and higher prices, these are in effect more Nonesuch recordings under their original European labeling.

Jean-François Paillard is very much of the old-fashioned Baroque school, as of approximately its heyday in the 1930s. Heavyweight, solid, massive and Romantic in the slow moments, lumpy and slurping in the fast, all the endings retarded almost to a standstill, every fast movement in the same monotonously inflexible tempo—no, I do not much like the stuff, though I realize that many a listener (including me) once got a fine start towards new musical horizons in just such playing. I throw in this evaluation mainly to warn the more advanced listener (not more worthy, mind you, just more experienced). Also typical of this style are the “arrangements” for modern orchestra—the Pachelbel canon—out of the old Bach-Stokowski approach and much earlier, ultra-Romantic but in truth pleasant to listen to. Be warned, be informed, take your choice.

The Pachelbel on the first disc is early Baroque, gentle 17th century stuff; the Fasch is brash and Bach-like. As for Maurice André, he is a splendidly unregenerate old-style Baroque trumpeter, on a piercingly loud modern instrument, and so are his numerous *élèves*—pupils. If you still cultivate an ear for “Baroque trumpet” recordings, this is the last-word ultimate. (On its original instruments, now coming into restored practice, the sound is much gentler though still noble.)

**T. Albinoni: Célèbre Adagio; Concertos & Sinfonies pour Trompette, Hautbois et Cordes.** M. André, J. Chambon, Georg-Friedrich Handel;

Orch. de la Radio-diffusion Sarroise, Ristenpart. **Erato (RCA) STU 70231**, stereo, \$6.98.

Karl Ristenpart, another "Nonesuch" conductor, operates on the borders of musical Germany here and is a more up-to-date Baroque practitioner while still espousing the big symphonic sound. His Albinoni is more German than Italian (or French) but it flows spaciouly and flexibly, altogether more musical than the Paillard offerings. Again—a "celebrated" arrangement, ultra-old-fashioned, and again the piercing André trumpet, but less prominently recorded in this case. On the whole this is a valuable and very listenable survey of an outstanding Italian Baroque composer, whose music is richer and thicker than that of Vivaldi, more Bach-like, but not yet tending to the fruity as in still later Italians.

P.S. Georg-Friedrich Handel is a present-day violinist and presumably no relation of old Georg Friedrich Händel, as the famed composer was known in his native Germany. What a name to carry around under your arm, though!

**Saint-Saëns: "Organ" Symphony (No. 3).** City of Birmingham Symphony Orch., Fremaux. **Klavier Patrician KS 526**, stereo, \$5.98.

The best hi fi recording of this well known "hi fi test" piece—with its low-low organ tones—since the celebrated early LP from Columbia that used to rattle the hi fi show speakers all over, and this one also happens to be highly musical, about the nicest version I've heard. The organ is perfectly balanced against the orchestra and really beautifully set off, so you can hear all the organ passages (you sometimes can't) and yet they are never obtrusive. A gorgeous recording, no other word will do.

**Saint-Saëns: The Carnival of the Animals. Fauré; Ballade. Litloff: Scherzo from "Concerto Symphonique," No. 4.** John Ogdon, Brenda Lucas, pianos; City of Birmingham Symphony Orch., Fremaux. **Klavier Patrician KS 527**, stereo, \$5.98.

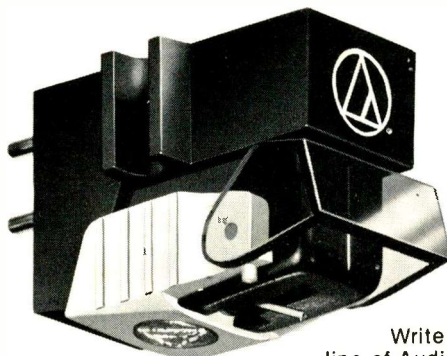
Here's another winner in this remarkable series from a small company, imported out of England. John Ogdon—no minor pianist!—is a great thunderer but he plays sensitively here with Brenda Lucas and the humorous little piece flows gaily along with its assorted animals; the other items, Ogdon alone, are played with virtuoso keyboard ability and the unusually alive and warm sound of Frenchman Fremaux and his British ensemble.

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# Theater

## and the Spoken Word

Donald M. Spoto

**A Little Night Music**, Original Cast Album: Columbia SQ 32265, \$6.98.

Stephen Sondheim's latest musical marks the coming of age of that genre in America. It is consistently entertaining, innovative, tuneful, adult. It refuses to insult the intelligence and sensitivities of its audience. It is a thoroughly satisfying experience in every way (I say this after a half dozen viewings), and the original cast album Columbia has released in stereo and quadraphonic is superb.

I was present at the historic recording session for this show, a cold winter's

day that began in high spirits (Sunday morning at ten a.m.) and ended with an exhausted crew whose spirits were undiminished (Monday morning at two a.m.). Under Goddard Lieberson's expertise and with the advice of Sondheim himself, an ideal disc was cut. Unlike the *Follies* album, on which Capitol elected to make painful cuts, *Night Music* restores even the cuts made in the performing version. It is Sondheim's score, undiluted, as Sondheim himself wanted it preserved. And it is glorious.

The entire score is in  $\frac{3}{4}$  time, but it never cloys, never bores. There is apparently no end to the fertility of Sondheim's imagination, as there is in his lyric line a sense of the possibilities of English, and of internal rhyme. His music and lyrics, like Jonathan Tunick's richly supportive orchestrations, fairly shimmer with the blue sparks of genius. There is strong reminiscence of Ravel in this score, as there are occasional homages to Mahler, Richard Strauss and even Gilbert and Sullivan. But over all there is Sondheim's own unique talent: in his complex trio *Now/Later/Soon* there is a modernization of the madrigal and the operatic ensemble; in *The Glamorous Life* there is a witty iconoclasm about the cliché of the travelling actor; in *You Must Meet My Wife* and *Liaisons* there is a Cowardesque bittersweetness, but an altogether original verbal manipulation. And in two show-stopping numbers his control of the material is astounding: *A Weekend in the Country's* infectious rhythm and wit build to a telling *Rosenkavalier* finale (even with the latter's famous first eight notes), and in *Send in the Clowns* we at last have a ballad that may outlive even the critics' raves. (Glynis Johns had a frightful col that March recording day, but none of the limpid dignity of her nightly stage delivery of the song is lost here. And let students note that the harp obbligato recalls Mahler's seventh symphony—which bears the title *Song of the Night!*)

And so on and so on. Each number in this score makes its own contribution to a successful whole. Miss Johns, Hermione Gingold, Len Cariou and the rest are eminently believable in their roles, which are based on characters in Ingmar Bergman's film *Smiles of a Summer Night*. In supporting roles, D. Jamin-Bartlett's talent cannot be ignored in her lusty *The Miller's Son*, and Patricia Elliott's disarming *Every Day A Little Death* elicits all the humane contradictions of this Beckett-like air. Mark Lambert and Laurence Guittard, Victoria Mallory and Judy Kahan are all fine, too.



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Treasure this album—in the excellent quadraphonic version or in the stereo (curiously, only the latter includes the libretto, which is a must for continued, deeper enjoyment). *Donald M. Spoto*

Performance: A Sound: A

**People Past and Present: Samuel Pepys and People Past and Present: Jane Austen**  
Argo Stereo ZPL 1165 and 1168.

Records with titles like these might strike you as a sure cure for insomnia. Not so! The set, containing readings from and commentaries on the works of important figures in English letters, emerges as a witty, refreshingly diverting evening at home with great writers.

The Jane Austen disc is the better of the two. Dorothy Reynolds and Angus MacKay read critical comments by Charlotte Brontë, Sir Walter Scott, Elizabeth Barrett Browning and Virginia Woolf, among others. All but Mrs. Woolf had high praise and witty remarks of their own, but the author of *Mrs. Dalloway* and *To the Lighthouse* dismissed Jane Austen curtly. That is not surprising, for she was busy breaking new literary ground herself, and had no patience with the traditional novel form.

The record then swings into excerpts from Jane Austen's own writings, and here the real fun begins. There are pointed, trenchant social sketches—all of them amusing and some downright hilarious—from *Emma*, *Pride and Prejudice*, *Mansfield Park* and some letters that reveal a highly cultivated and sensitive mind that had no patience with pretense. Jane Austen (1775-1817) really comes alive here—in fact, I became acutely aware of the origins of a tradition that would flower in our own time with Noël Coward. The dialogue between Emma and Mrs. Elton, e.g., or between Mr. and Mrs. Bennett, could come to us straight from *Hay Fever* or *Private Lives*—or even from Gilbert and Sullivan. This is a fine, funny, informative record that will provide pleasure to those who enjoy Anna Russell, Joyce Grenfell or Nichols and May. And if there are students about, it's a pleasantly painless way to absorb the kind of literature that, in schools, is usually represented as archaeology.

The Samuel Pepys collection has some neatly inserted lute music from the period (Pepys lived from 1633-1703). Carleton Hobbs has chosen excerpts from the famous diary ranging over a ten-year period, and the information it provides on Restoration England, the Great Fire of London and socio-

political matters both great and small is generally colorful and interesting. The diary concludes with Pepys' admission that "the badness of my eyes has made it necessary for my good wife to read to me, the which she do very well." His entries on his personal life, on his wife's portrait and her apparently unsuccessful dancing lessons are gently witty and humane. In them we find the soul of a good and simple man who has left us an important chronicle on life in 17th century London.

The two records are part of a new series by Argo/Decca, and we are

promised others. I would welcome albums like this on, say, Eliot, Lawrence, Virginia Woolf and others from the 19th and 20th centuries. With a small but appreciative audience reacting quite properly (the recordings were made live at the National Portrait Gallery's "People Past and Present" series in London which started in 1968), there is an added dimension of spontaneity. It's all a surprisingly delicious lot of fun as well as 21 carat culture.

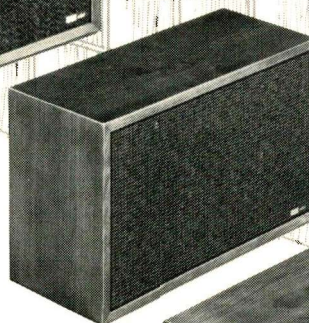
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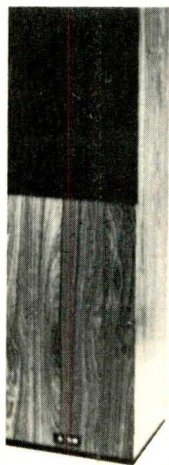
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# Jazz & Blues

Martha Sanders Gilmore

**McCOY TYNER:** Reevaluation: The Impulse Years

**Musicians:** McCoy Tyner, piano; Art Davis, bass; Elvin Jones, drums; John Coltrane, saxophone; Jimmy Garrison, bass; Thad Jones, trumpet; Frank Strozier, alto saxophone; John Gilmore, tenor saxophone; Butch Warren, bass; Steve Davis, bass; Lex Humphries, drums; Rashied Ali, drums; Bob Cranshaw, bass; Mickey Roker, drums; Henry Grimes, bass; Roy Haynes, drums; Albert Heath, drums.

**Songs:** *Inception; Welcome; Contemporary Focus; One Down, One Up; Effendi; Blue Monk; Serenity; Monk's Blues; Have You Met Miss Jones; Sun Ship; Autumn Leaves; You'd Be So Nice To Come Home To.*

**Impulse/ABC AS-9235-2**, 2 discs, stereo, \$11.96.

The late tenor saxophonist John Coltrane walked into the Red Rooster Bar in Philadelphia, Tyner's hometown, and found himself a piano player. McCoy Tyner was only 17 years old when the two musical geniuses met, and went on to join and embellish the Coltrane Quartet in 1960. But Tyner had already gained wide musical experience, having studied privately at the Granoff School of Music, and Music City, then working locally with trumpeter Cal Massey. In addition, he was a member of Art Farmer and Benny Golson's jazztet for six months.

McCoy Tyner is indeed a masterful pianist, an orchestral one if you will. His right hand relies upon well articulated arpeggios, his left on a modal approach and predominant use of fourths. And Tyner can also employ Peteronesque single-note rippling lines that bend and sway with the breeze.

Of the twelve selections included on these LP's which cover the years 1962-65, eight were originally issued under Tyner's own name and are more in the mainstream, single-note fashion. Take for instance his vivacious high-hatted *Have You Met Miss Jones?*, a Rogers and Hart show tune which features Roy Haynes feather-light brush work and the adept walking bass of Henry Grimes. All in all, a delightful number. In *You'd Be So Nice To Come Home To*, Tyner salutes fellow jazz pianist Bill Evans with his delicate left hand voicings. And *Autumn Leaves* is not in the least sad or forlorn, Tyner taking it at a medium bounce.

*Effendi* was taken from McCoy's first album with Tyner a mite more restrained here perhaps, tossing off phrases as if they were nothing. Bassist Art Davis is thoroughly amiable, treating his bass almost as though it were a piano. He achieves such a round full tone with it. You may recall *Monk's Blues* from the album "McCoy Tyner Live at Newport" in which Tyner completely captures Monk's wry wit and puckish, devil-may-care attitudes. He is with a pick-up group which includes bassist Bob Cranshaw and drummer Mickey Roker. And in *Blue Monk*, another tribute to Thelonious Monk, Tyner is delightfully droll, turning out a first-rate bluesy solo.

Tyner's forays into sound with John Coltrane are expressive of an entirely different facet of his character, a more adventurous, more abstract and experimental one. In *Welcome* Tyner welcomes us with gorgeous rolling arpeggios, a 1965 contribution reminiscent of the work of Alice Coltrane in which he creates an all-embracing spinning wheel of sound. Coltrane states the theme majestically on soprano sax, playing crystal-clear high notes. A rare thing of beauty, it has an infinite quality about it.

*One Down, One Up* shows Coltrane in the final transition stage of his career, abandoning his Indian musical framework for an even freer form of musical expression. Tyner builds a bold, skyscraping solo against Coltrane's screaming, screeching pinched nerves of sound. The music here is evolutionary, organic, as Coltrane demonstrates his total command of his instrument. Highly percussive and glittery is *Serenity*, the concluding section of a five-part suite entitled "Meditations," with Tyner's unique left hand coming to the fore over which he imposes plenty of pedal.

The quality of the sound reproduction varies from cut to cut but is on the whole good. The recordings are well-documented and Anthony Saks' notes carry a wealth of information.

McCoy Tyner continues to be one of the most exciting pianists alive today. He is a definitive artist, ever rich in musical ideas, and one of my favorites.

This is a hardy cross-section of Tyner and an invaluable addition to anyone's collection. Those Impulse Years were good years.

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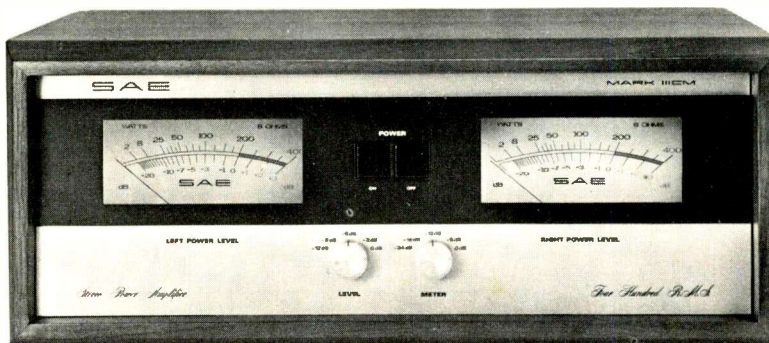
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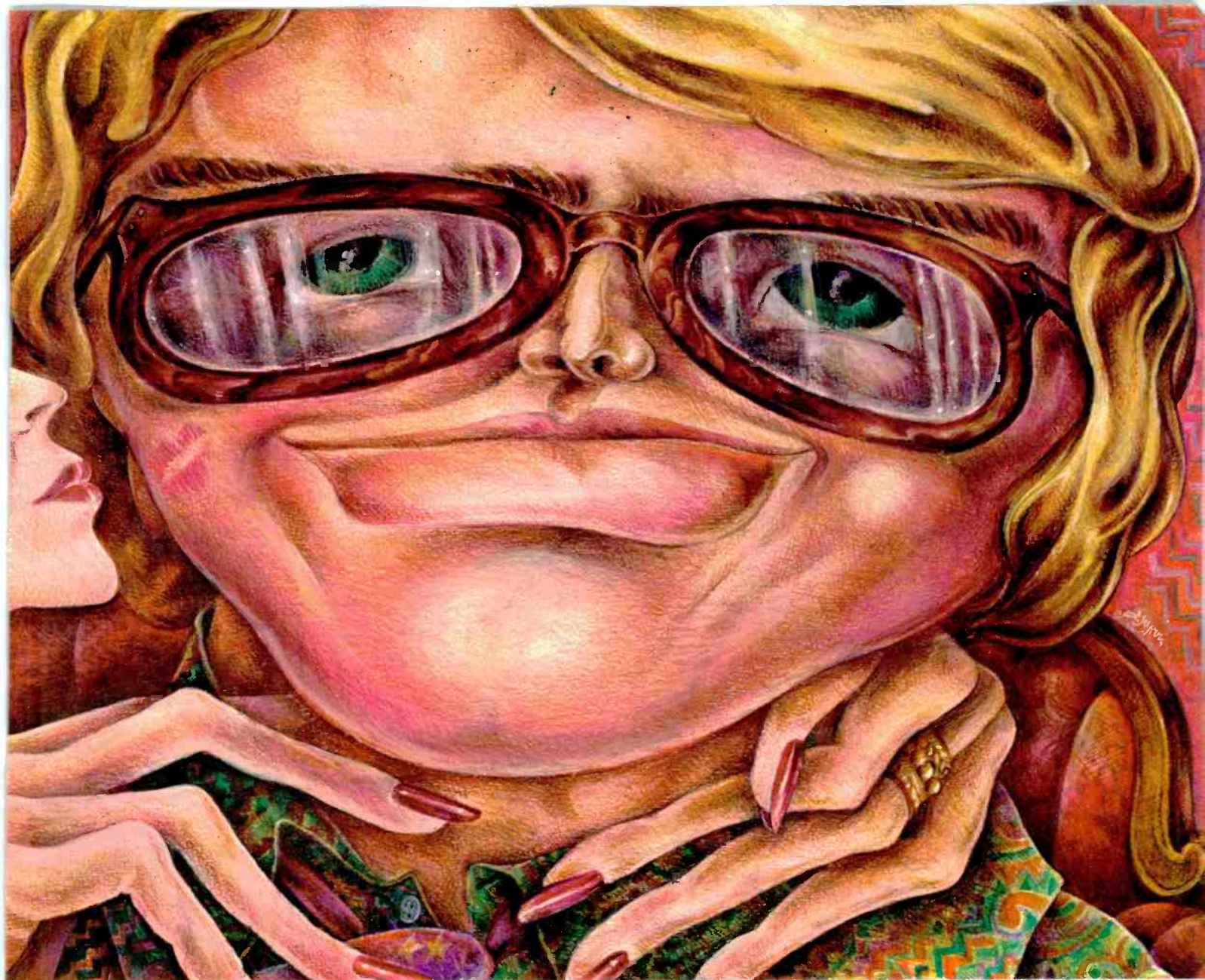
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