

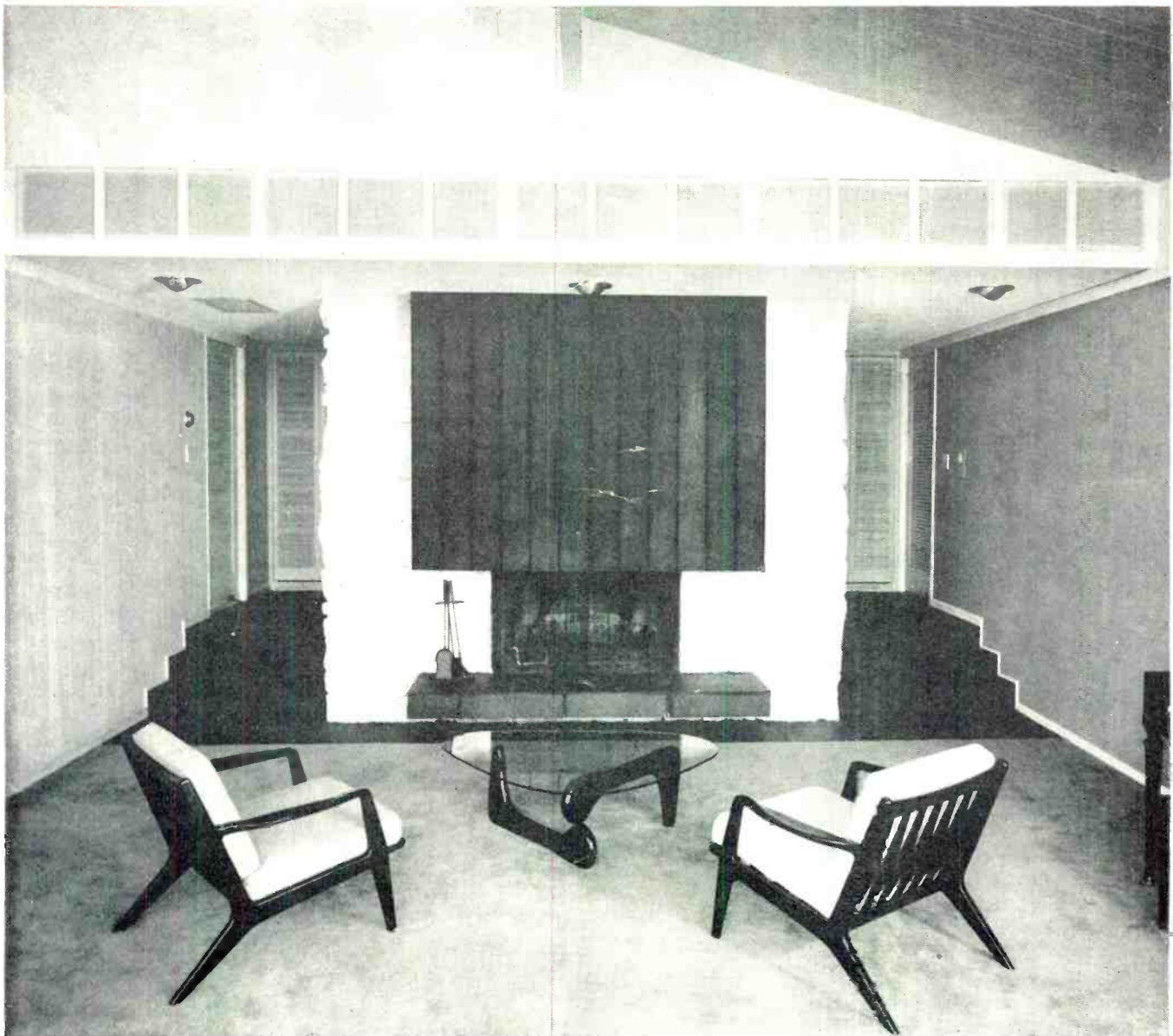
AUDIO

CDC

FEBRUARY, 1964

60¢

...the original magazine about high fidelity!



Above the fireplace, below the ceiling page 63

ON A DESERTED MOUNTAINTOP 10,000 FEET ABOVE THE CALIFORNIA DESERT THE SCOTT MONOPHONIC 310 IS ABOUT TO BE REPLACED... BY THE NEW TRANSISTOR 4312 STEREO TUNER

High atop Mount Santa Rosa, in California, the Palm Springs Television Company has been using monophonic Scott 310 broadcast monitors to relay FM programs from Los Angeles 105 miles away to the town of Palm Springs, directly behind the mountain. With the advent of stereo, new equipment was needed that would be as reliable as the 310, and provide the same performance . . . now in stereo. After an exhaustive study of available tuners, the brand new Scott 4312 transistorized tuner was selected for the job. Like the 310's they are replacing, the new Scott 4312's will have to undergo a punishing ordeal on the mountaintop. Towering snowdrifts make these tuners completely inaccessible for many months of the year. There is no margin for error . . . these tuners have to work perfectly, with unvarying reliability. They cannot drift even slightly during the entire period.

Robert Beaman, Chief Engineer for Palm Springs Television Company, emphasized the two basic factors in the selection of the Scott 4312:

1. The radically new Solid State circuitry, designed by Scott, provides the optimum in stability and assures years of cool-running, trouble-free performance . . . a must for a remote location like Mount Santa Rosa.
2. New Scott transistor circuitry makes possible three-megacycle detector bandwidth which provides a new standard of stereo separation not previously achieved with vacuum tube tuners.



Here are the seven features that make the Scott 4312 the world's first truly reliable TRANSISTORIZED tuner.

1. Transistorized time-switching multiplex circuitry. Separation in excess of 35 db at 400 cps, a new industry standard.
2. 3-megacycle detector, widest of any tuner ever designed. Results in extremely good stereo separation, drift free performance, excellent capture ratio.
3. Nuvistor front end. Nuvistors chosen for their reliable performance and extremely low cross modulation, in excess of -65db. This outstanding design specification assures you that strong local stations show up only once on the dial.
4. Silver-plated RF circuitry. Assures sensitivity of 1.9 microvolts (IHF).
5. Sensitive tuning meter and antenna orientation indicator.
6. Transistorized Auto-Sensor circuitry instantly switches to stereo mode when stereo broadcast goes on the air.
7. Professional slide-rule tuning, with heavily weighted mechanism, and use of ball-bearings throughout. Assures true velvet-touch tuning. \$365*

 **SCOTT®**

H. H. SCOTT INC., 111 Powdermill Road, Maynard, Mass.
*Slightly higher West of Rockies. Accessory cases extra. Export: Morhan Exporting Corp., 458 Broadway, N.Y.C. Canada: Atlas Radio Corp., 50 Wingold Ave., Toronto

FOR NEW SCOTT CATALOG CIRCLE 100 ON READER SERVICE CARD

AUDIO

FEBRUARY, 1964 VOL. 48, No. 2
 Successor to RADIO, Est. 1917

Number 6 in a series of discussions
 by Electro-Voice engineers

C. G. McPROUD • *Publisher*

DAVID SASLAW • *Editor*

JANET M. DURGIN
Production Manager

Contributing Editors

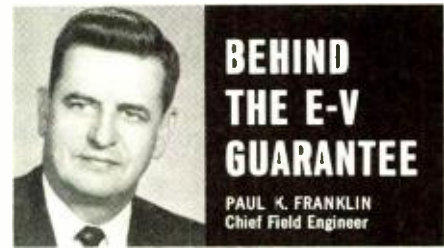
EDWARD TATNALL CANBY

JOSEPH GIOVANELLI

HAROLD LAWRENCE

CHESTER SANTON

HERMAN BURSTEIN



HENRY A. SCHOBER
Business Manager

SANFORD L. CAHN
Advertising Director

EDGAR E. NEWMAN
Circulation Director

Representatives

Bill Pattis & Associates,
 4761 West Touhy Ave.,
 Lincolnwood 46, Ill.

James C. Galloway,
 6535 Wilshire Blvd.,
 Los Angeles 48, Calif.

Warren Birkenhead, Inc.,
 No. 25, 2-chome, Shiba Hama-
 matsu-cho,
 Minato-ku, Tokyo, Japan

AUDIO Articles

Master Timer	19
Bad Sound From Great Composers	21
Reducing Distortion in Stereo Phonograph Systems	23
A Re-Recording Filter	35
Basic Questions and Answers	36

William G. Dille
 Lewis A. Harlow

J. G. Woodward
 H. E. Riekels, Jr.
 Christopher Faye

AUDIO Reviews

Light Listening	6
Record Revue	44
Jazz and All That	50

Chester Santon
 Edward Tatnall Canby
 Bertram Stanleigh

AUDIO Profiles

McIntosh FM-Stereo Tuner	38
Clark Stereo Headphones	40
EICO IM-Harmonic Distortion Meter	40

Model MR67
 Model 100
 Model 902W

AUDIO in General

Audioclinic	2
Letters	8
Audio ETC	10
Editor's Review	16
Tape Guide	42
About Music	48
New Products	52
Cover Story	63
New Literature	64
Industry Notes	65
Advertising Index	66

Joseph Giovannelli
 Edward Tatnall Canby
 Herman Burstein
 Harold Lawrence

While dynamic microphones have long been considered as "rugged," this strength was often gained at the expense of wide range and sensitivity. The problem centered on the massive metallic diaphragms first used. Shortly after World War II, E-V engineers created the long-awaited breakthrough with Acoustalloy® diaphragm material. Acoustalloy is a plastic that remains chemically inert, for unchanging characteristics over many years. It does not become brittle despite extremes of temperature, does not fatigue, and is capable of being precisely molded to a specified stiffness. By combining mechanical and acoustical damping, a very uniform and wide-range frequency response can be obtained.

Although the moving system of a dynamic element is inherently quite rugged, careful mechanical design can achieve an almost indestructible microphone. The nesting principle—another E-V design feature—arranges the microphone internal structure so that each part serves to protect the adjacent parts from mechanical shock while fulfilling its main functional purpose.

The transducer components are designed and manufactured to extremely close tolerances so that mechanical alignment is maintained. The entire assembly, in turn, is carefully fitted within the microphone case itself. The net result is a unit so closely "packed" that only mechanical shock strong enough to distort the outer case will normally affect the performance of the microphone.

E-V engineers learned long ago that a fragile microphone cannot successfully survive in the often-frantic environment of TV, movie, and recording studios. It is a matter of great satisfaction to us that, despite the industry's most generous guarantee, very few E-V microphones are returned for repairs of any kind. And this favorable return ratio, in turn, makes possible the unique two-year warranty that asks no questions, but simply repairs—at no cost except for finish—every E-V professional microphone returned, regardless of cause. It literally doesn't matter whether it failed from accidental abuse or a structural fault.

Because repair facilities and experienced repair personnel are quite expensive, we must be very certain that E-V professional microphones will easily outlast the warranty period. That they consistently do so is the direct result of years of development of the E-V dynamic microphone design concept.

For technical data on any E-V product, write:
 ELECTRO-VOICE, INC., Dept. 243A
 Buchanan, Michigan 49107



AUDIO (title registered U. S. Pat. Off.) is published monthly by Radio Magazines, Inc., Henry A. Schober, President; C. G. McProud, Secretary, Executive and Editorial Offices, 204 Front St., Mineola, N. Y. Subscription rates—U. S., Possessions, Canada, and Mexico, \$5.00 for one year, \$9.00 for two years; all other countries \$6.00 per year. Single copies 60¢. Printed in U.S.A. at 10 McGovern Ave., Lancaster, Pa. All rights reserved. Entire contents copyrighted 1964 by Radio Magazines, Inc. Second Class postage paid at Lancaster, Pa.



RADIO MAGAZINES, INC., P. O. Box 629, MINEOLA, N. Y.
 Postmaster: Send Form 3579 to AUDIO, P. O. Box 629, Mineola, N. Y.



Coming Next Month

Construction . . .

- A Transistorized FM Squelch. K. E. Springer. With the addition of two transistors and a few other parts, a squelch can be added to tuners using the saturated plate current pentode limiter.

- A Houseful of Hi-Fi. Herbert M. Honig. The author describes his system of having sound where you want it with complete control of the remote sound.

Tape Recording . . .

- Recording a Community Music Festival. Gil Daney. If your community, or a surrounding one, has a music festival which rates recording, now is the time to start preparations. The author describes how the 7th Annual Alaska Festival of Music was recorded.

and

Equipment Profiles . . .

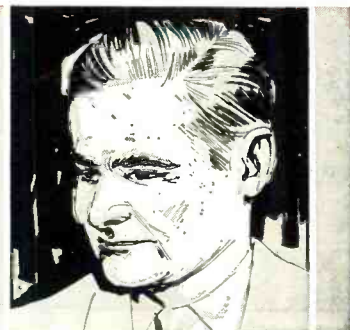
- PML Condenser Microphone, Model EC-61.
- ADC Point Four Stereo Pickup.

In the March Issue

On the newsstands, at your favorite audio dealer's, or in your own mailbox.

AUDIO CLINIC

Joseph Giovanelli



Send questions to:

Joseph Giovanelli
2819 Newkirk Ave.
Brooklyn 26, N. Y.

Include stamped, self-addressed envelope.

Interference with FM Stereo

Q. I have been having a considerable amount of difficulty recording the stereo FM transmissions of WKFM (Chicago), though the signal strength is average for the other five stereo stations in this area. Two of these stations are very easily recorded.

The trouble appears to be most apparent during those periods between selections, or any other quiet time: a gurgling noise, no particular frequency (but within the 100-300 cps range) is emitted through the system at a high enough level to warrant comment from non-critical listeners.

I wonder if you might offer some suggestions as to what the problem is. If so, possibly you can offer advice on its elimination.

I have listened to the same station through other FM-stereo tuners and found the same condition, to a slightly greater or less degree. G. W. S.

A. I suspect that the reason you are having difficulty with one particular FM stereo station is that this particular station is transmitting a background music channel. Your stereo equipment apparently does not have sufficient filtering to reject this sub-carrier. Possibly the subcarrier is beating with the bias oscillator in your tape recorder. Of course, if you hear the background noise even when your tape recorder is not being used, it indicates that the carrier is beating with the 19 or 38 kc signals in the multiplex section of the tuner.

Perhaps the manufacturer of your equipment can supply you with a "trap" circuit which will effectively eliminate this source of interference. You will also require instructions for its installation into your equipment.

There is one further possibility, and that is that the station itself is the culprit. It is sometimes difficult to monitor exactly what is happening when all of this information is transmitted from a single transmitter. I believe, however, that your equipment is the most logical source of the difficulty.

Interpreting Frequency Response

Q. In specifications for various pieces of equipment, the frequency response may be stated for one piece of equipment as being a certain range, plus or minus 0.5 db. In another piece of equipment it will be stated as being plus 0 minus 1 db. In either case, the range of frequency departure is only

1 db. Can you explain which response is more desirable. Michael J. Moffet, FPO, San Francisco, California.

A. Let us assume a "nearly flat" response from 20 to 20,000 cps: there is a dip of 1 db between 10 and 11 kc. Otherwise the response is "flat." We would say that this response is flat, minus 1 db, between 20 and 20,000 cps.

However, if the response has some peaks and some dips with respect to the reference frequency, even though over most of its frequency range the amplifier produced output equal to the reference frequency level, then the response would be written as plus or minus a given amount between two limits of frequency. The given amount would depend upon the magnitude of the peaks and dips.

Whichever method of writing specifications is used, the sound produced by the equipment would be good except where a peak or a dip is extremely sharp, extremely deep, or a combination of these two.

Crossover Network Design

Q. In designing an L-C network, how do you cope with the case where the speaker impedance is changing rapidly with frequency in the region of the desired crossover point. For example, I want to design a 12-db-per-octave high-pass filter to roll off an 8-ohm midrange speaker at 300 cps. The impedance of this speaker rises from 4 ohms at 300 cps to about 14 ohms at 150 cps. The usual 12-db-per-octave filter for 8 ohms at 300 cps produces less than half of the 12-db-per-octave attenuation required—presumably for the above reason. It is okay when loaded with a 4-ohm resistor in place of the speaker. What is the solution? Reid A. Raiton, Berkeley, California.

A. When designing a crossover network, design at the best impedance point you can find. In other words you have a speaker whose impedance is changing in the range of crossover action. You want to get the best attenuation possible for the network. Because the impedance at the crossover is not the 8 ohms stated on its instruction sheet, you must design the network for the impedance the speaker exhibits at the crossover point. (There are exceptions to this, as in your case. However, the basic principles which are stated here will cover the general method which would have to be followed under these circumstances. You will probably find that this kind of design philosophy is a bit unorthodox, but by using it I have produced some very fine results.)

If the impedance is 4 ohms, it is necessary to design a 4-ohm network even though the speaker's impedance is stated to be 8 ohms. You will still not get the exact rolloff you desire but it will often be close enough for practical purposes. (In your case you would have to design around the stated impedance of the speaker because of a steep impedance rise below crossover.)

You might consider the possibility of changing the crossover point to a lower

consider this...

Whatever the other components—most music systems today start with a Garrard Automatic Turntable!



What makes the Garrard so special?

Is it creative engineering, quality control, Garrard's 50 years of experience? Is it features?

Admittedly—the counterweight-adjusted tone arm; the heavy balanced turntable; the Laboratory Series® motor; the ability to track your choice of cartridge at the lightest specified pres-

sure; the convenience of single and automatic play, either at your service when you want it—all play their parts.

But a Garrard is more than the sum of such parts.

A Garrard is a pleasure to own.

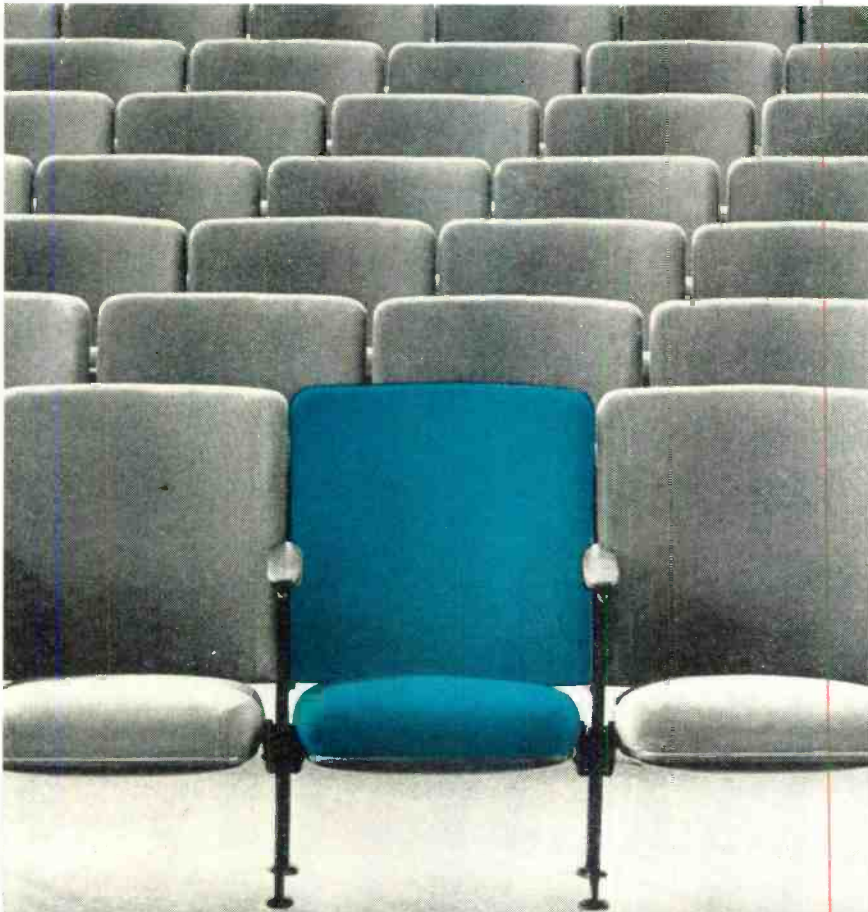
A Garrard is an enduring source of pride and satisfaction!

This is why more dealers recommend Garrard, and more people are buying Garrard, than any other component!

There is a Garrard Automatic Turntable for every high fidelity system. Type A, \$79.50; AT6, \$54.50; Autoslim, \$39.50. For literature, write department GB-14, Garrard, Port Washington, N. Y.



Garrard[®]
WORLD'S FINEST



the best seat in the house...

... and it's right in your living room if your FM is equipped with a

FINCO® AWARD WINNING FM ANTENNA

Broadcasting authorities agree that an outdoor antenna is absolutely essential for the reception of full quality monaural and multiplex FM sound.

A *FINCO* FM antenna will deliver a clean undistorted signal and bring in more stations, regardless of location.

Guarantee yourself the best seat in the house for tonight's FM concert... install a fidelity-phased *FINCO* FM antenna.



Illustrated
FM 4
\$24.90 list

Other models
available from
\$3.75 to \$71.30

FM Electronic Booster
Model T-AMB-AC
\$34.95 List

Available at local dealers...
or write for Bulletin #20-213.

THE FINNEY COMPANY

PRODUCERS OF THE WORLD'S FINEST FM AND TV ANTENNAS
Dept. 34 West Interstate, Bedford, Ohio

or higher portion of the spectrum. This might put the speaker back on the proper impedance or get you close enough to it. It sounds as though the speaker has a resonance somewhat below the crossover point you are now planning to use. Otherwise you would not be getting this rise in impedance. Therefore, try to avoid this frequency. The frequency in which you are interested is 300 cps. If the midrange speaker has a resonance within an octave of this point, the crossover frequency is likely to be emphasized to a degree greater than it should be. After all, not only is the woofer transmitting some signal at 300 cps but so is the midrange speaker. If the output of the midrange is high at this frequency as compared to what it is at most other frequencies, the 300-cps point will stand out with a resulting unpleasant audio peak. To avoid this, cross over at a higher frequency which is determined by the degree of the resonant peak. If the peak is 6 db, try 500 cps as the crossover for the midrange, while you cross over at 300 cps for the woofer as you had originally planned to do.

You may have a similar condition when you consider the crossover point of the tweeter. You will have to take this into consideration when designing the networks.

In any case, the crossover network must be designed around the impedance of the speaker at crossover when possible, rather than its rated impedance. In order to obtain a particular crossover frequency, you may actually have your speakers crossing over at frequencies above and below this point, with the result that the response is smooth over the frequency range. Crossover networks cannot be designed strictly by the "book." You will have to use a "cut and try" approach. Much depends upon the particular brand of speaker used, and, to some extent, upon the individual speakers used. Also, the cabinet in which the speakers are housed plays a part in the over-all performance of the system.

It will help if you take your impedance curves with the speakers mounted in the enclosures you plan to use. This impedance curve will give you a quick idea of resonant points, crossover frequencies to use, and crossover impedance. You don't need an anechoic chamber to get fine results; use the methods I have just described. Æ



\$2.50
each

**SAVE YOUR
COPIES OF
AUDIO**

- Each file holds a full year's copies.
- Jesse Jones Volume Files for every publication.
- Covered in durable leather like Kivar, title embossed in 16 Kt gold.

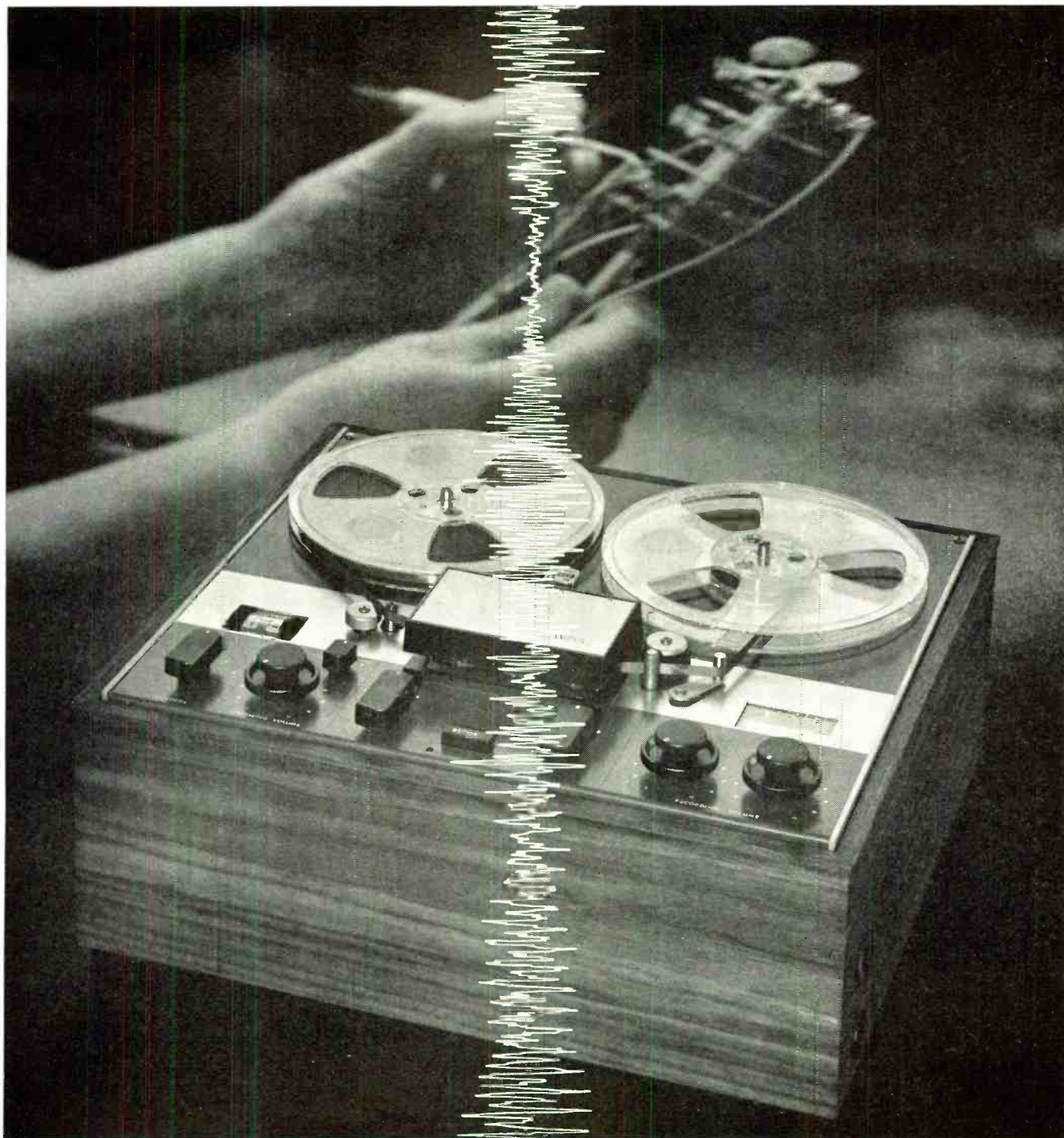
Satisfaction guaranteed

**Attractive and
practical for your
home or office**

3 for \$7.00
6 for \$13.00

**ORDER NOW — send
check or money order
MAGAZINE FILE CO.
520 FIFTH AVENUE
NEW YORK 36, N. Y.**

FREE DESCRIPTIVE FOLDER
UPON REQUEST



What new recorder is virtually custom-built?

AMPEX F-44

The F-44 is a brand new 4-track stereo recorder from Ampex. It's Ampex through and through. And there's this, too: at every stage of manufacture Ampex tunes, adjusts and aligns each F-44 to obtain its maximum performance—far beyond minimum specifications. Thus, no two F-44s are quite alike. Each is virtually a custom-built recorder. Each performs to the utmost of its capabilities. And each gives you the best possible sounds today—and for many years to come. As an F-44 owner, you'll receive from Ampex a record of the individual performance specifications of your own F-44. This record shows the frequency response curve, the signal-



to-noise ratio, the flutter and wow, and the crosstalk rejection measurement. And it is signed by the Ampex engineers who tuned and adjusted your recorder. The new Ampex Fine Line F-44 also features a new special design hysteresis motor for smooth, quiet, accurate operation; an easy-to-read point-to-point record level meter for each channel; multiple sound-on-sound capability; new simplified controls; and the Ampex one year warranty. See and hear the new F-44 at your local Ampex dealer. Brochure? Write: Ampex Corporation, Consumer Products Div., 2201-C Landmeier Rd., Elk Grove Village, Ill. In Canada, Ampex of Canada Ltd., Rexdale, Ontario.



LIGHT LISTENING

Chester Santon

The Black Watch—Scots Guards London Tape LPM 70073

Those who hanker for the music of the Highlands can point to only a few tapes that offer the skirl of bagpipes. Record collectors, on the other hand, have had more than ample opportunity to indulge themselves in the somewhat specialized sound of massed pipers. The Band of the Scots Guards and its pipers are hardly a stranger on the Angel label with a half dozen excellent recordings released in recent years. The pickings have been much slimmer on tape with only the reels on Audio Fidelity (Bagpipes and Drums of the 9th Regiment Pipe Band—AF 1857) and London (Scottish Soldiers—70057) coming immediately to mind. If you've waited this long for a reel of bagpipes in order to take advantage of the latest tape processing, you may be surprised to learn that the latest release doesn't necessarily put the earlier reels in the shade. At 7.5 inches per second on quarter track, bagpipes are bagpipes and that's all there is to it. Keenly aware that most listeners have only the vaguest idea of the subtleties that distinguish one bagpipe tune from another, London Records has assembled a program that does not neglect the brass band of the Scots Guards. As in the case of the selections offered by the pipers, the band devotes itself to the musical product of its native soil. The hearty, masculine flavor of the sound will lure anyone with a home system that can do it justice. Among the first to buy this recording will be the fortunate souls who had a chance to see the Black Watch in action during its recent American tour.

Guus Jansen: Happy Hammond Hi Fi Record L 1016

Don't let the silly verbiage on the back of the jacket cover scare you away from this Hammond organ release in Hi Fi Records' Life Series. Chances are your snort of disbelief will be as loud as mine was when I read that this single channel disc had been produced in Hi Fi's exclusive "3 D Mono Sound." If the 3 D Mono phrase doesn't raise your hackles, the rest of the claim on the jacket may give them at least a momentary twinge. It states, believe it or not: "3 D Mono sound process, with stereo effects available from ordinary monophonic playback equipment, through only ONE speaker. You will hear the impossible from a monophonic recording; perspective, depth and position of instruments!" That's what it says on the jacket. Only one thing kept my fuming down to a reasonably moderate level as I took the disc out of the jacket and placed it on the turntable. Over the years this West Coast outfit has turned out a well engineered product with sound quality several notches above average. Their artists and repertory may not be the greatest but stinting on recording equipment has not been part of their credo. In this recording, the sound from a good mono system bespeaks an outstanding mono recording and nothing more. The Hammond organ, guitar, drums and bass have vivid mono impact. There is more than enough room ambience to give the instruments illusion of placement in the center of a large studio but that is all the "stereo" effect I have been able to garner. When played through my normal stereo setup the instruments do appear to take up a little wider area than when mono recordings are fed to both of my speaker systems. In the practical terms that determine a record's overall value, Hi Fi Records has no

need for fancy sloganeering in this release. Guus Jansen, an excellent Hammond man discovered in Amsterdam, demonstrates that American organists by no means hold a monopoly on the instrument. In this varied program of zesty novelties and dreamy ballads he is bound to attract a wide audience in any country that recognizes imagination and technical proficiency in a Hammond organist.

110 in the Shade (Original Broadway Cast) RCA Victor LSO 1085

There is always the possibility that the score of "110 in the Shade" may be widely surpassed as the current Broadway season continues to unfold but, at mid-December, this unassuming musical had already established a strong position on the basis of its music alone. The score for this tale of the West based on N. Richard Nash's "The Rainmaker" could be described as a watered down version of the great "Oklahoma." Such praise is not as faint as it sounds because the songs are the work of two comparative youngsters whose fame so far has been gained off-Broadway. Harvey Schmidt and Tom Jones are the composer and lyricist responsible for the long-running hit, "The Fantasticks." This is one of the rare off-Broadway productions to really make the grade in cities beyond New York. The fact that "The Fantasticks" has simultaneously played 150 U.S. cities and 25 foreign countries definitely sets it apart from other off-Broadway productions. With that kind of headstart in the downtown area, it's no wonder the newest Schmidt-Jones effort is winning applause in midtown New York as one in a long series of successes produced by David Merrick. Since the star system is still the life blood of Broadway musicals, "110 in the Shade" will undoubtedly be remembered in later years for one main achievement. It is the show that first brought star billing to Inga Swenson, the Swedish beauty recruited by Merrick from Shakespeare productions at the Stratford, Connecticut Festival. On the basis of her singing and acting on this record it is very easy to imagine Miss Swenson in a wide variety of future Broadway roles that could include parts such as those played by Barbara Cook or Celeste Holm. In the eight "Shade" songs embellished by her voice, Inga Swenson runs the gamut from the stark drama of *Old Maid* through the sweetness of *Simple Little Things, Is it Really Me?* and *Love, Don't Turn Away* to the torrid beat of *Raunchy*. Robert Horton of TV's "Wagon Train" series and Stephen Douglass, an old hand at Broadway musicals, are far more convincing than the average male singers encountered on stage these days. Reminiscent of the cute comedy songs in "Oklahoma" is the dapper number, *Little Red Hat*, sung by Lesley Warren and Scooter Teague.

Jennie (Original Broadway Cast) RCA Victor LSO 1083

It's too bad Mary Martin's latest show doesn't do for the ear what her sumptuous "Jennie" costumes do for the eye. This story of theater folk at the turn of the century is just the thing for the sort of visual display that should accompany the unquenchable radiance of Miss Martin's personality. The problem of the home listener stems from the fact that the lyrics and music are the work of two eminent theater craftsmen whose best work has been done in musicals with a modern

theme. Howard Dietz, lyricist, and Arthur Schwartz, composer, have enjoyed a thirty-five year association on Broadway that is surpassed only by the team of Rodgers and Hammerstein in terms of creative output. Mention such great shows as "Three's a Crowd," "The Bandwagon," "Flying Colors," "Revenge with Music," "Inside U.S.A." or "Gay Life" and you're talking about a fabulous slice of Broadway musical history. With one or two exceptions, their songs for "Jennie" sound as though they could have been written by any one of a number of Broadway lesser lights. To everyone's relief, Mary Martin has the headlong talent to light up the darkest corners of the score. She works wonders at the slightest opportunity.

The story of this musical was inspired by the career of one of America's greatest actresses, Laurette Taylor. Mary Martin plays Jennie Malone, a bright young actress barnstorming the country in a repertory company directed by her capricious husband. At play's end, she is headed for stardom on Broadway, having entertained us with a few outstanding numbers such as *I Still Look at You That Way, Before I Kiss the World Goodbye* and the harem-style *Lonely Nights*. The show is moderately amusing but Mary Martin deserves a "South Pacific" everytime she returns to Broadway.

Don Baker Sound Showcase Capitol ST 1908

Were you to hear this release on a typical middle-priced console, you would probably say that organist Don Baker has done it again. An upper-bracket component rig, however, will tell you a different story. Readers of AUDIO are apt to decide that Don Baker has not done it again. Some of them may have in their collection, as I do, at least one Don Baker stereo recording that has better frequency response than this "Sound Showcase." Unlike labels that prefer to do their tampering in what they consider to be strict secrecy, Capitol comes right out and tells us on the back of the Showcase jacket that a high boost of six db was applied at 5,000 cycles along with a boost of four db at 100 cycles. This may not seem like much of a peak at either end of the relatively narrow spectrum they're playing with. It is, however, more than enough to take this record out of the running for those listeners who know from years of experience a reasonably flat organ recording can be. As Baker puts the Morton pipe organ through its paces, I find the four db boost at 100 cycles more disturbing than the six db boost at 5,000. The reason: Capitol has provided very little response below the 100 cycles peak, taking its cue from the reduced bass response on current RCA and Columbia discs. With the Big Three of the record industry acting this way in the matter of bass on discs, how many future buyers of audio components are going to look for items capable of authentic-bass reproduction? The component industry is fortunate in having a multitude of smaller and more enterprising labels to turn to for sound that can still give its equipment a good workout. As for Capitol—in the case of this release—the head-hanging line forms on the right.

Twilight of Steam Mobile Fidelity MF 13

A new release by MF is always an event of interest to railroad buffs but this latest recording should have a special usefulness if you're just getting serious about steam. Album 13 is bound to have better than average luck in its specialized market because it is designed to accompany a new book published by Grosset and Dunlap entitled "The Twilight of Steam Locomotives." Since the recording attempts to offer a caption in stereo sound for most of the locomotives lavishly pictured in the book, episodes starring an individual train are briefer than those usually found on a Mobile Fidelity recording. The seventeen tracks on this disc offer a very comprehensive survey of surviving steam locomotives in all parts of this country and one area of Canada. As in past releases, MF makes a special point of pampering the sharp transients of their out-of-door prima donnas.

“Without question, the SA-1000 is one of the finest amplifiers we have ever tested. In addition, it reproduces music as well as it tests...this is due to the unusually excellent transient response in conjunction with its unusually excellent everything else.”

-AUDIO / September, 1963

Type 8417 output pentodes with cavity anode design.

Totally resonance-free ultra-wide-band output transformers.

Triode-connected dual power-pentode driver stage.

Oscilloscope-type cathode-follower input stage with compensated attenuator.

Hinged cover for rarely used controls (bias and balance).

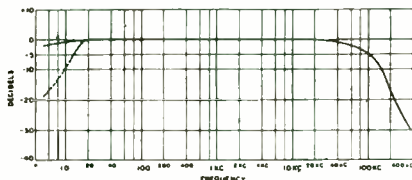


150-watts of power!

THE SA-1000 represents Fisher's first entry in the highly specialized class of extremely high-powered dual-channel basic amplifiers. There has been no scarcity of advanced equipment in this heavy-weight category; excellent high-wattage stereo power amplifiers of well-known makes have been available at prices starting in the \$230-to-\$270 range (for factory-wired kits) and rising all the way up to \$764 (for a pair of single-channel models of very de luxe construction). What does it mean, then, when Fisher finally decides to match its own contender against such formidable competition and sets the price at \$329.50?

To those who know Fisher, it can mean only one thing: Fisher has exhaustively tested, measured and evaluated all these other power amplifiers in its own laboratories and finds the SA-1000 to be distinctly superior to *all* of them, regardless of price. As for the price tag, it happens to be in the low 300's rather than the 400's or 500's solely as a result of Fisher's unusually large and technically unmatched manufacturing facilities, geared for heavy initial production in anticipation of demand.

Frequency Response (0 db = 4 watts)
Subsonic Filter: Dotted Line

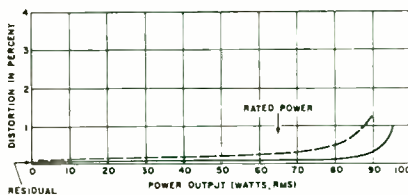


The Fisher SA-1000 is a challenge to the severest critics and most discriminating judges of professional sound reproducing equipment, both as to specifications and listening quality. Its music power rating is 150 watts IHF Standard, with *both* channels driven. The RMS power rating, again with both channels driven, is 130 watts (65 watts per channel). However, as a glance at the intermodulation curve will show, each channel will deliver 80 watts at 0.5% 1M

distortion, thus indicating the extreme conservativeness of the official rating.

The output stage of the SA-1000 is engineered around the newly developed 8417 beam power pentodes, *never before used in any electronic device*. Designed specifically for use in this amplifier, the 8417 offers extreme linearity, resulting in greatly reduced distortion, and has unusually low drive-voltage requirements, permitting the previous stages to 'coast' at their lowest possible distortion levels.

Total Harmonic Distortion at 1 kc: Solid Line
Intermodulation Distortion (60 cps/7 kc, 4:1):
Dotted Line



Each pair of 8417's in the SA-1000 drives a giant output transformer via plate-cathode coupling—a modified and improved 'ultra-linear' configuration that provides 12 db of the most desirable and stable type of negative feedback in the output stage.

The driver stage, too, is entirely novel. A triode-connected 6HU8/ELL80 dual power pentode circuit developed by Fisher engineers is capable of delivering 40% more drive to the output stage than is required—and at a remarkably low impedance. The result is very low distortion, the fastest possible recovery time, great stability and hence outstanding transient response.

The input stage of the SA-1000 is of a type widely used in laboratory oscilloscopes but never before in high-fidelity amplifiers. A compensated input attenuator in conjunction with a cathode-follower circuit permits adjustment of the input signal from 0 db to -12 db in closely calibrated 3 db steps without the slightest effect on input impedance and frequency response.

The power supply of the SA-1000 is one

of the most elaborate ever used in a stereo power amplifier. Regulation and filtering are of the highest order and all silicon diodes as well as filter capacitors are most conservatively operated.

Bias and balance are readily adjustable on each channel by means of the built-in laboratory-type calibration meter, but the controls for these rarely needed adjustments are ingeniously concealed behind an attractive hinged cover—another Fisher exclusive.

These are the most important facts and figures. You cannot fully evaluate the Fisher SA-1000, however, simply by reading about it. A comparative listening test at your dealer is an absolute must in this case. *Then* you will know that, even in this exalted category, not all power amplifiers sound exactly alike—and that the most flawless of them all costs only **\$329.50*** It is also available in StrataKit form as the K-1000, priced at only **\$279.50*** Both carry the famous Fisher Warranty for all tubes, diodes and parts for one year from date of purchase. Industry wide standard: 90 days.

\$1.00 VALUE! ONLY 25c!

The new 1964 edition of The Fisher Handbook, a comprehensively illustrated 52-page reference guide, component catalogue, and idea book for custom stereo, plus detailed information on the Fisher SA-1000 Stereo Power Amplifier. I enclose 25c, double-wrapped, to cover cost of handling and mailing.

FISHER RADIO CORPORATION
21-29 44th Drive, Long Island City 1, N.Y.

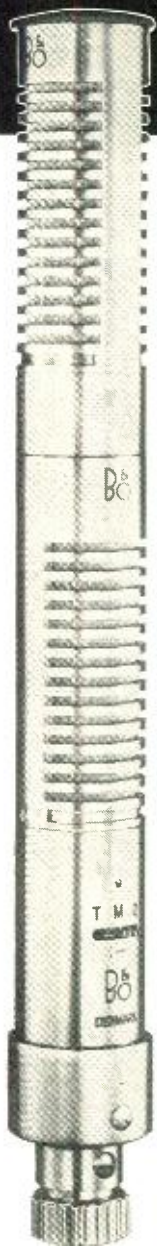
Name _____
Address _____
City _____
Zone _____ State _____

03220

The Fisher

*SLIGHTLY HIGHER IN THE FAR WEST. EXPORT: FISHER RADIO INTERNATIONAL, INC., LONG ISLAND CITY 1, N. Y. CANADA: TRI-TEL ASSOCIATES, LTD., WILLOWDALE, ONT.

DYNACO



**WIDE
BAND**
microphones
for
STEREO
and
MONO

professional
quality
for the
studio and
the audio
perfectionist



Stereo Spacer and two
B&O 53 microphones

The new B&O 200 convertible microphone comprises two ribbon elements in a rotating housing for controllable separation with ideal point—pickup for multiplex compatibility. Its performance surpasses even the famed B&O 50 and 53. Standard 200 Ω impedance, phase switch, T-M-O switch; accessory matching transformer.

Write for detailed specifications

DYNACO, INC.

3912 Powelton Ave. • Phila. 4, Pa.
CABLE ADDRESS: DYNACO, PHILA.

LETTERS

Demountable Stage Enclosures

SIR:

Harold Lawrence's column in the December issue of *AUDIO* raises some questions about demountable stage enclosures for multi-purpose auditoriums. Certain of the basic problems in the design of such enclosures were not mentioned in that column and should be brought to the attention of your readers.

Demountable stage enclosures are, of course, not needed in halls designed only for concerts. There are no demountable stage enclosures in such halls as the Amsterdam Concertgebouw, Vienna Musikvereinssaal, and Boston's Symphony Hall. Rather these fine concert halls have permanent walls and ceilings surrounding the stage platform, which essentially make the entire hall, both audience and performing areas, one space acoustically.

The necessity for demountable stage enclosures arises when one wants to use a multi-purpose auditorium, having a stage-house and fly-space for theatrical scenery, as a concert hall. Sound reflecting surfaces are necessary to surround the orchestra, cutting it off from the sound-absorbing stage house, mixing and blending the sound of the various instruments and efficiently projecting it to the audience. Another important function of the enclosure is, of course, the achievement of adequate "on stage" hearing conditions for the orchestra itself. Examples of demountable stage enclosures, included as an integral part of the multi-purpose auditorium design, may be found at the Indianapolis Clowes Hall, the Montreal Place des Arts Grande Salle, the Seattle Opera House, and a number of similar multi-purpose auditoriums now under construction.

These stage enclosures not only have to be satisfactory acoustically, but they also must be capable of being disassembled and reassembled quickly and economically. In other words, they must allow the hall to perform a "quick change act" between theater and concert hall. The "stage enclosure" at Severance Hall in Cleveland, discussed by Mr. Lawrence, does *not* perform this function. It is a permanent stage enclosure and could be optimally designed for music performances with no need to consider assembly and disassembly.

We have found that when the stage enclosure is designed as part of the over-all acoustical design of the multi-purpose auditorium, the results achieved are recognized as good by critics, listeners, and performers. Such enclosures are either heavy, fully automated to permit push-button assembly with a minimum of time and labor, or lighter weight enclosures, manually assembled and disassembled. The Montreal Grande Salle enclosure is an example of the first type. The enclosure at Clowes Hall, on the other hand, is a lightweight design, permitting a reduction in the amount of work required to disassemble and assemble the enclosure manually.

The acoustical engineer, faced with the problem of designing a stage enclosure for a multi-purpose auditorium, will investigate all materials, including plywood, glass-fiber reinforced plastic, damped steel, and plywood-steel sandwich construction. The decision to use one material over another depends on the particular acoustical characteristics desired from the enclosure, the economic factors, and the maximum weight allowable.

Mr. Lawrence mentioned our firm's work at the Henry and Edsel Ford Auditorium

in Detroit, and Northrup Auditorium at Minneapolis. The problems in both of these halls were complicated by the fact that they were existing halls, that Bolt Beranek and Newman did *not* design either hall acoustically, but was restricted to getting the best possible results with changes only at the "sending end." In neither case could we promise the orchestra that the stage enclosure would solve all the acoustical problems of the hall. In both cases, the improvement in the *bass* response of the hall was particularly noticeable.

The *automation* of both enclosures necessitated expensive construction, but either hall can be converted from a concert hall to a theater in less than one hour. Mechanization of an enclosure, which results in higher initial costs, also can significantly reduce long term costs (labor, down-time, etc.) and this factor must be considered in any total solution to the stage enclosure problem in a hall.

But one must be very skeptical of any claim that a new stage enclosure, a new loudspeaker, a new kind of seat, or *any* other single feature can solve completely the acoustics problem of a hall.

The fact that consideration was not given in the design of either the Ford or Minneapolis stage enclosure to the problems of recording engineers is perhaps just one more of the many dilemmas facing acoustical engineers in concert hall design. Orchestra managements usually consider this problem secondary to the problem of providing the best possible acoustical environment for their subscribers.

DAVID L. KLEPPER
Bolt Beranek and Newman Inc.
Cambridge, Massachusetts

Pike Pokes Back

SIR:

Herewith, a Blast at Bryan. All in good fun, of course.

First, though I've been called many things by many people, Mr Bryan is the first to dub me a Rich Cathedral Owner. The actual out-of-pocket cost of our used pipe organ was well under \$500—less than the price of many less versatile electronics. It lived in the garage of our quite ordinary three-bedroom split-level for years.

If Mr. Bryan enjoys playing "simplified arrangements of timeworn old chestnuts" well and good. May I venture to suggest, however, that many of us, myself included, have travelled this road. What is satisfying today may not be equally so tomorrow.

Yes, indeed, I do "take a very dim view—of electronic organs," but not of all electronic organs. To quote Douglas (Alan Douglas, "Some Electronic Extensions to Music Generating Systems," *Electronic Engineering*, Nov. 1963; pg. 726.) "Musical tastes divide sharply in the matter of electronic tone generating systems. This is quite right and proper—it has always been so with conventional tone producers. It only becomes improper when it is claimed that one system produces sounds *which it is known cannot be produced by that system.*" (Italics mine.) "This division of merit is becoming more acute; the cheaper instruments get less and less like what they claim to be; while those striving after the 'real thing' have correspondingly improved. The gulf continually widens."

WINTHROP S. PIKE
101 Leabrook Lane
Princeton, N. J.



“...by combining this unit, Citation A, with a *solid state basic amplifier* of comparable quality, a sound path could be set up that approaches the classic goal of amplifier design—a straight wire with gain.”

—HIGH FIDELITY MAGAZINE

THE NEW CITATION B

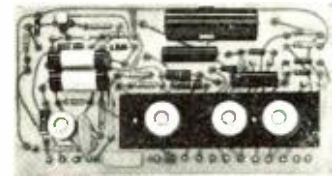
PROFESSIONAL 80 WATT SOLID STATE STEREO BASIC AMPLIFIER



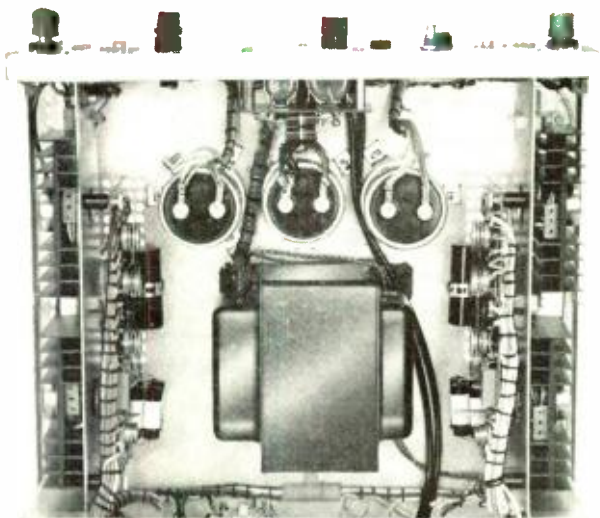
Handsome front panel: facilitates custom installation. Features include current-adjustment meter, on off switch with pilot light and low-cut filter. Removable bottom panel conceals riding adjustment controls.



Computer-grade silicon output transistors: heavy-duty, solid state devices, virtually impervious to abuse. Will take 100% more power than their use in Citation B will ever demand.



Driver stage: Wideband silicon driver transistors are mounted on rugged, military-type epoxy glass board. Board pivots for easy accessibility or removal.



Top view of chassis: computer construction throughout. Five sub-assemblies assure easy accessibility and minimum operating temperature through efficient heat dissipation; laced military wiring harness couples each stage.



Electrolytic capacitors: engineered to computer-grade specifications for unlimited shelf life and consistent, long-term performance.



“Heat sink”: heavy-duty finned aluminum device which rapidly draws heat away from output transistors—insuring long life, fail-safe performance.

The “classic goal of amplifier design” is now reality. The big “B” is here. The Citation B. A power-packed “brute” loaded with 80 watts of flawless performance—a true product of the computer age. • The “B” has the widest frequency response of any basic amplifier—1 to 100,000 cps. • The “B” has the best square wave response—less than one microsecond rise time. • The “B” has the highest damping factor—50 to 1 at 10 cps. (No other power amplifier is even close.) • The big “B” is the only power amplifier completely free of hangover or clipping at full power output. The Citation B reflects Harman-Kardon’s solid state leadership in every way—performance, design and construction. “A straight wire with gain” when matched with Citation A, the big “B” will also enhance the performance of any other high quality stereo preamplifier. For more information—write Citation Division, Harman-Kardon, Inc., Plainview, N.Y., Dept. A-2.

harman kardon

A subsidiary of THE JERROLD CORPORATION

AUDIO ETC.

Edward Tainall Canby



SPEAKERS: SUBSONIC RUMBLES

I always try to get in a prediction when the predicting seems good. Otherwise, the next guy may beat me to it. Probably has already.

As a result of a couple of recent auditions, almost simultaneous, added to a lot of recent conversation and on top of a general uneasy feeling that goes back at least three or four years, I'm about to predict thoughts.

Of course if I'm wrong, you can forget what I've said.

It's about loudspeakers. The whole speaker area is sort of rumbling for me, down in the low bass, 'way underground. Like a volcanic area getting ready to blow off something or produce an earthquake. Most speaker people right now are looking and listening the other way, of course. Too busy with profits. (Or losses.) Decor, sales surveys, distribution and all the rest. But my ears are open and I keep picking up these subsonic rumblings.

Forward and Sidewise

Most things in hi fi, as in other areas of our industrial production and development, move forward (or sidewise) in great spurts of activity. The forward motions are the fundamental ones and they aren't usually marketing spurts, either. I'm not talking this month about sales and profits spurts—in fact, these may well run an opposite course from the forward bursts of sheer technological progress. Marketing bursts are more likely to occur in a sideways direction. Expansion, proliferation, elaboration in detail.

Years of consolidation and refinement upon a basic idea or layout often lead to very good sales; whereas times of spurt in the technical end may lead (but not always) to temporary slow-downs in the economic progress. For it takes a while to adjust to new ideas, to adjust the new ideas themselves, polish them up, get them into smooth production, into distribution and, of course, into widespread acceptance.

This connection between spurts in economy and spurts in development is complex and full of tensions. You can't be sure that a new idea won't catch on quick like wildfire, and you always hope it will, so that its economic potential roars into profits and volume with overwhelming speed. It has happened. It always can. But usually it's not the really new idea that does this. It's the old idea, perfected, brought up to peak flavor. The right time, the ripe time.

An opposite condition can brew itself, slowly and ominously. Sometimes we just spoil for really new ideas. We need 'em so bad that opportunity starts knocking twice or three times, and hard. And a few of us are likely to jump into action with spectacular results, plunging into the brand new, setting off economic landslides and earthquakes, and just maybe, cleaning up huge jackpots. There can be disaster, too. But

what is important is the crying need itself. It's there and it will not be denied.

Plane of Consolidation

Now, if I may say so, the speaker market has been poised these last few years upon a relative plane of developmental consolidation. Forward progress has not been marked nor radical. I know—howls will be heard at such a suggestion; there are those who think we're always getting bigger and better and going even forwarder than ever. I'll stick to my guns. We've been having a lot that isn't very new or very different in fundamental ways.

We've had much that is new *in detail*. That includes the spreading use of more and more tricky cone materials, fabricated ingeniously with assorted plastics and into dome shapes that do a lot to spread out the highs where we listeners want them (which isn't straight ahead, thank you). We have flattened out our woofers to fit into new flat speaker boxes that all but hang on the wall (not on my wall, though)—but not with any fundamental newness of design (with one exception—below). Just useful modification-in-detail. No enormous improvement in sound.

We've had lots of furniture ideas, beyond this; none exactly radical. Make the boxes wider, narrower, shorter, longer; deck them out in Provincial, Danish Modern or Utility, ship them in parts for kit builders, to save everybody money—excellent ideas, all these and many more. But not really developmental. We've even seen considerable improvement in speaker elements long familiar, going honorably back to the beginnings of home hi fi. Some outfits still spray highs out of small horns, as they have done for a long time. But many of these horns no longer sound horny, the way they did years ago. I know I've been listening to some from E-V and have had to revise my ideas a bit as to what can be done via this ultra-familiar system of propagation. (My thought here is that the rather spectacular success of the cone tweeter, turned dome tweeter, has had a healthy effect on the older tweeter forms, which are again renewed and show new vitality such as, awhile back, we would not have thought possible. This it always is and should be.)

None of these are fundamental developments. Nor is the now highly versatile use, in dozens of formats, of two fundamental approaches to the small speaker box, both long ago "innovated;" one is the ported or vented enclosure, once called the bass reflex in its original and relatively simple form; the other is the sealed-up small enclosure, now being used more or less freely according to design taste by many speaker system makers. *Details, details!* Good ones and bad.

Yes, there have been interesting experiments, in speakers, that are basically new or newish. Until now, none has precipitated a large-scale change in the field. Until now, none has made a big enough success, on a

big enough scale, to tip us out of our plane of consolidation.

There are, I might suggest, the ever present electrostatics, a continuing "threat" which must be re-evaluated each and every year, as the electrostatics themselves change and as the speaker market and the consumer taste changes. They first came into hi fi prominence 'way back with the Janszen tweeter unit, which made quite a solid splash thanks to its undeniably good sound at a time when horns and such were not producing very lovely highs, nor cones either. The electrostatic principle continues to pack nuclear explosive, though so far nobody has unlocked the commercial chain reaction. Here's something to keep a very wary eye upon, for this is a really fundamentally different way to build a speaker, one that offers sound-values that are very hard to beat, together with a pack of problems that have defied ingenuity so far.

Instead of a very small semi-piston with an increasingly lengthened stroke, variously coupled to air in boxes and horns to get the requisite push, your electrostatic presents an almost ideal operating surface to the air, relatively very large in area and moving with an almost infinitesimal "throw" or stroke, thereby by-passing a raft of serious problems. The electrostatic shoves air with what amounts to a weightless and virtually uniform piston, moved uniformly over its entire surface and very nearly free of stress. In effect it just about isn't there. Ideally speaking, of course. And so it comes very close to the ideal transparent transducer, transforming electric into acoustic signals (OK—electrical into acoustical...) with near-ultimate fidelity. Ideally, anyhow.

Yet where are the millions of electrostatics, to replace millions of cones, domes, horns? Alas, the ideal flaunts itself continually in front of our glazed eyes, as good as ever, but practical problems are so damnable difficult! We can't put the electrostatic out of our minds; it's just too good a principle. And yet we haven't quite been able to make it swing, all the way. Not yet. Not in these years of successful consolidation in the conventional speaker areas.

I can recall a good many small-size electrostatic tweeters over the many years and at least three triumphantly impressive large full-range units, one of which is still extant. The little economy-sized electrostatics keep popping up as auxiliary tweeters, often in ready-made equipment (as in the Columbia 360K of some years back and in assorted imports) where the inherent problems can be solved behind the scenes, so to speak, minus external power supplies, transformers and so on. Even these have been lately scarce and not significant—other more conventional "compromise" speakers have continued to cop the field, ideal or no.

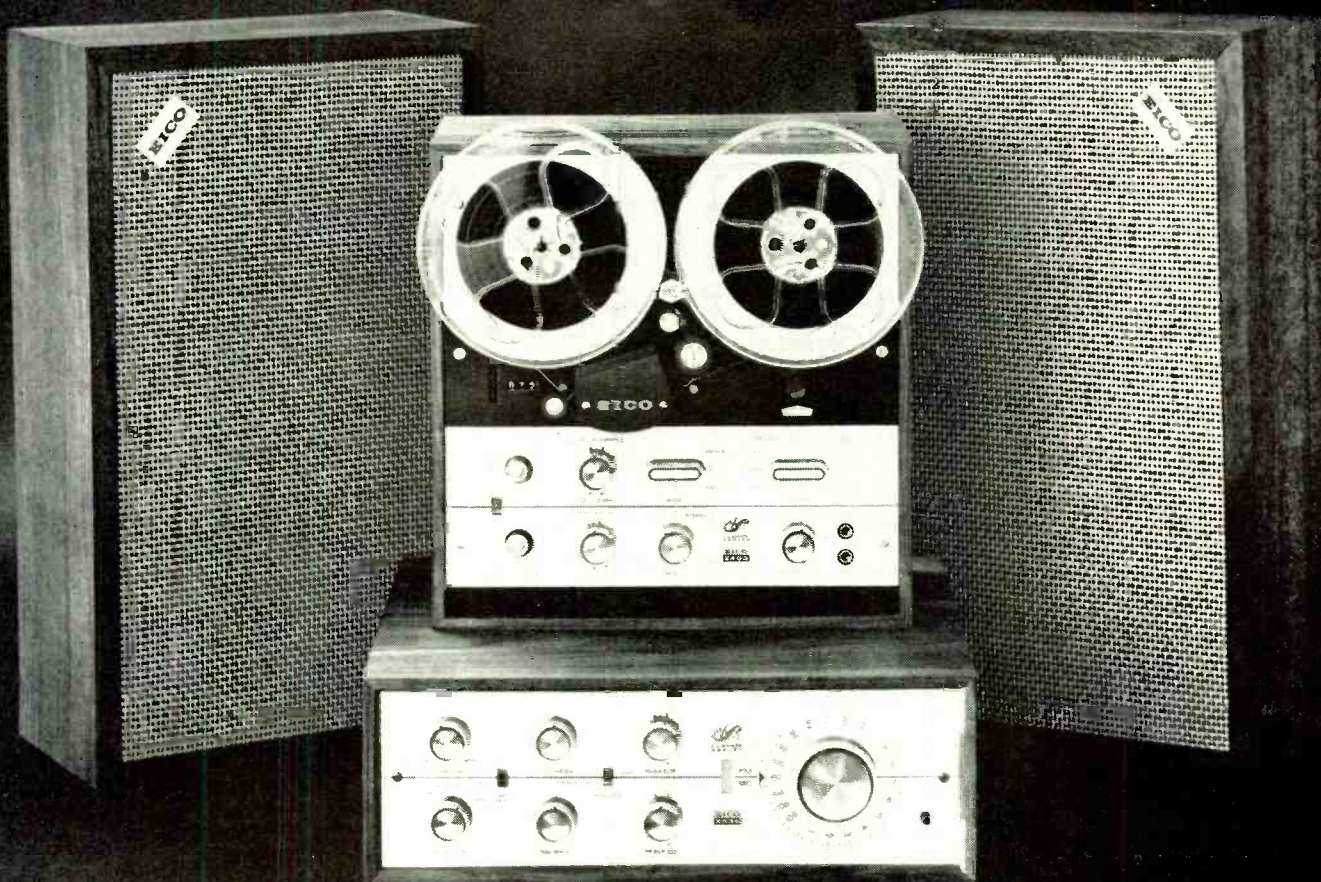
This is what I mean. All such interesting ideas have lately failed to start any sort of chain reaction. (And please, if I don't mention umpteen others equally worthy of interest, remember I'm making a point, not a survey.) The climate hasn't been right. The continued consolidation has been too potent an influence.

And so in spite of its pleasing expansion, its multitudinous improvement-in-detail, the speaker field has not moved forward. A vast amount of motion has been sidewise. A good many speakers now on the market sound for all the world like their predecessors of ten years or more ago (and they cost more). Most speakers, I'd say, are only marginally better-sounding now than five years ago.

Change in Taste

On the other hand, *some* speakers are a lot better. They are widely distributed speakers, too. And therefore *people know*

An FM tape stereo system of comparable quality would cost up to \$850



start with the Eico receiver kit — only \$154.95

You can build a complete, high quality FM tape stereo system from the new Eico Classic Speed Kit package for only \$445. This system includes the Classic 2400 stereo/mono 4-track tape recorder; Classic 2536 FM MX stereo receiver and two HFS-8 2-way high fidelity speaker systems.

Completely wired you'd save nearly \$300 on this system over other makes of comparable quality—factory wired price \$570. You can also select any individual component at a remarkably low price.

Here's why it's so easy to build these superb components. The 2400 tape recorder comes with the transport completely assembled and tested—only the electrical controls and amplifiers need be wired. The 2536, is without doubt the easiest-to-build receiver ever designed. The front end and the IF strip of the tuner section are supplied completely pre-wired and pre-aligned, and high quality circuit board and pre-aligned coils are provided for the stereo demodulator circuit. Speaker systems are completely assembled in fine oiled finish walnut cabinet.

EICO CLASSIC 2400 STEREO/MONO 4-TRACK TAPE RECORDER Performance on a par with recorders selling at twice the price. 3 motor design enables each motor to be optimized for its particular function.

- 3 heavy-duty 4-pole motors, capstan motor with integral fan
- DC braking of reel motors
- Standby operation between all transport modes prevents tape spillage, provides slur-free starts, permits easy cueing & editing
- Automatic end-of-tape switch & digital counter
- Jam-proof belt shift mechanism selects 7½ or 3¾ ips speed.
- Requires no head wearing pressure pads
- New combination erase and record-play

- 4-track stereo head
- Equalization selector provides uncompromised equalization on both speeds.
- Mixing mike and line level controls
- Dual electron-ray level indicator tubes
- Made in U.S.A.
- Oiled finish walnut base incl. in price of both semi-kit and wired versions. Semi-kit (transport assembled & tested) \$199.95; wired \$269.95.

EICO CLASSIC 2536 FM-MULTIPLY STEREO RECEIVER Makes every other stereo receiver seem overpriced. Combines stable sensitive FM stereo tuner *plus* a virtually distortion-free 36-watt stereo amplifier with remarkable overload, transient and regulation characteristics.

AMPLIFIER SECTION □ all program sources—magnetic phono, adapted ceramic phono, tuner, tape □ Full control facilities—bass, treble, blend and balance □ Tape monitor switch □ Distortion at 10-w/channel 40 cps—0.5%; IHF, power bandwidth at 1% distortion, 30 cps—20 kc.

TUNER SECTION □ Low noise, shielded & temperature compensated front-end for drift-free performance □ 4 amplifier-limiter stages & ultra-wide-band ratio detector. □ Electron-ray tuning bar & stereo program indicator □ Velvet-smooth rotary tuning □ IHF usable sensitivity 3 μv (30db quieting); 1.5 μv (20db quieting). □ IHF distortion 0.6%; IHF capture ratio 3db. Kit \$154.95; wired \$209.95 (Incl. FET)

EICO HFS-8 2-WAY SPEAKER SYSTEM Compact 2-way speaker system in handsome oiled finish walnut cabinet. Full transparent bass; clean, smooth middles and highs. Two speakers: 8" high-gap energy woofer-mid-range transducer, and matched 2" tweeter. Wired only, \$44.95.



2036



2200



2050



2080


OTHER NEW EICO CLASSIC SERIES COMPONENTS 2036—36-watt stereo amplifier. Kit \$79.95; wired \$109.95. 2200—FM/MX Stereo Tuner. Kit \$92.50; wired \$119.95 (Incl. FET). 2050—50-watt stereo amplifier. Kit \$92.50; wired \$129.95. 2080—80-watt stereo amplifier. Kit \$112.50; wired \$159.95. Optional oiled finish walnut cabinet for the 2536, 2036, 2200, 2050 and 2080 are available for \$19.95. Add 5% in West



FREE 1964 CATALOG
Dept. A-2




Eico Electronic Instrument Co., Inc., 131-01 39th Ave., Flushing, N.Y. 11352 Export: Roburn Agencies, 431 Greenwich St., N.Y. 13, N.Y.

The  **POBE**

Quadramatic

the revolutionary new
amplifying system with

**ABSOLUTE
ZERO
DISTORTION**



For the first time in amplifying history the distortion barrier has been broken. The newly patented Quadramatic system did this by reproducing sound without 1%, ¼%, or ½% distortion, but actually zero distortion. The complete absence of any distortion in the Pure-Quadramatic units makes them **the only HI-FI components on the market today that can produce pure sound exactly as it was originated.**

Hand made craftsmanship, and space-age compactrons with a circuit that operates **components at 50% of rating**, allows Pure-Quadramatic to offer **the ultimate in HI-FI components with a 100% unconditional lifetime guarantee.**

The Model 402-C Stereo Power Amplifier, 40 watts per channel, for \$314.00, and the Model Stereo Control Center, for \$269.00, are the first components available.

Air freight shipments made anywhere in the U.S.

Ask your dealer about Pure-Quadramatic equipment, or for "The Quadramatic Story", mail 25¢ with your name and address to

**Pure Sonics, Box 88,
Oak Park, Illinois**

they are better. More and more people. They can hear it. Their friends tell them, too. The word travels from living room to living room. And so tensions are building. The sidewise motion—always NEW, NEW, yet no real improvement in sound—is bad for it emphasizes those areas where there has been improvement in sound.

Mass taste in speaker sound, you see, is undeniably changing in the large, in the over-all. It's changing faster than you think. And that change is undeniably towards a recognition of good sound—*clean* sound. Once inculcated, the idea grows fast. Don't we keep telling 'em? Good sound is *good!* It surely is, for any ear that takes awhile to listen. (Even if in the showroom people may still prefer the bad sound on short exposure.)

It isn't restricted to component equipment and hi fi fans alone, this change in taste. The popular phonograph-radio is also improved, relatively, all along the line, relatively greater, actually, than in the best component speakers—there has been further to go.

Even the juke box has changed. Noticed it? Very few of the old thump-and-boom monsters are still around. Very few juke boxes cut off at the old muffled 3 or 4 thousand level. Most are now bright in sound and clean enough not to be overtly unpleasant—and you can hear the speech sibilants. That's new. It helps, too.

Even the lofty sound-standards of the movie palaces have gone up—not in the sound systems, I presume, but the sound on the films. Just listen to an old movie awhile and see. People hear these sounds.

What with all this, then, the whole area of the loudspeaker is now getting to be seismic. No eruptions of importance, no vast upheavals. But there are fumaroles, smoke pots, bubbling springs of activity all over the place, puffing up, subsiding, only to puff up again. Shivers and tremors underground and every so often a little harmless earthquake. Things are definitely uneasy, pressures for a change are building. Given a few more years of peace-on-earth, we may enter a period of real eruptiveness—we are overdue. Anything could start it. Or a lot of things, almost simultaneously. For these tensions are going to grow and must be met, somehow.

The speaker, remember, is the biggest source of unfaithfulness to the great god Fi that we have ever had. Of the three major transducers, the mike, the phono pickup, and the speaker, the last is by far the most intractable. It is bound to be because it is so big. It is the power-transducer, where the others, so to speak, are voltage-transducers. In transducers the physical problems involved in audio vibrations grow more complex as they grow bigger, literally, in size.

We're doing all right in pickups. Low mass. We're doing extremely well in professional mikes. Same. And as for the in-between circuitry, it has so long been enormously better than the transducing that only the continuing solid-state excitement has kept our minds on the circuits. Speakers are next in line—and straggling. People are realizing it.

How come all these hi fi speakers sound so different from each other? A pea-sized brain can get that idea, given time! We've given plenty of time. How can they be hi fi and different. They *are* different. They sound different.

But among those speakers that are really tops in sound quality today, there is no macro-difference in sound. They do, in fact, sound largely alike; the differences are relatively insignificant, especially for the untutored ear, the pea-sized brain! Fea-

brains and big-brains *are* impressed. No question about it.

With Meat on Them

And so my prediction, already more or less implicit in what I've said, is that we are ripe for some radical upheavals in the speaker field, for major improvements in sound itself. Radical intrinsically and radical in effect upon the market. Something's got to give, soon.

To put it another way, the times are getting better every day for launching something really new in speakers, something fundamental as well as practical. The period of marginal improvement-in-detail is running out, its interest going stale. The market is getting ready for spectacular changes—with meat on them. Those who have the stuff to offer are in a position to clean up.

Sure—there may be some heavy losers, there may be a lot of fizzling also-rans, with ideas not big enough to catch, in spite of NEW, NEW publicity. But with the right combination of clever, fundamentally new design, of manufacturing know-how for economy, of cybernetics for people-usefulness, and intelligent promotion for good public relations, with all this and distribution too, *somebody* ought to be able to clean up. Turn the speaker market upside down. It has happened before. It can happen again.

What radical innovations? Well, goodness me, don't start rushing my hunch! A hunch is a hunch, a feeling that can't really be pinned down but keeps right on growing.

I'll mention two, provisionally. Two items that in fact helped to precipitate this article out of what had been merely a growing uneasiness on my part, pretty much unfocused. Maybe these aren't "it." They are very good little fumaroles, though, and they could produce those preliminary earthquakes that would start the big blow-up. They are the right sort, if in very different ways. Neither item is in large scale production; one is just being imported now in threes and fours at a time, the other at this writing is still in prototype, hand made. I've heard 'em both. They both have potential, just where potential might do the most.

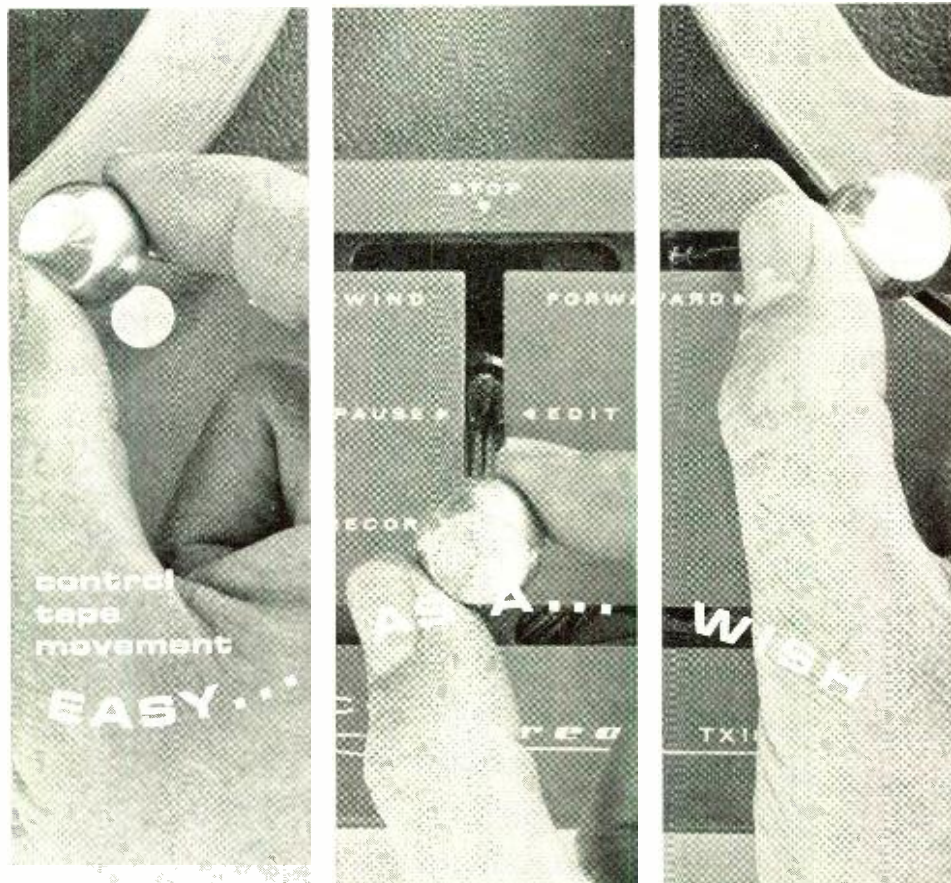
1. Transcendent

This one, already in manufacture, can be named and has been demonstrated hereabouts. A good many in our tribe of audio writers and editors have already heard it. No doubt it is being written up elsewhere too—though in what terms I do not know, and just as well. It is an electrostatic full-range speaker, made in Canada, the Sigma "Transcendent."

Just one more full-range electrostatic? I'd guess it packs more voltage than that. A number of very ingenious and well-calculated design features add up, I think, to a possibly significant step ahead of past units of the type in terms of impact on the speaker market,—including relatively inexpensive mass production and unusual flexibility in home use. No details here—if it goes, we'll be looking at it in detail later. But the significant externals are such things as these.

It looks like a three-section folding screen (folds both ways, radiates equally easily on both sides, of course, and looks as good), thus fitting easily into many rooms and allowing a wide variety of sound-distribution patterns, to need and taste.

Thanks to trick phasing circuitry it does *not* present a point-source to the ear but spreads its sound-source, without change

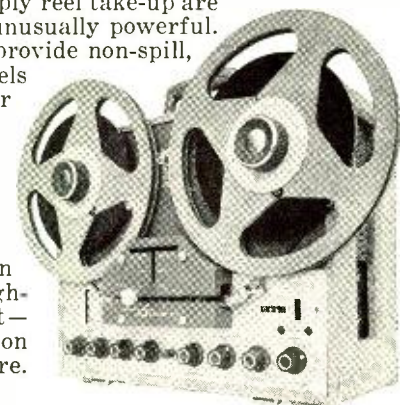


THE NEW **NEWCOMB** TX10 SERIES

STEREOPHONIC TAPE RECORDERS

SOUND ON SOUND UNLIMITED / HYSTERESIS SYNCHRONOUS MOTOR/MONITOR FROM TAPE OR PRE-AMP/TAKES 10½" REELS

Designed for instant, intuitive reaction to your thought, the Newcomb TX10 integrates all tape motion control through a single, central joystick. But this is only the beginning. The TX10 is outstanding for its simple, straightforward, dependable operation; exceedingly gentle tape handling; quietness; coolness. Small as a suitcase in size, big as a studio in scope, the TX10 has separate mixing controls for each channel. There is a separate knob for "Mike" and a separate—not concentric—knob for "Line" for each channel. Two recording-level/playback-volume meters are arranged pointer-to-pointer in the same illuminated window for ready stereo comparison. Plug-in transformers instantly convert mike channels for use with low impedance microphones. The TX10 has three heads, no pressure pads on heads. Major tape guides are stainless steel. To load the machine, tape is simply held in a straight line and dropped in the slot; automatic shut-off and supply reel take-up are automatically re-set. The new hysteresis motor is cool, quiet, unusually powerful. Differential braking on both reels and a unique tape tensioner provide non-spill, no-stretch, ever-so-gentle stops even with fully loaded 10½" reels rewinding at the rate of 2400 feet in 90 seconds—18 miles per hour! A four-digit counter gives accurate location even with a full reel of triple-play tape. You can record sound on sound, back and forth as many times as you wish, either channel serving as master. All TX10 models are two-speed machines. The push-push speed selector automatically supplies proper speed-frequency correction. There are four models in the series. Standard are 3¾-7½ i.p.s. recorders with either two or four tracks. On special order you can get 7½-15 i.p.s., two or four track. Throughout, the Newcomb TX10 is the instrument for the perfectionist—dedicated professional or amateur enthusiast. For a description in depth write for your free copy of the new TX10 brochure.



NEWCOMB AUDIO PRODUCTS CO., Department T-2, 6824 Lexington Avenue, Hollywood 38, California

A MUST FOR EVERY RECORDING & BROADCAST ENGINEER

ALTEC'S COMPLETE LINE OF
STUDIO PLAYBACK AND SPEECH-
INPUT EQUIPMENT IN ONE HANDY
REFERENCE CATALOG.



Custom-built Altec control console in ABC-TV's Studio One, New York. Note jack panel containing 720 connections that permit virtually any patching configuration.



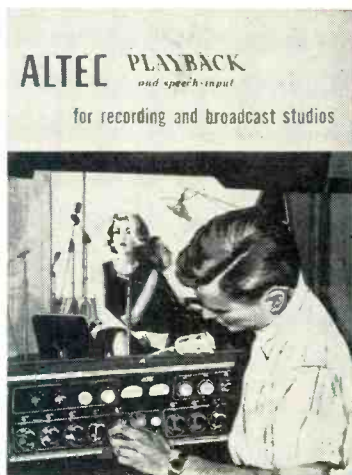
Banks of Altec 128B Amplifiers used for PLAYBACK monitoring by Universal Recording Corp., Chicago.



Control-room view of three A-7 Systems used for 3-channel PLAYBACK monitoring at United Recording Studios, Hollywood.



Monitoring with Altec "Duplex"® Speakers in Capitol's control room. More than 70 of these speakers are used throughout Capitol's recording studios in Hollywood.



There's no longer any need to search through hundreds of Altec catalog sheets...everything is now together in one "book" especially prepared for the recording and broadcast engineer. In it, you will find complete information on...

- **SPEAKER SYSTEMS** to satisfy most stringent requirements of studio PLAYBACK. Indispensable for accurate A-B comparison of the taped recording with the live rendition for judging accuracy and realism.

- **MICROPHONES** including the only American-made condensers; 8 new models of studio dynamics featuring exclusive Altec Sintered Bronze Filters (some models come with individual, certified calibration curves); famous studio stand-bys, the W.E.-type 639 and 633; plus complete information on the revolutionary new 690A dynamic microphone / transistorized amplifier that directly replaces the carbon transmitter in ordinary handsets to provide broadcast quality in TV and radio programming.

- **AMPS AND PREAMPS** you've used or heard about, including a few that may be new to you. Covered are power, program, compressor, remote mixer amplifiers; preamplifiers; the all-purpose 250 SU Stereo Control Console.

- **TUNERS** guaranteed to meet the most critical FCC broadcast standards. The 314A FM MPX Tuner for the ultimate in multiplex network relay... and for off-the-air executive stereo monitoring, record and tape PLAYBACK, the 708A "Astro," the only AM/FM MPX Tuner-Amplifier with transistorized power output stages.

If you insist on the best in professional PLAYBACK and speech-input equipment, this new catalog is a MUST. Write to Dept. AM-2, for your FREE copy now, while a sufficient supply is still available.

©1963 ALTEC LANSING CORPORATION



ALTEC LANSING CORPORATION
A Subsidiary of
LTV Ling-Temco-Vought, Inc.
ANAHEIM, CALIFORNIA

from center to edges. It gets away with relatively low voltage for an electrostatic, will play out of most home-style amplifiers (rewire the amplifier output stage so that the speakers work off the tubes; or via an adapter that stays plugged into the wall and hooks to the regular speaker output).

But most interesting to me is the price. It has been set at \$630 list for a stereo pair—two three-section screens, not just one. That puts it in an explosively interesting position; for this is at last "competitive," a price that will make a lot of people sit up and take notice of electrostatic features in a serious way. Well they should, too. And once the idea gets around, in today's atmosphere . . . well a lot might happen. Who knows.

2. Mr. R

My other innovation is as yet nameless and brandless, though two of them are sitting under my piano at the moment and came up the stairs with me, one dangling from a finger of each hand. I don't aim to give away secrets prematurely, important or no, and Mr. R., the man who built these, may have more and better tricks up his sleeve than I have heard. (His initial has a strange resemblance to that found in a once-familiar combination, an R and a J.) Or maybe he'll prove to be full of hot air when it comes to blowing up a significant fumarole in the presently seismic speaker field.

He's not full of hot air so far, if I'm any preliminary judge. I can only say that his small speakers, inexpensive eights and tens modified out of very ordinary types with nice compact magnets and short throw, are full range units (suitably enclosed, of course), from top to bottom all the way and not a tweeter or a network anywhere. Loud, too. Real loud. And what R has to say in his slightly casual way about ideal pistons is, I think, going to produce some lovely purpling of audio faces and shaking of fists! Or maybe just some horse laughs. Shall see. All I know is I want to be there when the fun begins. It'll be great.

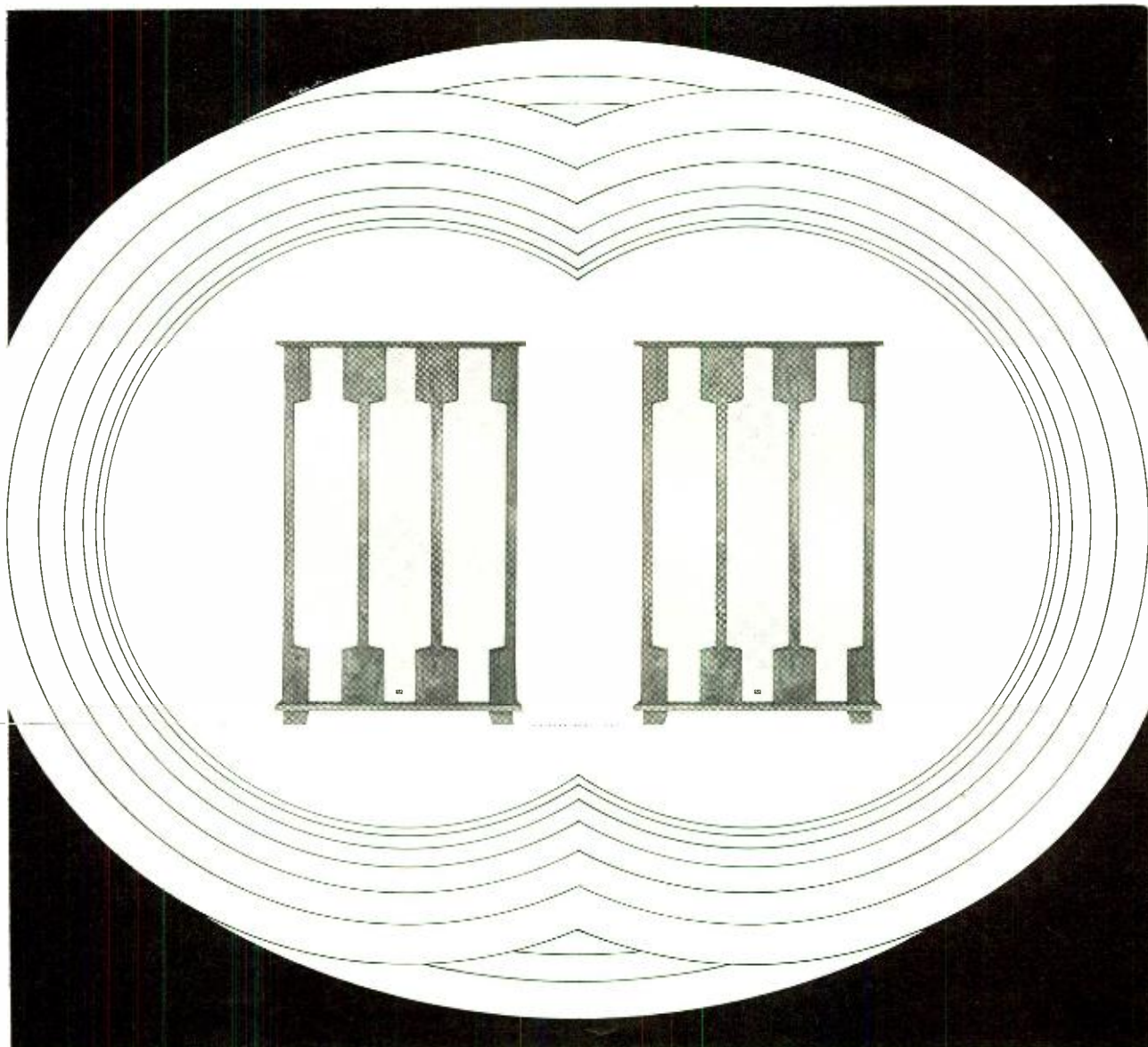
You see, Mr. R's intelligence is not to be under-rated, nor his feeling for what is about due or needed, even if he is a painter and a comic strip artist on the side (i.e., three sides of his apartment; the fourth side, more or less, is his audio lab.) *He might just have something here, I'm speculating.*

It just might be a real cheap speaker line of utter simplicity, single-unit, yet with sound quality very much too good to be put aside by anybody with at least one ear to the ground. Revolutionary—considering the price, of course.

The price isn't set yet. If it comes out too high, then we'll have just another interesting minor speaker development, attached to some rather startling theories. But R knows this as well as any of us—and so the price is likely to be right, if at all. Shall see, here too. So there just might be a nice little major earthquake, if something like this happened upon the scene. Who knows.

Anybody else? If you ask me, there must be dozens of similar things brewing here and there, emitting little seismic warnings, rumbling subterraneously beneath today's outward, on-sale market for not-so-radical speakers. Any one of them in these days, might be a volcano, set off an earthquake to shake the whole business. So if your little fumarole is smoking merrily, stoke up your inner fires and work hard! Things are coming to a head. We'll be able to use a good solid eruption pretty soon. I'm just sitting here waiting for it.

Æ



EXPRESSLY FOR STEREO

Symphony No. 1

The music is spacious, transparent, alive with detail in proper perspective — utterly faithful to the texture and dynamics of the original, as you expect from Bozak speakers. The B-4000, distinctively styled in mahogany or walnut, is surprisingly small for such big music. A pair are unobtrusive in even a modest living room. They are also available in kit form. Ask your Franchised Bozak Dealer, or write for catalog.



DARIEN / CONNECTICUT

EDITOR'S REVIEW

CIRCULAR DISTORTION GENERATOR

OVER THE PAST YEAR OR SO we have devoted a goodly amount of space to the problem of distortions which result from variation between the vertical (and lateral) angle at which a record is cut, and the angle of the pickup. From the articles we have presented, and are presenting now, and from personal observation, it is clear that the cartridge manufacturers have met the problem head on, and a new breed of improved cartridges are in the marketplace. And they all boast a 15-deg. vertical angle.

Great—that should solve the problem of the unnecessary distortion contributed by the cartridge.

But what about the record?

Recently we questioned several rather knowledgeable gentlemen about this problem and the comment from almost every one of them was “Why bother about improving cartridges when the records they play are virtually circular distortion generators?”

Of course we must “bother about” any existing distortion we know about but these gentlemen do have a point: the record companies have received far too little attention in this matter.

Certainly there is no question that the record companies are not even close to the progress achieved by the cartridge manufacturers in producing “standardized” products in the marketplace. (We must note that the preceding statement is a generalization, which means it is generally true but not necessarily specifically.)

This being the case, why not call the record companies to account and insist they get with it? Why not?

After all, it is true that questions and pressure on the part of cartridge users spurred the cartridge manufacturers on. We must do the same with record companies if we want them to improve their products with all due speed.

It isn't that the record manufacturers are unaware of the problems. The truth is that they were aware as soon as, if not sooner than, the cartridge manufacturers—in fact it was the R.I.A.A. which adopted the 15-deg. angle as a standard before anybody else did. A *voluntary* standard mind you. Thus the record companies are in the position of being first on paper and last in practice. (Yes, Mr. Record Mfr, we know about those limited series and the claims, but we are talking about reality and the bulk of your releases.)

By the way Mr. Record Mfr, we aren't mad at you. We would be the first to concede the truly great job you have done over the years. All that we ask is that you take the next step, wholeheartedly, soon. We believe everyone will benefit.

IF THE WENCH COMPLAINETH

Verily 'tis all too common nowadays to hear tell of the “delicate” female ear which cannot endure sounds louder than soft background music or some similar trivia. Thus we have the sad spectre of laboriously selected and assembled components used as an oversized table radio. Sadder yet is the spectre of the “laborious assembler” enduring this intolerable situation in order to still the tongue of his wench.

Thinking about how we could aid our readers who might be similarly afflicted, we decided to offer the following verse from Shakespeare's “The Tempest” (Act III, Scene II) as an opening gambit towards explaining some of the positive points:

Caliban

Be not afeard; the isle is full of noises,
Sounds and sweet airs, that give delight, and hurt
not.

Sometimes a thousand twangling instruments
Will hum about mine ears; and sometimes voices,
That, if I then had waked after long sleep,
Will make me sleep again: and then, in dreaming,
The clouds methought would open, and show
riches

Ready to drop upon me; that, when I walked,
I cried to dream again.

If any of you feel that you might have some more convincing material, please send it along and we will share it with those who need it.

THE STANDARD ANTENNA

Some readers have written in to question what we mean by the notation “it pulled in xx stations loud and clear on our standard antenna” in our equipment reports. Simply we are referring to the fact that we use a known antenna, and circumstances, as a real basis of comparison between tuners.

We have stated several times our belief that statistics, by themselves, are not an adequate means of reporting a product as complicated as an FM tuner. It is not so much the individual characteristics, but rather the way in which they are related to each other that is significant. In fact, this was one of the very significant points made by the well-known and well-skilled engineer Daniel von Recklinghausen in his two-part article last August-September.

If this is true, if relationship of characteristics is more significant than the individual characteristic, how then do we report this? We have been attempting to do this by using a known antenna on tuners under test so that we can have a common departure point.

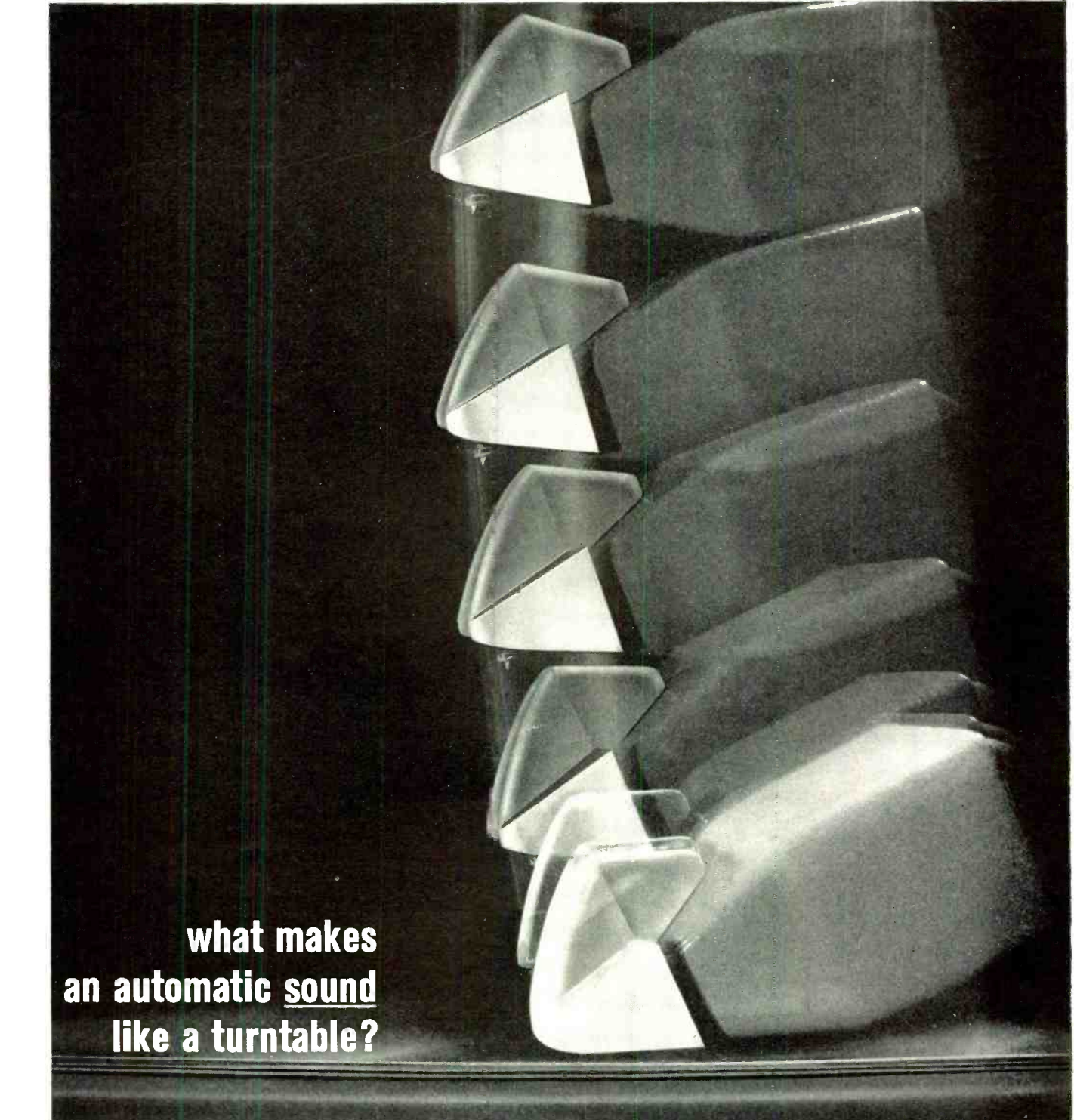
In addition to a standard antenna, under our procedure we compare it with a standard tuner (a good quality unit whose statistics are known) so that we can eliminate local and time-of-day variations.

We do admit that this method is not as scientific as we would like, but we do believe it is more indicative of total performance of a tuner than any other test procedure we use.

Any ideas?

THE LOS ANGELES HIGH FIDELITY SHOW

For those people who are not subjected to the barrage of local publicity announcing the Los Angeles High Fidelity Show (yes, another year has gone by), please note that the Show will take place from March 11-15 at the same old stand in the Ambassador Hotel. We understand that there are some new products to be introduced at that time, soooo . . .



what makes
an automatic sound
like a turntable?

The U38!
**expressly designed
for automatic
turntables**

The new generation of automatic turntables tracking and tripping at lower and lower forces demands this new kind of cartridge. Demands a "floating stylus" that protects your diamond and record as it plays...demands complementary electrical characteristics which maximize the use of forward-looking circuitry whether vacuum tube or solid state. The U-38 meets these demands and makes your automatic **sound like** a turntable. With Pickering's famous plug-in replaceable stylus assembly you get a cartridge with a life-time of trouble free performance. Pickering and Company, Inc., Plainview, New York.

Pickering



U38 cartridge with
AT Stylus... 2-5 grams tracking force
ATG... 1-3 grams



Plug-in head assembly for
Garrard Type A and Model AT6

should Sherwood increase its prices by 20%

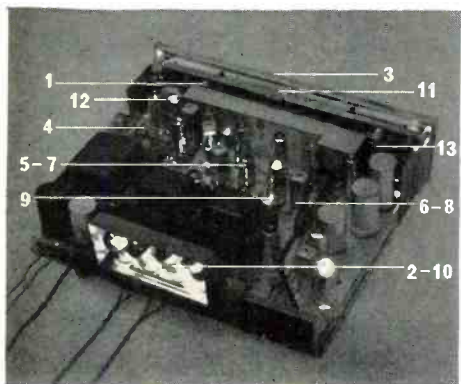


the superlative new S-8000 III FM stereo receiver priced at \$319.50



Years ago, Sherwood high-fidelity tuners and amplifiers were evaluated by highly-respected, totally-impartial research companies as either the finest designed or the best valued on the market. ■ Although we were pleased by such endorsements of pure quality in design and performance, the really significant fact was that *other leading components carried higher price tags.* ■ *Subsequent Sherwood components have received ratings indicating features and performance equal or superior to brands carrying price tags at least 20% higher.* ■ A current example of Sherwood design superiority is our new S-8000 III receiver. Sensitivity is rated at 1.8 microvolts. Capture effect is an *outstanding 2.4 db.* ■ No other FM receiver can claim the 80-watt music-power rating of the S-8000 III, and only one other (priced \$50 higher) offers the professional D'Arsonval zero-center tuning meter that's standard with Sherwood. ■ We still believe that our old-fashioned policy of superior engineering and realistic prices is best for both you and Sherwood.

SOME OF THE S-8000 III FEATURES THAT MAKE THE DIFFERENCE



1. Zero-center tuning
2. 80-watt music power
3. Complete stereo control center
4. 1.8 μv . (IHF) sensitivity
5. Wide-band 3-mc. gated beam limiter
6. 1-mc. band pass balanced ratio detector
7. 2.4db. capture effect
8. 1/3% distortion at 100% modulation
9. Interchannel hush
10. Long-life Novar output tubes
11. 8-inch professional-type tuning scale
12. Silk-smooth flywheel tuning
13. Positive stereo broadcast identification

For your free copy of our complete catalog, write Dept. A-2
SHERWOOD ELECTRONIC LABORATORIES, INC.
4300 North California Ave. Chicago 18, Illinois

Sherwood
HIGH FIDELITY

STEREO RECEIVERS ■ TUNERS ■ AMPLIFIERS ■ STEREO INDICATOR LIGHTS ■ SPEAKER SYSTEMS ■ CONTEMPORARY CABINTRY

Master Timer

WILLIAM G. DILLEY*

Timing accuracy and coordinating remote instruments is often a necessity in professional recording. This master timer, with its remote indicators, audible and visual, can expedite recording sessions.

THE METRONOME, a familiar item, has been with us for almost 15 years in its patented mechanical form. Many variations have since joined the original and are available in all sizes and modes of operation, with the common objective of establishing and maintaining a regular beat with respect to time. When the terminology "metronome" is employed to the average individual, he immediately envisions "Junior" laboriously practising the piano with the aid of this device. While this is a valid application, it is not the primary purpose of the unit to be described. For home musical use, there is, certainly, a requirement for a *regular* beat to maintain a tempo, but the *accuracy* of the number of beats to any given increment of time is not of any practical significance. In our modern day of radio and TV commercials, "spots," and program material, everything is geared to accumulative time, and *accuracy*, therefore, becomes paramount.

In addition to the requirement for accuracy, the recording process offers problems that cannot be solved by a mechanical sounding device. Individual control of participating instruments becomes more effective as the instruments are isolated from each other, but this, in turn, causes the individual to hear himself above the other performers. The power (sound pressure) delivered by a mechanical metronome is not only inadequate to reach all performers from one central location, but would be recorded along with the program if used in this manner. An electronic signal, however, can be amplified, distributed to each performer via headset, and the individual levels controlled. This arrangement provides an accurate tempo for all performers even though physically separated from each other. The unit to be described was designed for this specific purpose.

Design Criteria

Requirements for the completed design were straightforward and few. The unit should: 1. Be portable; 2. be stable with line voltage changes (105 to 125V

* 577 East Avery St., San Bernardino, Calif.

Fig. 1. Front view of the master timer.



a.e.); 3. provide a signal to drive either speaker, headphones, or power amplifier; 4. provide visual tempo indication; 5. Provide an over-all accuracy of tempo setting on the order of 2 per cent or less (exclusive of temperature changes).

Circuit Description

The circuit (see Fig. 2) uses a 12BH7 twin triode in a free-running multivibrator configuration with one plate coupled to an output transformer for audio indication, and the other plate coupled to neon lamps for visual indication. Because of tracking error in dual potentiometer and economy considerations, balanced operation was discarded in favor of unbalanced operation. One half of the multivibrator, therefore, has a fixed R-C time constant, while the other half has a variable time constant. (The aural side is fixed and the visual side is variable.) For visual indication, the time period of the aural plate output was considered too short, so the longer time period of the variable plate output was used. In order to keep this indication from occurring on the "off beat" and possibly causing confusion, the positive-going cycle of the aural plate was clamped with a diode. This circuit arrangement

results in the audible beat attack occurring simultaneously with the visual beat, but the visual side holds for a longer period of time than the audible. The tempo, or rate, is controlled by varying the R-C time constant by means of a potentiometer. While one potentiometer, alone, would provide the complete range required, the resolution of the rate control would be poor, and the accuracy of the unit would be more a function of ability to set the dial than the accuracy of the electronics. It is for this reason that the resistance determining the time interval between beats was broken up into two parts and switch controlled from the front panel. Instead of the full range being covered by a control rotation of approximately 300 deg. (dial marking limits), some 600 deg. of rotation is employed for the same range coverage.

The B+ is provided by a voltage-regulated power supply consisting of a rectifier with a capacitor input, a single filter, and two VR tubes.

Construction

Construction of the unit was based upon use of a Bud miniature cabinet (C-1798) as a housing. This cabinet

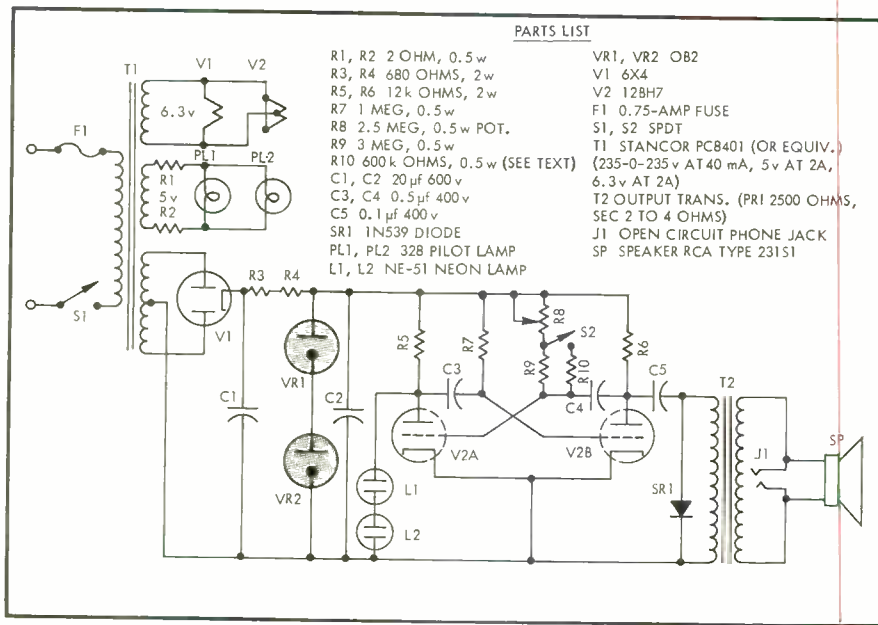


Fig. 2. Schematic of the master timer.

measures 6 × 6 × 6-in. The transformers and tubes are mounted on top of the chassis; the speaker, lamps, switches and range pot on the front panel; the fuse holder, signal jack, and line cord are located on the rear of the chassis; and all other components are mounted underneath the chassis. (See Fig. 3 and 4.) For ease of working, the front panel and chassis were fabricated from aluminum stock, but since a front plate with integral plate chassis comes with the cabinet, it may be used. A flange should be attached to the rear, however, to allow jack and fuse holder mounting. Panel marking was accomplished with Tekni-Cals and the handle is a standard Heath-kit item attached with two metal screws.

Only two areas require any specific discussion: the neon lamp installation and the variable R-C network. Two neon lamps are required in the visual plate circuit and substitution of several NE-51 lamps may be required to obtain equal brilliance in the two selected.

It is for neon lamp brilliance reasons that the voltage-dropping resistors have been inserted in the pilot lamp circuit. These resistors may be eliminated, but

in the opinion of the author, the pilot lamps will be too bright for the comparative brilliance and location of the neon lamps.

The maximum and minimum resistances required to cover the rate range with the specific capacitor employed were 5.5-meg max. (37 beats-per-min.) and 0.5 meg min. (212 beats-per-min.). Utilizing a 2.5-meg potentiometer as the variable resistance, R_9 was selected as 3 meg to provide the 5.5-meg total for the low end and R_{10} was selected as 600k (in parallel with 3 meg) to provide 0.5-meg minimum for the high end.

Calibration

Since the tempo dial simply indicates numbers from 0-100, a calibration card should be prepared for each range. This can be accomplished by counting the beats in a given period of time using a watch or clock. The accuracy of calibration will depend, of course, on the accuracy of the time standard and the period of time during the counting process. A more precise method would be to measure the time between beats using an oscilloscope.

Performance

The completed unit provides a tempo output that is variable from 37 to 212 beats-per-minute in two ranges: 37 to 65, 65 to 212. Accuracy can be broken down into two separate areas: line voltage and dial resolution. A ±10 volt change in the line voltage causes a deviation of 1.3 per cent at the extreme low end (37 beats-per-min.) and 1 per cent or less at range settings in excess of 100 beats-per-min. Dial resolution is good in the low range, becoming more critical in the high range with the extreme high end setting representing the worst case.

One division on the scale represents approximately two beats-per-minute change at the highest setting. Allowing for one complete scale division of misalignment (or positioning) of the control, the resulting error would be less than 1 per cent. The accumulative error considering the worst cases, therefore, is less than 2 per cent over-all. There is a change in tempo with the change in temperature from turn-on to warm-up, but this has been ignored since the unit is stable once the internal temperature stabilizes. The cabinet, itself, although ventilated, helps to provide a "poor man's" oven because of its small size.

Circuit Variations

The circuit, itself, is not critical and ordinary wiring practices will provide the required results. Certain components within the circuit, however, can appreciably change the output with respect to rate and level. Rate is most affected by the R-C time constant components and the neon lamps. It is affected to a lesser degree by VR_1 and VR_2 , C_2 , and the loading of the aural plate circuit. It is apparent that R_9 and R_{10} should be selected empirically after the rest of the



Fig. 4. Under-chassis view.

circuit has been assembled. Oil-filled capacitors were used in the R-C circuits, and values for R_9 and R_{10} were selected on the basis of the value of C_2 . The aural time pulse is not critical and the listed values for R_7 and C_3 may be used with no adjustments. From the foregoing, it should be obvious that any tube change or change in the listed components may require recalibration of the unit. Any small speaker could be substituted for the one used, the gain being a function of the efficiency of the speaker employed.

For those who may prefer a more simple, less expensive and less accurate unit, the following changes will result in an electronics accuracy on the order of 5 per cent with the same line voltage variations. 1. Eliminate VR tubes; 2. eliminate neon lamps; 3. change 12BH7 to 12AU7; 4. change R_3 and R_4 to 1000 ohms.

(Continued on page 60)

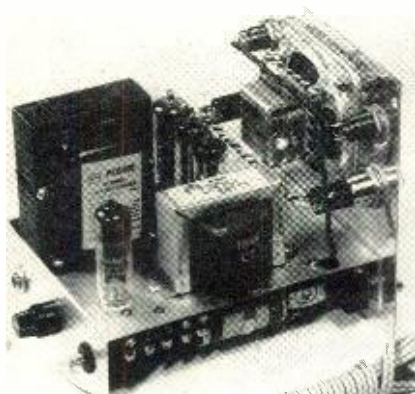


Fig. 3. Rear view of the chassis.

Bad Sound from Great Composers

Sometimes the composer is to blame

LEWIS A. HARLOW*

BAD SOUND and its elimination have been the preoccupation of audio engineers since the very beginning of interest in hi fi. First these engineers gave us super amplifiers—at a super price that was well worth paying. Next came the smoothing out of the many of the humps in speaker response. Then stereo, with other sounds which had not been audible before; these, too, the engineers have faced and largely conquered. Recently there came multiplex—and we all know the problems which ensued, and are in the process of solution.

The engineers' name for bad sound is *distortion*, of which there are several kinds. We will deal with two kinds. The first is harmonic distortion, which can be generated at any number of critical areas in the electronic circuitry. It is usually possible to pinpoint the exact source of the trouble and, once found, measure and minimize it.

The second is called intermodulation distortion. Here the harmonics of the oboes, basses, and other "offenders" go way up out of earshot, where they proceed to bicker with one another. Feathers fly and flutter back down into audibility, causing vague listener discontent and a desire to shut off the set and go to bed without knowing exactly why the loss of interest.

Not all of the distortion, harmonic and intermodulation, is electronically inspired. Much of it is lying dormant in the printed score of the music, waiting to be generated on the concert stage or in front of the recording microphones. The blame is squarely in the lap of the composer of the music. Some composers intuitively avoid this bad sound. Others don't, or perhaps they are vaguely aware of it and are willing to put up with it as a negative by-product of

another objective. The sympathetic interpreter can and does help to reduce the level of the unpleasantness, and this is one of the several reasons why you shop from recording to recording of the same piece—and why there will always be buyers for new recordings of standard masterpieces.

The problem of distortion at the source is all of the intermodulation kind. Harmonic distortion, held in a good amplifier to a fraction of a per cent, goes happily haywire in most music at the live level. The symphonic melody, assigned to the second violins and reinforced an octave above by the first violins, will measure on a distortion meter as better than 100 per cent second harmonic distortion of the second violin part. This has been going on since the time of Haydn, and the sound is just lovely.

The 18th and 19th century masters of composition were not aware of intermodulation problems as such, but ironically, the worst offenders among them did their transgressing by choosing to ignore rules of harmony and counterpoint which, in their time, had already been around for a couple of centuries. The pre-Elizabethan pedagogues who formulated these rules knew nothing at all about acoustics and electronics, but as their means of making music was extremely primitive, they were able to hear *all* of their sound clearly—and rule against the effects which they found unpleasant.

Five composers have been selected to serve as the examples of this bad sound. No desecration of the departed spirit is intended—or likely. Each of these men has in many ways proved his right to immortality, and this group of five can probably stand the abuse better than most others. There will be suggested comparisons of recordings in which "sound" is to be listened for, and you will do the listening.



In the examples to follow, the figure in parentheses is the number of versions of a particular work which are currently available on discs. This is admittedly a nonaesthetic way of measuring artistic worth, but when you are record buying, popular demand is at least worth knowing about.

I. Ludwig von Beethoven (1770-1827)

Beethoven? Yes, Beethoven, Are you surprised? Beethoven's 32 piano sonatas are without question among the most inspired and valuable of all contributions to the literature of the instrument. They include, though, some of the worst piano writing ever known. Beethoven loved to hurl thunderbolts, and if he happened to be in this mood at a time when all he had at hand was a piano, you got the whole piano squarely between the eyes.

A favorite Beethoven thunderbolt is the chord with which he concludes many of his sonata movements. Symbolically, it is do-mi-sol-do very low with the left hand, and do-mi-sol-do very high with the right. In between is a two or three octave vacuum. The four-note chord played by the right hand is harmless enough, but that very low left hand do-mi-sol-do is just dripping with ID.

For the Beethoven comparison project (which is going to be with Chopin), you will be needing a Beethoven piano sonata. The most popular are: VIII, *The Pathétique* (21); XIV, *The Moonlight* (24); XXI, *The Waldstein* (11); XXIII, *The Appassionata* (24). The remainder of the 32 are worthy and appropriate for the comparison in case you already own one of them.

For the most shocking "sound" comparison between Beethoven and Chopin, the suggested Chopin is the very off-Broadway *Mazurkas* (10). Here is a happy wedding of inspired content and distortionless limpidity of sound. In this

* 62 Long Wharf, Boston, Mass.

Illustrations of composers from "High Fidelity Primer" by Institute of High Fidelity.

comparison, the Beethoven content will not suffer, but the Beethoven sound will seem shabby, as it is supposed to.

Perhaps a fairer comparison with a Beethoven piano sonata should be a Chopin piano sonata. Two are available, his *Second* (16) and his *Third* (11). Chopin was never happy in the classical forms, and this is amply evident in his sonatas and his two concertos. In this comparison, the Chopin sound will still be overwhelmingly better, but the Chopin content may impress you as almost nil, and your respect for the over-all worth of the Beethoven sonatas will have grown.

A third Beethoven comparison will be Beethoven-Beethoven. You will use your same Beethoven sonata as the jumping off place, and with it you will compare one of the five Beethoven concertos: *The First* (14); *The Second* (11); *The Third* (20); *The Fourth* (20); *The Emperor* (26). In these concertos, Beethoven has an orchestra available to do his thunderbolt hurling and otherwise handle his emotional outbursts, and his piano style holds to the more conservative traditions of Mozart. His lack of sympathy for the unaccompanied piano of the sonatas is one of the reasons why they are so challenging to the present-day interpreters of piano music, and why these interpretations vary so widely. Beethoven quite obviously knew that he was mistreating the piano, and didn't care too much.

II. Robert Schumann (1810-1856)

Schumann is probably the most maligned of all orchestral composers. Wagner, Stravinsky and others have been castigated for their daring, but the charge against Schumann is technical incompetence. Everybody knows that the Schumann sound is muddy and that latter-day conductors must "re-orchestrate" to make his symphonies presentable.

Schumann is worthy of inclusion in this group under scrutiny, but he is really not as bad as his reputation would indicate, and this you will discover for yourself. His greatest fault was probably his tendency toward unnecessary doubling of voices. It is as though his strings and his winds do not trust one another, each considering it necessary to play all of the time. This produces a kind of distortion, not exactly intermodulation in the simple sense, but rather what you get from a soprano chorus as compared with a soprano soloist.

It is quite true that many conductors "re-orchestrate" Schumann, but mostly this consists of telling Joe or Frank to lay off for twenty bars and come in at the tutti. The result is an interesting variety of Schumann symphonies, but through it all the original Schumann sound seems to persist. For this reason, any of the available versions of a Schu-



mann symphony by a big-name conductor will be entirely satisfactory for comparison. In this case we will compare him to his contemporary, Felix Mendelssohn. The ratings on the Schumann symphonies are: *The Spring* (5); *The Second* (2); *The Rhenish* (5); *The Fourth* (6).

If you want to show up Schumann sound at its worst, you will want to compare it with the best sound of Mendelssohn, and this will be the *Midsummer Nights' Dream Music* (16). The comparison is anything but fair, and it would probably be better to compare with a Mendelssohn symphony such as *The Scotch* (6), *The Italian* (18), or *The Reformation* (6): This is fair.

You may already own Schumann's *Piano Concerto* (24), but under no circumstances should you use it in this comparison project. The superb piano writing in this piece will dominate your attention, and you will fail to hear the orchestral sound, which is what you are listening for.

III. Richard Strauss (1864-1949)

Strauss, a superb craftsman in the orchestral medium, is included in "The Five" by accident; the accident being that period in his long life in which he was most productive. Strauss flourished at the very end of the Romantic era, when music was bigger, and longer, and louder, and yet softer than it had ever been before. Strauss was just the man to accept this kind of a challenge; it was tailored to his talents and his temperament.

The later Strauss tone poems are monuments of complexity piled layer on layer. Strauss, the technician, could put together this mass of music superbly, but unfortunately we do not listen in layers. To any one set of human ears, the "big" era of Strauss output is unpleasantly loaded with intermodulation,

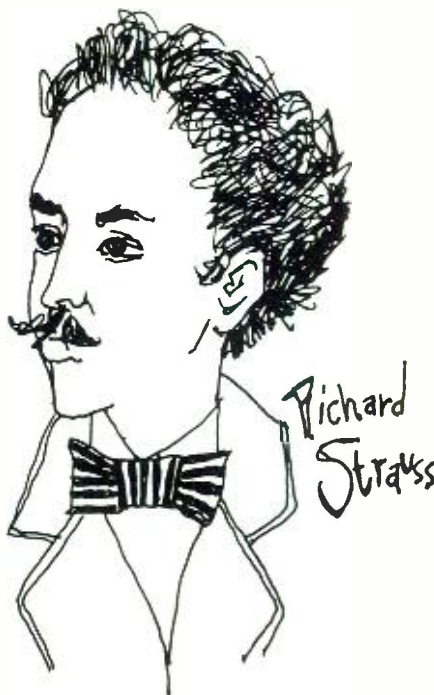
most likely because the good Strauss is too deep in layers.

The first comparison will be Strauss-Strauss. The bad Strauss sound will be found in the *Rosencavalier Waltzes* (16) and the good Strauss sound will be heard in *Til Eulenspiegel* (15), fortunately written at an earlier date before the grandeur complex had taken full hold. This example is perhaps proof that Strauss was an unfortunate victim of his times.

The second comparison will also be Strauss-Strauss, but here the same *Rosencavalier Waltzes* will be compared—don't laugh—with a waltz by Johann Strauss. Richard Strauss was very conscious of the responsibility of his name. He would write Strauss waltzes bigger and better than any Strauss waltzes previously written. This he proceeded to attempt, and the result was the *Rosencavalier Waltzes*, the biggest and the stuffiest waltzes of all time and an excellent example of bad sound for inclusion in this program.

The Johann Strauss waltz to be used for comparison should be *The Emperor*. Johann's waltzes (all 37) are not generally listed in the catalogs by their individual names, but *The Emperor* should be in almost every collection! Listen for the good sound, and it is really good. The music of the Waltz King is so strongly associated with hotel trios, outdoor bands, and other non-symphonic groups that it is little realized that Johann Strauss deserves to be ranked as a great orchestrator. A Johann Strauss waltz, played by the full complement of musicians for which it was written, is rewarding listening.

(Continued on page 58)



Reducing Distortion in Stereo Phonograph Systems

J. G. WOODWARD*

In this two-part article the author presents a thorough discussion of tracking and tracing distortions. This part concentrates on tracking problems.

In Two Parts—Part I

EVER SINCE THE phonograph was developed as a commercial product which achieved popular acceptance, progressive elements in the recording industry have continually sought means for improving the quality of the disc records and of the reproduced sound from records. The result over several decades has been a steady improvement in techniques, materials and components upon which occasional advances of a major nature were superimposed, totalling to quite a phenomenal rate of progress. The practical development of the two-channel stereodisc system, its commercial introduction and subsequent improvement is a recent and striking example of such progress. However, signals reproduced from two-channel 45/45 stereodisc recordings were subject to two types of distortion which had been much more easily controlled in monophonic lateral-cut recordings. These distortions, which are inherent in the geometrical relationships between stylus and record-groove motions, are tracking-angle distortion and tracing distortion. Their nature will be described in subsequent sections. Until recently the distortion products due to tracking and tracing errors were much greater than the products due to non-linearities in high-quality recording and reproducing equipment and, hence, were the limiting factors in stereodisc reproduction.

Three years ago an intensive study of tracking-angle and tracing distortions was initiated at the RCA Laboratories. The outcome of this program has been a more complete understanding of the phenomena involved, and also the development of practical methods for reducing both tracking and tracing distortion to very low values. Because of the effectiveness of the new techniques, the decision was made to include them as two of a number of elements which comprise the DYNAGROOVE recording

* RCA Laboratories, Princeton, N.J.

^{1,2} All footnotes at end of article.

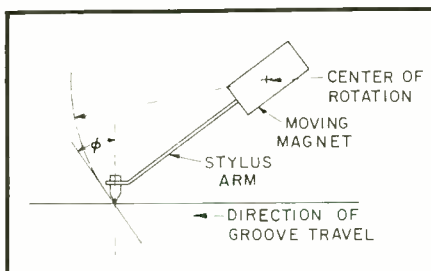


Fig. 1. Diagram showing the vertical tracking angle in a moving-magnet pickup.

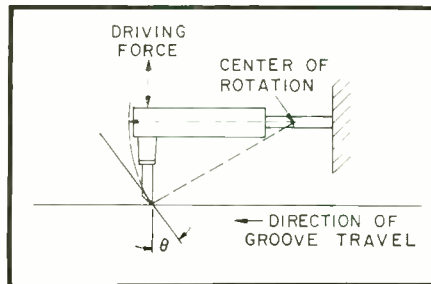


Fig. 2. Diagram showing the recorder design angle in a stylized stereodisc-recorder mechanism.

system introduced by RCA Victor early in 1963. Descriptions of these techniques were given to the recording industry during 1963 through technical journals and by other means. It was thought that many readers of *AUDIO*, who might not have ready access to some of the technical journals would also be interested in these new developments. In this series of two articles, the basic concepts involved in understanding tracking and tracing distortion will be outlined, laboratory experiments leading to the new understanding and techniques will be reviewed, and measurements illustrating the improvements resulting from practical application of the new techniques will be presented. Those readers wishing a more rigorous and detailed discussion are referred to the articles

listed in the bibliography, which includes references to work done at the RCA Laboratories as well as elsewhere.

The Vertical Tracking Angle

The fact that a tracking-angle error will produce harmonic and intermodulation distortion products in sound reproduced from records has been known for many years and has been studied analytically.^{1,2} This is true of both the lateral and the vertical tracking angle. A lateral tracking-angle error occurs when the axis of the pickup is not perpendicular to the line drawn from the stylus tip to the center of the record in the plane of the record. It is a simple matter to control the lateral tracking angle, and pickup arms are usually designed to avoid lateral-angle errors of more than 2 or 3 degrees across a 12-inch record. It is impractical to design a pickup and arm to have a vertical tracking angle of 0 deg., since this requires that the pivot point of the moving system of the pickup lie in the plane of the record. The situation is depicted in *Fig. 1* for the case of a moving-magnet pickup. Similar considerations apply to other types of pickup. In this illustration the moving system of the pickup is constrained to move in a rotational mode when the stylus is deflected in a vertical direction, with the center of rotation lying within the magnet. Due to the rotational constraint, a vertical deflection of the stylus causes the stylus tip to move in a circular arc. For the small deflections normally occurring, this arc can be replaced by a straight line tangent to the arc at the stylus tip, which line makes an angle, ϕ , with the vertical. This angle, ϕ , is the vertical tracking angle. In stereodisc systems both lateral and vertical components of motion occur. Hence, it is important that both the lateral and the vertical tracking angle be controlled if distortion in playback is to be kept to a minimum.

The distortion in playback will be

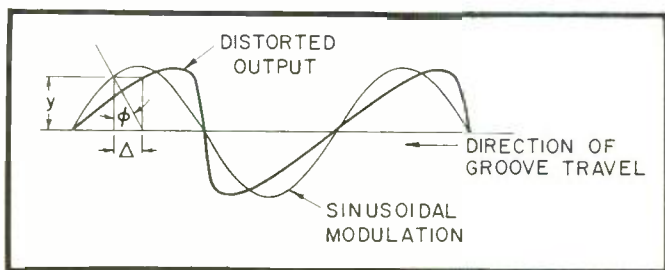


Fig. 3. Distorted waveform of a sinusoidal vertical modulation played back with a pickup having a vertical tracking angle, θ .

minimized if the vertical tracking angle of the pickup is equal to the effective vertical angle of the modulation recorded in the record groove. The angle of the modulation in the groove has been tentatively termed the *vertical recorded angle* by the recording industry. The vertical recorded angle is determined in part by the *recorder design angle*, which angle is determined by the geometrical design of the stereodisc recorder, as illustrated in Fig. 2. In the example shown here a vertical deflection of the recording stylus causes the stylus tip to move along a circular arc about a center of rotation which is situated at some distance above the record surface. For small vertical deflections the stylus tip moves along a line making an angle, θ , with the perpendicular to the record surface. The angle, θ , is the recorder design angle. The way in which the recorder design angle combines with other factors to determine the vertical recorded angle on the record will be considered later.

Effects of a Tracking-Angle Error

Let us now consider the manner in which a vertical tracking-angle error degrades the signal reproduced from a stereodisc. The geometrical constraints illustrated in Fig. 1 and 2 show clearly that any vertical deflection of the recording or playback stylus must be accompanied by a longitudinal deflection along the direction of groove travel if the vertical angle of the pickup or recorder is other than zero. The resulting distortion which may occur is illustrated for a sinusoidal signal in Fig. 3 for the case of a 0-deg. vertical recorded angle and pure vertical modulation. Since the pickup stylus follows the sinusoidal modulation, $y = y_0 \sin \frac{2\pi x}{\lambda}$, while being constrained to move along a line making an angle, ϕ , with the vertical, an instantaneous phase delay of $\Delta = y \tan \phi$ occurs. In these equations y is the instantaneous value of the recorded vertical displacement of amplitude y_0 , λ is the wavelength, and x is measured along the direction of groove travel. During positive displacements Δ has positive values representing instantaneous phase delays. During negative displacements Δ has negative values representing phase advances. As a result the output of a displacement-responsive pickup will have the waveform indicated in the figure.

In addition to the harmonic distortion products generated in the case of a single-frequency tone, intermodulation products are generated in the output of a pickup having a vertical tracking-angle error when playing back a recorded signal consisting of two or more tones. A test signal which has been particularly useful in elucidating tracking-angle phenomena consists of a high-level 400-cps component upon which a low-level 4000-cps component is superimposed, with both being recorded as vertical modulation on the record. The longitudinal component of stylus displacement due to the vertical deflection at the 400-cps rate results in a periodic varia-

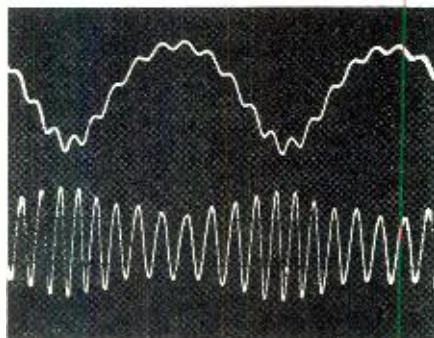


Fig. 4. Upper: Playback waveform of a 400 + 4000 cps vertical recording with a vertical-tracking-angle error. Lower: The 4000 cps component, alone, of the upper trace. Note the presence of both amplitude modulation and frequency modulation.

tion in the relative velocity with which the groove moves past the stylus. Since the relative stylus-groove velocity is modulated at the 400-cps rate, the 4000-cps component is frequency modulated by the 400-cps component. In addition, the 4000-cps component is amplitude modulated by the 400-cps component, this being due to periodic changes in slope of the groove. It is as though the angle between the pickup and the record were being varied at the 400-cps rate.

The distortion and modulation effects just described are demonstrated in Fig. 4, which is an oscilloscope trace of the output of a velocity-responsive pickup playing back a recorded 400 + 4000-cps signal with a vertical tracking-angle error. The reproduced 400 + 4000-cps signal is shown in the upper trace. The distortion of the 400-cps component is evident. Since a velocity-responsive pickup is used, this trace is the derivative of the distorted wave drawn in Fig. 3. In the

lower half of Fig. 4 the 4000-cps component in playback is shown after the 400-cps component has been removed by a high-pass filter. Both amplitude modulation and frequency modulation are seen.

To a first approximation, the magnitude of tracking-angle distortion is proportional to the amplitude of the recorded signal and inversely proportional to the wavelength. This latter fact makes the distortion magnitude increase as the center of the record is approached.

Measurement of Distortion Products

In the case of playback of a single-tone signal a tracking-angle error leads to the generation of distortion products which are harmonics of the recorded tone. This distortion is predominantly second harmonic. In the case of the 400 + 4000-cps signal the predominant IM products due to frequency modulation and amplitude modulation are the sidebands at 3600 and 4400 cps. In laboratory studies of tracking-angle effects a harmonic wave analyzer was used to measure the percentage second harmonic of the 400-cps component when playing back the 400 + 4000-cps signal. The wave analyzer was also used to measure the amplitudes of the components appearing at 3600, 4000, and 4400 cps so the percentage of the sideband amplitudes relative to the carrier amplitude could be computed. In addition, a discriminator was used to measure directly the peak value of the per cent frequency deviation, and a conventional IM meter was used to measure the percentage of amplitude modulation.³ Each of the quantities was measured as a function of the vertical tracking angle of the pickup, using a special laboratory-constructed pickup⁴ whose angle was continuously adjustable from -25 to +30 deg. Only the angles between -3.5 and +3.5 deg. were inaccessible because of the pickup case contacting the record surface. This pickup and its adjustable mounting are pictured in Fig. 5. The pickup is supported by clamps which can be slid around the circular rails to change the angle. The rails, upon which an angular scale is inscribed, permit rotational adjustment about a center located at the stylus so changes in the vertical tracking angle do not alter the lateral tracking angle or the overhang of the pickup and arm. Negative angles

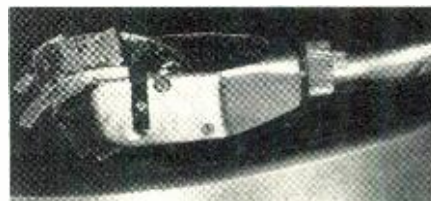
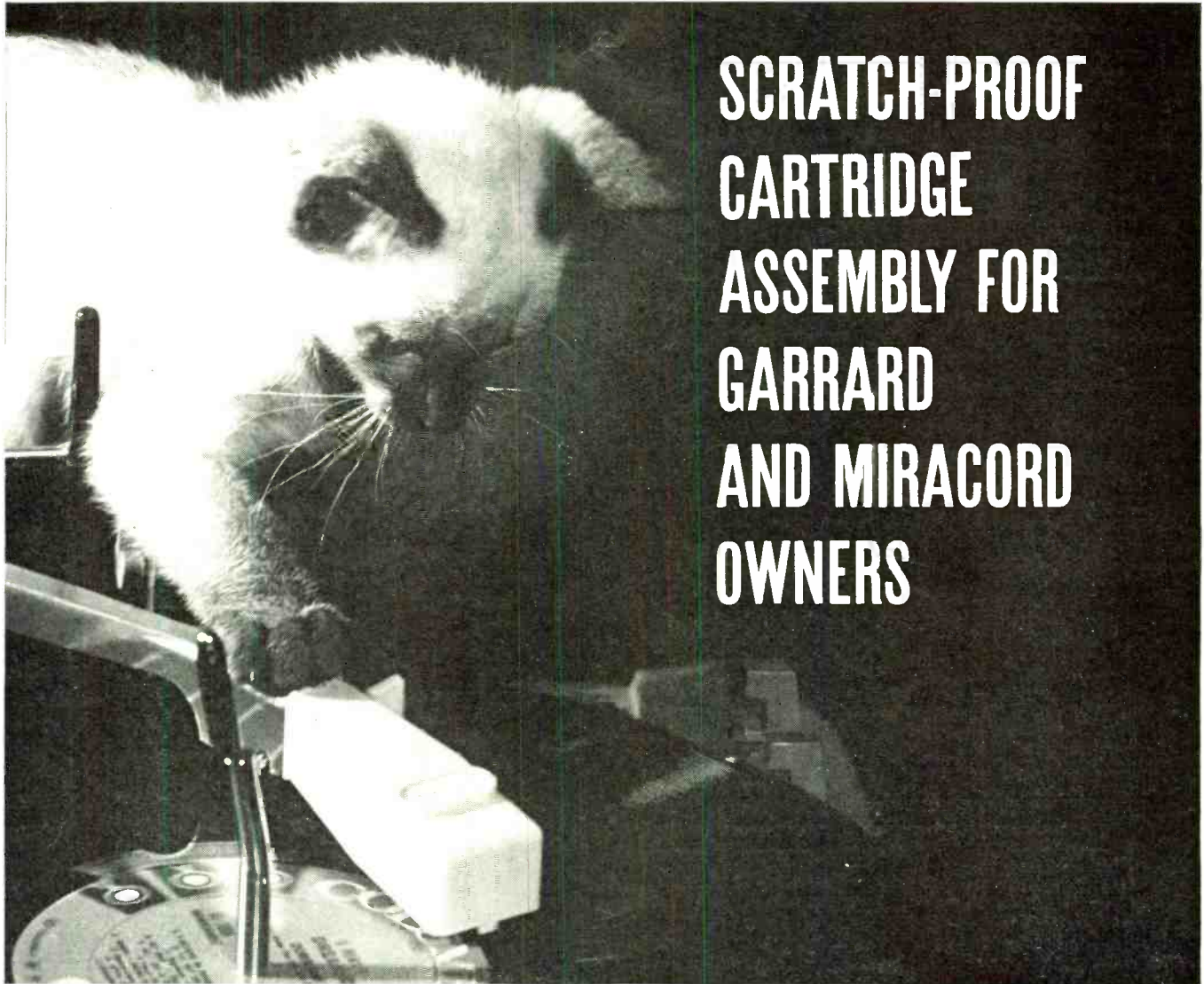


Fig. 5. A laboratory-constructed pickup mounted in a head which permits variation of the vertical tracking angle between -25 and +30 deg.

new from **SHURE**

originators of scratch-proof high fidelity tone arms



SCRATCH-PROOF CARTRIDGE ASSEMBLY FOR GARRARD AND MIRACORD OWNERS

Attention music lovers and felinophiles; interesting to note that both cat and cartridge have retractile styli for gentleness and protection from scratching

GREATER RECORD AND NEEDLE PROTECTION . . . FINER RECORD REPRODUCTION

Now, owners of Garrard Laboratory® Type "A" and AT-6 and Miracord Model 10 and Model 10H Automatic Turntables can assure themselves unprecedented and unparalleled record and needle protection, and highest sound quality simply by plugging in the Shure Stereo Dynetic GARD-A-MATIC "floating" cartridge assembly. Nothing else to buy . . . no wiring, no soldering, just plug in.

Ingenious GARD-A-MATIC cartridge inside a special tone-arm shell ends scratching due to dropping the tone arm or accidentally dragging it across the grooves . . . records stay new, sound new. Needles last longer—can't be damaged by pressing arm on record. Does away with tone arm "bounce" from floor vibrations, etc. Even plays warped records. And, the performance characteristics are those of the famed Shure Stereo Dynetic cartridges.

SPECIFICATIONS

Frequency Responses:	From 20 to 20,000 cps
Output Voltage:	6 millivolts per channel
Channel Separation:	more than 22.5 db at 1000 cps
Recommended Load Impedance:	47,000 ohms
Compliance:	20.0 x 10 ⁻⁶ cm per dyne
Tracking:	1.5 to 3.0 grams
Inductance:	600 millihenries
D. C. Resistance:	750 ohms
Stylus:	.0007" diamond
Stylus Replacement:	N99

MODEL M99/A. Fits Garrard Laboratory® model "A". Includes tone arm head, factory mounted cartridge, .0007" diamond. **MODEL M99/AT6.** Fits Garrard AT-6. Includes tone arm head, factory mounted cartridge, .0007" diamond. **Model M99/M10.** Fits Miracord Models 10 or 10H. Includes tone arm head, factory mounted cartridge, .0007" diamond. **MODEL N99.** Replacement stylus assembly, .0007" diamond.

SHURE

Stereo Dynetic®

GARD-A-MATIC™

CARTRIDGE ASSEMBLY

WRITE FOR DETAILS TO: SHURE BROTHERS, INC., 222 HARTREY AVE., EVANSTON, ILLINOIS

Manufactured under one or more of the following U. S. Patents: 3,055,988; 3,077,521; 3,077,522; D193,006; D193,934; other patents pending.

are obtained by sliding the pickup off the ends of the rails, turning it end for end, and sliding it back onto the rails. In this condition the record groove moves past the pickup from front to rear. The pickup performed satisfactorily in this mode for negative angles up to at least 25 degrees.

A typical set of measurements of a vertically-modulated recording made in the laboratory is shown in Fig. 6. A Westrex 3-C recorder, mounted in a conventional manner, was used to cut this record. A velocity-responsive pickup was used for all of the measurements except for the curve labelled "AM (displacement)," in which case the output of the pickup was passed through an integrating network to give a voltage proportional to stylus displacement. The uppermost curve of Fig. 6 was obtained by adding the percentages of the two sidebands at 3600 and 4400 cps. The frequency deviation values are the peak shifts in frequency measured as a percentage of the undeviated carrier frequency of 4000 cps.

The Vertical Recorded Angle

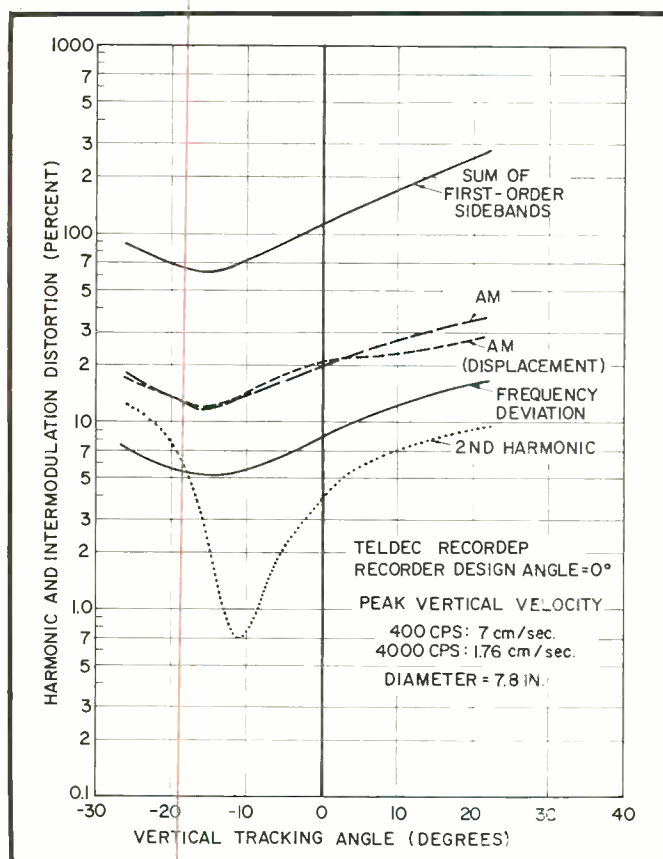
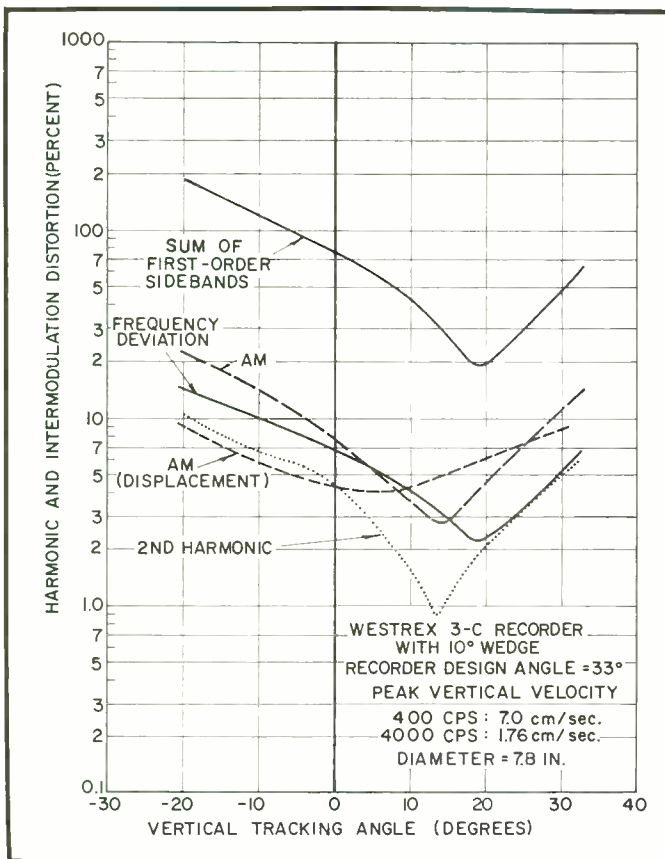
It was expected that data such as those shown in Fig. 6, obtained with a calibrated pickup, would permit measurement of the effective vertical recorded angle of the modulation on the record by indicating the angle at which the distortion components were a minimum.

Each of the curves plotted in Fig. 6 does, indeed, show a definite minimum for some angle. However, it is clearly evident that the minima found for the various distortion products do not all occur for the same angle, and we must decide which of the observed minima, if any, is the correct indication of the vertical recorded angle. While the reasons for the lack of agreement between the angles of the minima are still not completely understood, consideration of the possible mechanisms leads us to believe that the sum-of-the-sidebands data and the frequency-deviation data give the most reliable indication of angle. These quantities are almost entirely due to FM effects⁴ and, hence, are not sensitive to small variations in the amplitude of the 4000-cps component due to record wear and deformation of the groove wall under the force of the stylus. The FM data depend only on the slope of the long-wavelength, relatively-stable, 400-cps component in the portion of the cycle where the stylus displacement and acceleration are both small. The AM data, on the other hand, are influenced by the disturbing factors just mentioned, which factors are not related to vertical tracking-angle phenomena. Groove-wall deformation, in particular, may produce AM sidebands comparable in magnitude to those due to small vertical tracking-angle errors. The phases of the deformation sidebands are difficult to predict, but

may be such as to lead to cancellation effects with a corresponding shift in the angle for minimum AM.

In the vicinity of its null, the second-harmonic value due to tracking-angle errors is so small as to be comparable to distortion arising in the record-playback transducers and amplifiers. The second-harmonic components from the various sources may combine in various phases to produce cancellation effects. Hence, there is some uncertainty as to the exact value and location of the true minimum associated solely with vertical-tracking angle second harmonic distortion. In view of the above consideration, the most probable value for the vertical recorded angle for the recording used in obtaining the data of Fig. 6 is 8 deg. as read from the percentage sidebands and percentage frequency deviation curves.

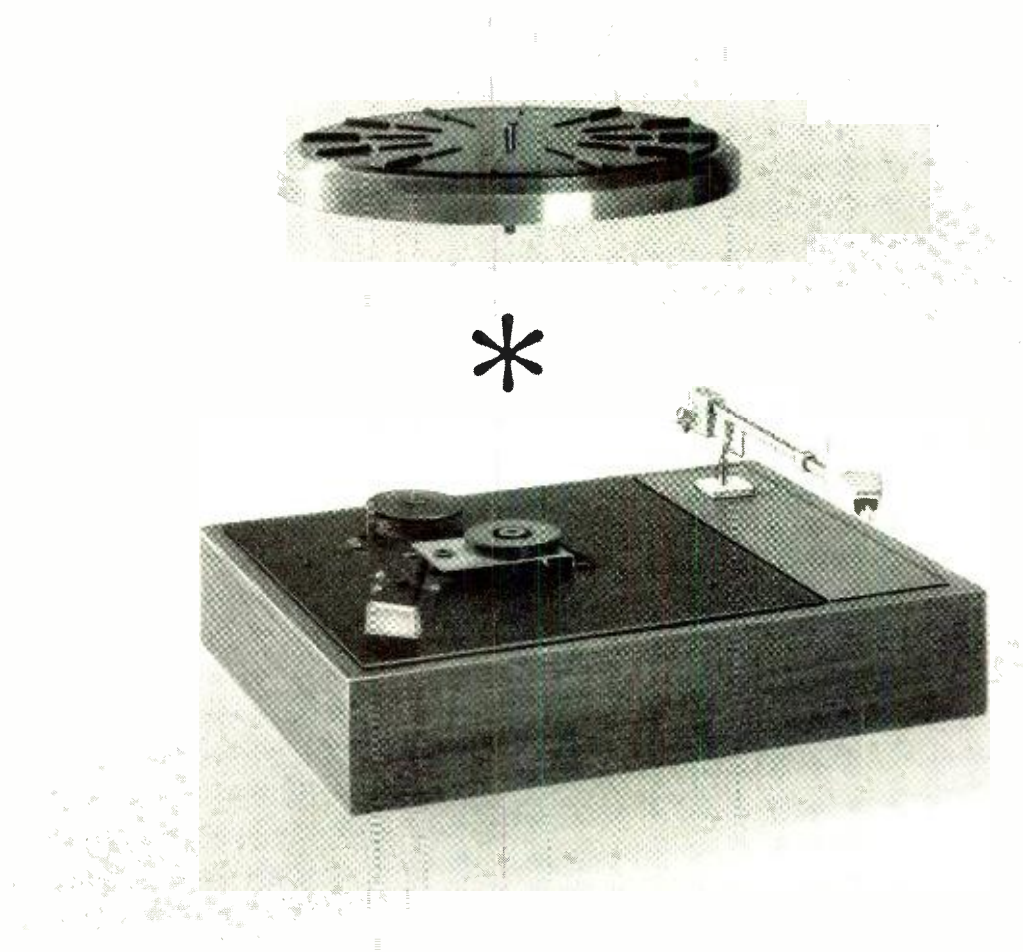
As has been mentioned, non-linear characteristics of the recorder, the pickup, and the recording and playback amplifiers can contribute to the harmonic and AM distortion products. The minimum values measured for the percentages of AM and second harmonic in Fig. 6 are determined primarily by the contributions of these sources. Since simple non-linearities cannot produce FM, these sources cannot affect the values of the percentage first-order sidebands and frequency deviation. The minimum values measured for these quantities are determined almost entirely by tracing dis-



Figs. 6 and 7. Measured values of distortion products as a function of the vertical tracking angle in playback. Except for AM (displacement) curve, all data were obtained with a velocity-responsive pickup.

***GYROPOISE® MAGNETIC SUSPENSION** introduces a new perfection to the reproduction of sound. Its secret is silence! The record platen rides on a cushion of air—suspended magnetically! Mechanical silence is the result. Vertical rumble is eliminated. But there's much more that recommends this remarkable turntable. It's a matched, balanced, coordinated system, complete unto itself. The arm and platen suspension have been unified to eliminate all mechanical feedback. The Unipoise® tonearm is balanced from a single bearing point. Its cartridge—the famous Stanton Stereo Fluxvalve—rides the record with a feather touch. The motor, too, is engineered for silence, rigidly mounted to the base to dissipate all possible vibration. The *800B Stanton Stereotable® System* even looks silent. The lines are slim, quiet and functional, with a base of natural walnut and fittings of gleaming brushed metal. See for yourself—and listen too—at your franchised Stanton dealer. Stanton Magnetics Incorporated, Plainview, New York.

STANTON



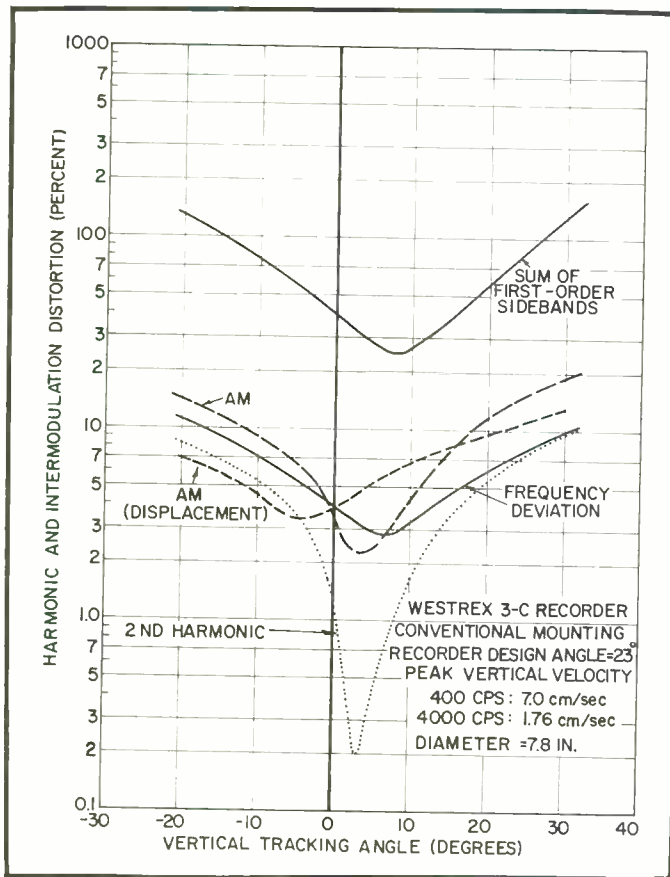


Fig. 8. Measured values of distortion products as a function of the vertical tracking angle in playback. Except for AM (displacement) curve, all data were obtained with a velocity-responsive pickup.

distortion. The way in which tracing distortion produces FM effects will be described in Part II. Equations for calculating tracing distortion products in the absence of groove-wall deformation are known,^{5,6} and the values computed for the conditions specified in Fig. 6 are in good agreement with the residual distortion observed at the minima of the sum-of-sidebands and the frequency-deviation curves. Cancellation of tracking-distortion products by tracing-distortion products cannot occur since a 90-deg. phase relationship exists between the two types of product. Thus, the products due to the two causes do not add algebraically but, rather, combine as the square root of the sum of their squares. When the tracking-angle error is zero, no tracking-angle sidebands are produced and only those due to tracing distortion remain. This is the condition existing at the minimum point of the sum-of-sidebands curve. A more detailed discussion of the relationship between tracking-angle distortion and tracing distortion has been given elsewhere.⁷

Stylus Bending and Lacquer Springback

In Fig. 6 the FM data indicate a vertical recorded angle of 8 deg. which is considerably smaller than the recorder design angle of 23 deg. as determined by the construction and mounting of the Westrex 3-C recorder used in making the test record. This discrepancy between the design angle and the recorded angle was first noticed when using the recorder at

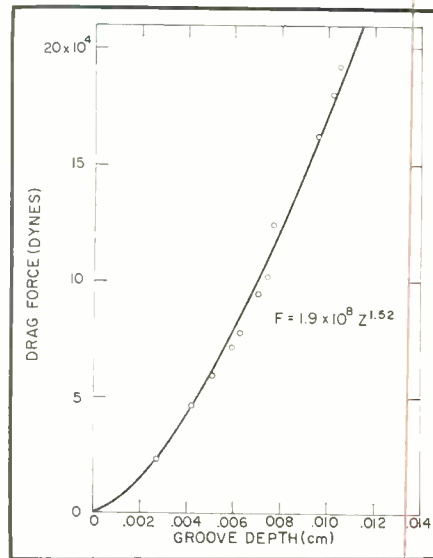


Fig. 9. Drag force exerted by the lacquer master on the recording stylus as a function of the groove depth being cut. The equation of the curve fitting the measurements is empirically determined from the data.

the RCA Laboratories. Subsequently, the same discrepancy was found to exist in recordings made with several other Westrex 3-C recorders. The performance of recorders having design angles other than 23 deg. was also investigated. A Teldec recorder which has a design angle of 0 deg. was used to record 400 + 4000-cps test signals. The playback results are shown in Fig. 7. It is seen that the verti-

cal recorded angle is -15 deg. in this case. Recorder design angles greater than 23 deg. were obtained by placing wedges of various angles in the mounting of the Westrex 3-C recorder. Typical playback results when a 10-deg. wedge was used in recording are shown in Fig. 8. The vertical recorded angle has now moved up to 18 deg. a 10-deg. increase over the 8 deg. previously observed when the recorder was mounted without a wedge. The data shown in Fig. 6, 7, and 8 are results of recent measurements.⁴ These measurements substantiate earlier measurements reported previously.⁸

Having ascertained that the discrepancy between the recorder design angle and the vertical recorded angle is real, reproducible, and significant, it became important to find a mechanism to account for the observed phenomenon. Anomalous behavior in pickups was first sought. Some pickups were found to have insufficient longitudinal restraint of the stylus arm. These pickups do, indeed, exhibit anomalously-large vertical tracking angles and high IM distortion when reproducing vertical modulation. However, most pickups, including the one used in the laboratory experiments, do not suffer from this shortcoming, so the source of the angle discrepancy was sought elsewhere. Bauer, who independently found and reported the angle discrepancy,^{9,10} close to attribute it primarily to springback of the lacquer master during recording. The nature of the lacquer material and of the cutting process is such that lacquer springback must certainly exist to some extent. However, laboratory measurements indicate that most of the observed angle discrepancy is due to bending of the recording stylus during the cutting process. As far as the end result on the record is concerned it makes little difference whether stylus bending

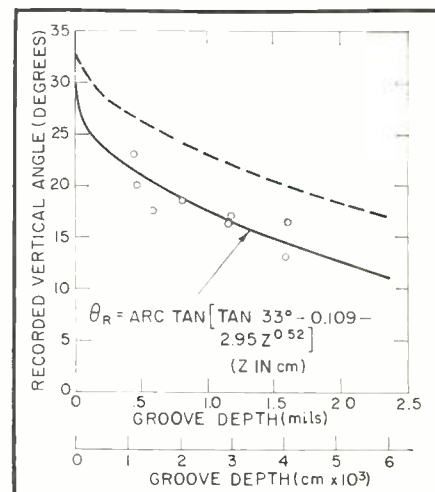


Fig. 10. Calculated (solid curve) and measured values of the vertical recorded angle vs. groove depth. Dashed curve shows the calculated angle when the contribution of lacquer springback is not included.



**IF YOU HEAR RUMBLE FROM AN AR TURNTABLE,
CHANGE THE RECORD.**

Hi-Fi/Stereo Review's Julian Hirsch writes: "... the only rumble that can be heard with the AR turntable, even with the tone controls set for heavy bass boost, is the rumble from the record itself." John Milder reports on the AR turntable in *Modern Hi-Fi*: "... the only time rumble is audible is when it has previously been engraved on a record by a noisy cutting lathe." Reviews of the AR turntable in *Audio*, *High Fidelity*, and in various non-hi-fi publications have reported its exceptionally silent operation.

AR turntables are guaranteed, as a condition of sale, to meet NAB Standards for professional broadcast equipment on rumble, wow, flutter, and speed accuracy. Literature, including reprints of the two reviews quoted from above, will be sent on request.

\$68⁰⁰ 33 $\frac{1}{3}$ and 45 rpm, complete with arm, oiled walnut base,
and dust cover, but less cartridge

(33 $\frac{1}{3}$ only, \$66)

5% higher in the West and Deep South

ACOUSTIC RESEARCH, INC., 24 Thorndike Street, Cambridge, Massachusetts 02141

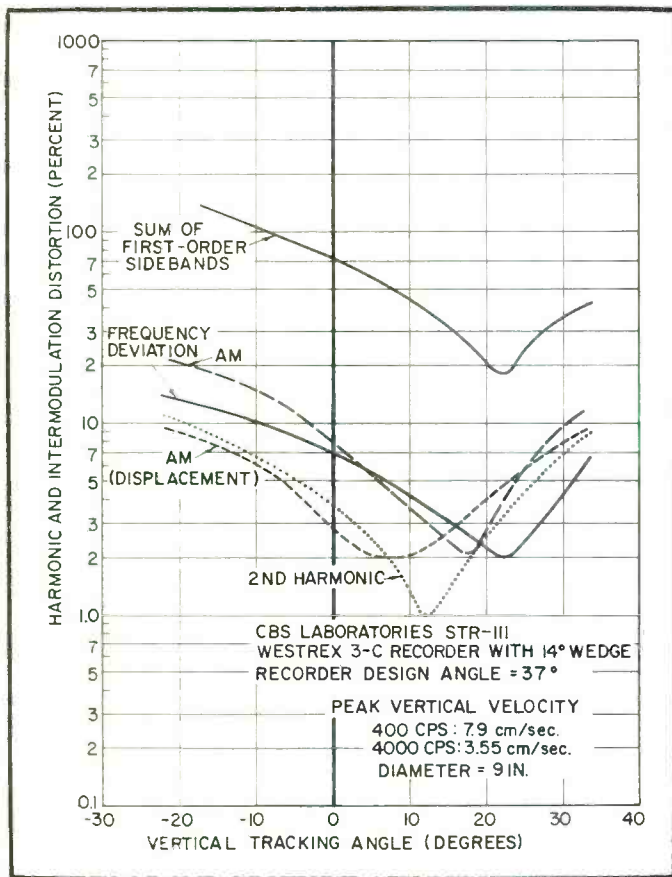


Fig. 11. Measured values of distortion products as a function of the vertical tracking angle in playback. Except for AM (displacement) curve, all data were obtained with a velocity-responsive pickup.

or lacquer springback is the mechanism involved. However, a more precise knowledge of the nature of the mechanism becomes important when corrective measures are being sought. Data are now available to permit a numerical analysis of the relative importance of stylus bending and lacquer springback. Before considering this analysis, however, the manner in which stylus bending can act to alter the vertical recorded angle will be described.

When the recording stylus is removing material from the groove being cut in the lacquer master a force is exerted on the stylus tip by the material. This drag force is sufficient to deflect the stylus tip longitudinally in the direction of groove travel. The drag force and the corresponding longitudinal displacement is greater when the groove depth is greater. Hence, when a vertically-modulated groove is being recorded the longitudinal displacement due to drag force varies in accordance with the groove depth at each instant. This modulated longitudinal displacement combines with that due to the recorder design angle. The design angle produces a longitudinal displacement which is opposite to the direction of groove motion when the stylus tip moves downward to cut a deeper groove. Since the longitudinal displacements due to design angle and to stylus bending are opposite in phase, they partially or completely cancel each other so that the longitudinal component of displacement

actually recorded on the lacquer master is reduced. Because the recorded longitudinal component is smaller, the effective vertical recorded angle is smaller.

The longitudinal components of recorded displacement due to the recorder design angle, to lacquer springback, and to stylus bending may now be combined in the following expression:

$$X = Z \tan \theta_D - k_L Z - C_s F, \quad \text{Eq. (1)}$$

where X is the total longitudinal displacement, $Z \tan \theta_D$ is the part due to the recorder design angle, θ_D , $k_L Z$ is the part due to springback, and $C_s F$ is the part due to stylus bending; Z is the groove depth, k_L is a constant of proportionality, C_s is the bending compliance of the stylus, and F is the drag

force acting on the stylus tip. A linear springback relationship between longitudinal deflection and groove depth is assumed here, as was done by Bauer.¹⁰ Part of the bending compliance is due to actual bending of the stylus and part is due to yielding of the sleeve which receives and holds the tapered shank of the stylus in the recorder. The stylus compliance was measured by applying known longitudinal forces at the stylus tip while the stylus was mounted in the recorder, and simultaneously measuring the longitudinal and vertical deflections of the tip as imaged in an optical comparator. Some variability between styli is found, and somewhat different results may be observed for the same stylus when it is removed and replaced in the recorder. A typical value of the compliance of the stylus used in the present experiments is $C_s = 1.02 \times 10^{-8}$ cm/dyne.

The drag force on the stylus while cutting grooves of various depths was determined by measuring the slight change in the rotational speed of the recording turntable when the turntable was coupled to the drive motor through a fluid linkage. Known braking torques were also applied to the rim of the turntable to provide speed-vs.-force calibration information. Some variability in drag force is observed for different styli and different lacquer discs. A typical set of measurements of drag force-vs.-groove depth is shown in Fig. 9. The curve drawn through the data points is described by

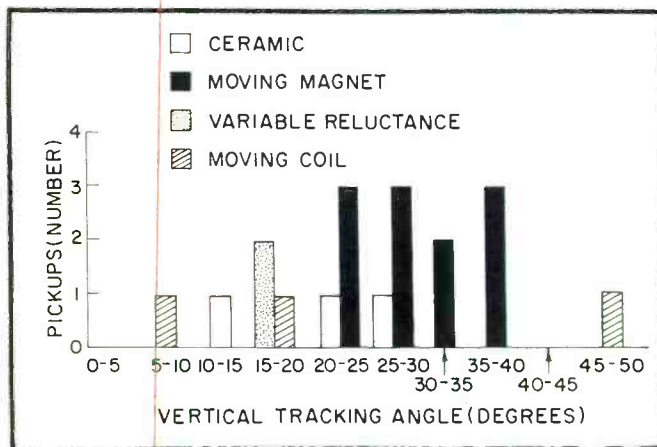
$$F = 1.9 \times 10^8 Z^{1.52} \quad \text{Eq. (2)}$$

where F is the drag force in dynes and Z is the groove depth in cm. This empirically-determined relation between drag force and groove depth and, also, the measured stylus compliance may be substituted in Eq. (1) to give the longitudinal deflection as a function of groove depth.

$$X = Z \tan \theta_D - k_L Z - 1.9 \times 10^8 (1.02 \times 10^{-8}) Z^{1.52} \quad \text{Eq. (3)}$$

For small modulation levels the effective

Fig. 12. Vertical tracking angles measured for 19 commercially-available models of pickup.



"Only the Music is Present...When the Classics Speak"



Classic Mark II-15" Woofer



Classic Dual 12-12" Woofer

(they look like this when the music stops)



It's a phenomenon of great speakers. Reproduction is so faithful you're totally absorbed in sound...unaware of its source. You'll find this particularly true when you hear the University Classic Mark II 3-way system. There is absolutely no distortion, no coloration... up to 40,000 cps. According to Julian D. Hirsch, Hirsch-Houck Laboratories, "...The University Classic Mark II justifies substantial claims that the manufacturer has made for it. It is one of a limited group of speakers to which I would give an unqualified top notch rating." Cabinetry in oiled walnut. \$295. Classic Dual 12 3-way system, finished in oiled walnut—\$229.50. Write today for your free "Guide to Component High Fidelity": Desk R-2 LTV University, 9500 West Reno, Oklahoma City, Oklahoma.

LTV UNIVERSITY A DIVISION OF LING-TEMCO-VOUGHT, INC. 9500 West Reno, Oklahoma City, Oklahoma

vertical recorded angle θ_R , is given by $\tan \theta_R = dx/dz = \tan \theta_D - k_L - 2.95 z^{0.52}$
 Eq. (4)

Equation (4) shows how the vertical recorded angle varies with groove depth when the peak-to-peak displacement of the modulation is small relative to the mean groove depth.

Measurements of the vertical recorded angle for various groove depths were made while using a 10-deg. wedge in the mounting of the Westrex 3-C cutter to make $\theta_D = 33$ deg. The results are plotted in Fig. 10. The plotted points of angle-vs.-groove depth show some experimental scatter but the trend is clear, and a good fit is obtained with Eq. (4) when the springback coefficient is assigned the value of $k_L = 0.109$. The equation thus empirically determined is

$$\theta_R = \arctan [\tan 33^\circ - 0.109 - 2.95 z^{0.52}]$$

Eq. (5)

The dashed curve in Fig. 10 is the recorded angle calculated when lacquer springback is not taken into account. The difference between the dashed and solid curves indicates that lacquer springback accounts for between 5 and 6 deg. of the discrepancy between the recorder design angle and the vertical recorded angle, or about 30 per cent of the discrepancy for a 3-mil-deep groove. The bending compliance of the stylus used in these tests was smaller than compliances measured for other styli, which means that under average recording conditions lacquer springback will contribute a smaller fraction of the total angular discrepancy than that found here.

The curves of Fig. 10 indicate that lacquer springback plays a predominant role in the first 0.2-mil beneath the record surface. This sort of "skin effect" can account for the disagreement which has consistently been observed between vertical recorded angles measured by playback methods and by microscopic observation of the groove edges at the surface of the record.

Corrective Measures

We have seen how bending of the recording stylus and springback of the master lacquer introduce uncontrolled elements in the recording process. The logical way to control these factors is by eliminating them. A step in this direction was taken in the development of the DYNAGROOVE recording process by using a specially-designed recording stylus in which the bending compliance was reduced. Further improvement in this direction requires a cooperative endeavor by the manufacturers of recorders and of recording styli. Similarly, the elimination of lacquer springback requires the development of new recording materials. As an interim measure, a wedge may be used in the mounting of a Westrex 3-C recorder to provide any vertical recorded angle within a some-

what limited range. On the basis of the work at the RCA Laboratories, a 10 deg. wedge was adopted to provide a vertical recorded angle of about 15 deg. in the DYNAGROOVE system. The 15-deg. angle will provide the best reproduction for pickups having the standardized 15-deg. vertical tracking angle. This recorded angle is obtained when recording the deepest grooves which will be cut on commercial records. As has been shown above, a larger angle is obtained for shallower grooves, so a tracking-angle error and distortion will exist for these grooves. This is a reasonable compromise since the shallower grooves ordinarily contain lower-level signals which are less likely to produce serious distortion.

Playback Considerations

This discussion would not be complete without some consideration being given to the practical problem of providing optimum performance in stereodisc playback systems. In order to minimize vertical tracking-angle distortion in playback the vertical tracking angle of the pickup should be the same as the vertical recorded angle on the record. At the present time most users will have a library of records made under widely varying conditions. The record used in obtaining the data of Fig. 6 was made under conditions representative of most American and some European record releases prior to early 1963. The record of Fig. 7 is representative of many European and a few American releases. (According to recent information several record companies in Europe have now adopted recording procedures which yield a vertical recorded angle in the neighborhood of $+5^\circ$.) The record of Fig. 8 is representative of RCA Victor's stereo DYNAGROOVE releases. (The DYNAGROOVE process for reducing tracing distortion was not included in making this test record). In Fig. 11 measurements of the CBS Laboratories STR-111 test record are presented. In making this record a 14-deg. wedge was used in mounting the Westrex 3-C recorder. This record is said to be representative of recording practice by Columbia Records since early 1963. There is currently considerable interest on the part of most major record companies in adopting practices which will control the vertical recorded angle and thereby permit the minimization of tracking distortion in accordance with the standardized playback angle. There are still some problems to be solved, but we can hope that a standard vertical recorded angle will be universally accepted without undue delay.

Much has already been published regarding the considerable range in the vertical tracking angles found in commercially-available pickups. The results of laboratory measurements of the angles

of a sample of 19 models of pickups of various types commercially available as this article was written are depicted in Fig. 12. Since several pickup manufacturers are preparing to offer newer models, a higher concentration of angles in the 15-20 degree bracket may be available by the time this appears in print. The factors involved in controlling vertical tracking-angle distortion are such that the problem can be solved satisfactorily only by adherence to a standard angle by manufacturers of pickups and of records. It will probably be impractical to maintain angle tolerances more stringent than ± 5 deg. around a 15-deg. standard angle. However, even with these liberal tolerances tracking distortion can be kept to low values.

Theoretical considerations show that the same kind of distortion is generated by errors in the lateral tracking angle and in the vertical tracking angle. No one would seriously consider introducing a 50-deg. error in the lateral tracking angle of his playback system. Yet errors of this magnitude, and greater, are commonly present in high-quality systems when, for example, a pickup having a 35-deg. vertical angle is used to play a record having a -15 -deg. angle. The question often asked is why does the reproduced sound under such conditions sound as good as it does. Part of the answer lies in the fact that the large-displacement signals occur for lower frequencies and are usually, and deliberately, recorded laterally rather than vertically. It is extremely rare in program material to find vertical modulation recorded without lateral components being present simultaneously. The distortion generated in the vertical component may then be masked by the other components of the total signal. The other part of the answer is that we sometimes do hear the distortion due to a vertical tracking-angle error. We can be sure that this form of distortion will be detected more frequently now that its existence has been pointed out by a number of writers, and now that stereodisc systems in which tracking distortion has been minimized are becoming available as standards for comparison. Perhaps even more important in this regard is the development to be discussed in Part II of this series, which treats the reduction of tracing distortion. When tracing distortion is reduced the reduction of tracking distortion becomes even more important, since the benefits of reduced tracing distortion cannot be fully appreciated unless tracking distortion is kept low. Each form of distortion tends to conceal reductions which may be made in the other, and the ultimate in high-quality stereodisc sound can be achieved only when every part of the system is optimized. Enough basic understanding

(Continued on page 57)

For
Connoisseurs
of Sound



CONCORD 884

The STAR Performer Concord's Transistorized Model 884.

Concord leadership in tape recorder engineering reaches new and exciting heights with the introduction of the new, transistorized Model 884. A recorder designed to surpass *all* other makes in engineering, styling design, features, and performance, the Model 884 brings you simplicity and ease of operation in a compact, beautifully styled tape recorder package — a recorder that will become your most treasured possession... A STAR in your home!

No other tape recorder, regardless of cost, has all the Concord 884 quality performance features . . . A matchless STAR performer!

- 4 separate transistorized preamps, 2 for record, 2 for playback
- AB Switch for comparing source versus tape when monitoring
- Built-in Sound-On-Sound Switch • Three Heads • Stereo Head-phones output jack • Illuminated VU meters • Full push-button operation • Three speeds • Master Volume Control • Push-pull bias oscillator • 15 watt stereo amplifier and two 7" speakers.

PLUS MANY MORE PRECISION ENGINEERED PROFESSIONAL FEATURES

For Connoisseurs of Sound

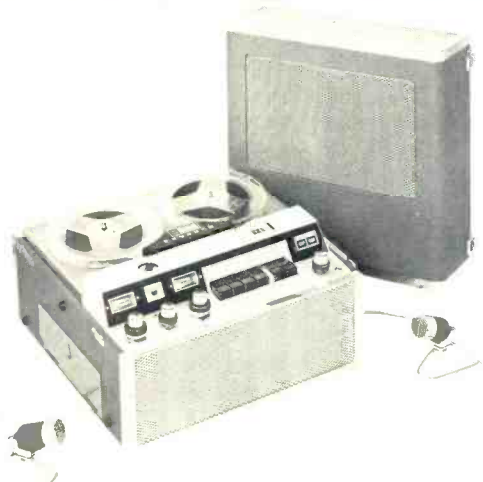
CONCORD 884

Concord, a symbol of quality the world over introduces the new choice of sound connoisseurs, the Model 884 . . . A recorder that combines manufacturing know-how, eye-appeal and professional features...a total package that presents one of the most startling tape recorders on the high fidelity market today, unsurpassed in

quality and price. The Concord 884 quality begins with basic engineering design, careful selection of high-rated quality material and components, plus the development of a high reliability manufacturing and production system which will assure you of a quality product. With this in mind, Concord has been able to achieve a brilliant entry into the tape recorder field—Model 884.

COMPARE THE 884 WITH ANY OTHER TAPE RECORDER AT ANY PRICE. YOU WILL SEE WHY THE 884 IS IN A CLASS BY ITSELF.

• ADVANCED DESIGN • PROFESSIONAL FIDELITY • PROFESSIONAL RELIABILITY
• OPERATING, TAPE HANDLING EASE • CONVENIENT TO USE • COMPLETE FACTORY SERVICE



SPECIFICATIONS

SPEAKERS: TWO — left channel 5" x 7" right channel 7" diam

PUBLIC ADDRESS OPERATION: Standard

POWER REQUIREMENTS: 110 volts — 60 cycles AC — 100 watts

TAPE SPEEDS: Instantaneous selection, automatic EQ 1 $\frac{7}{8}$ IPS, 3 $\frac{3}{4}$ IPS, 7 $\frac{1}{2}$ IPS

FREQUENCY RESPONSE:
7 $\frac{1}{2}$ IPS—30 - 20,000 cps
40 - 16,000 cps \pm 1.5 DB.
3 $\frac{3}{4}$ IPS—30 - 15,000 cps
40 - 12,000 cps \pm 2 DB.
1 $\frac{7}{8}$ IPS—50 - 10,000 cps \pm 2.5 DB.

SIGNAL TO NOISE RATIO: Better than 60 DB.

FLUTTER & WOW: Less than .15% @ 7 $\frac{1}{2}$ IPS
Less than .23% @ 3 $\frac{3}{4}$ IPS
Less than .35% @ 1 $\frac{7}{8}$ IPS

HARMONIC DISTORTION: Less than 1.5% at 3 DB below rated output

ERASE HEAD: In-line (stacked) $\frac{1}{4}$ track

RECORD HEAD: In-line (stacked) $\frac{1}{4}$ track (.0005 gap)

PLAYBACK HEAD: In-line (stacked) $\frac{1}{4}$ track (.00015 gap)

BIAS FREQUENCY: 70 KC nominal push-pull oscillator

LEVEL INDICATOR: 2 VU Meters, lighted

LEVEL CONTROLS: Individual controls each channel plus master output control

EDITING FACILITIES: Instant stop button

MODE SELECTION: Instantaneous

INPUT IMPEDANCE: 20K OHM for microphones
100K OHM for auxiliary

POWER AMPLIFIER OUTPUT IMPEDANCE: 8 OHMS

PREAMPLIFIER OUTPUT IMPEDANCE: Low impedance emitter follower

OUTPUT LEVEL: 15 watts combined

WEIGHT: 43 pounds

DIMENSIONS: 15 $\frac{1}{2}$ " (W) x 11 $\frac{1}{2}$ " (H) x 17" (D)

COUNTER: Digital type

REEL SIZE: 7" maximum

INPUTS: 2 microphones, 2 auxiliary

OUTPUTS: 2 lines, 2 speakers, 1 stereo head phone

ACCESSORIES

- 2 — professional type, high sensitivity, dynamic microphones (specially balanced for stereophonic recording), with stands
- 2 — recording patchcords
- 1 — speaker extension patchcord for right channel extension speaker
- 1 — 7" empty reel
- 1 — roll splicing tape

AB MONITORING SWITCH — Four separate record/playback amplifiers allow tape to be monitored INSTANTANEOUSLY while recording by an easy to reach panel switch.

PROFESSIONAL HEADS — Concord three head design assures you of maximum recording versatility. Concord three heads are precision-engineered to close tolerances, assuring you of finest performance attainable.

SOUND-ON-SOUND SWITCH — Achieve professional sound-on-sound recordings with the mere flip of a switch. With Sound-On-Sound, you record on one channel, play the recorded material back and record it on a second channel while adding new material. And only with the Concord three heads can you obtain professional sound-on-sound with an unlimited number of generations of re-recordings. The Model 884 has ability to create an echo effect plus a number of other novel sound effects.



PROFESSIONAL OPERATION — Push-button transport controls. Operates from fast forward to rewind without going into stop mode. Push-button cue and edit control. Transport and electronics automatically shuts off at reel end. By-pass jacks for internal speakers. Automatic disengagement of transport mechanisms when power is turned off. Automatic tape lifters. Interlocked recording controls prevent accidental erasure. Permits setting of recording levels without tape moving.

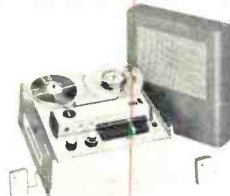
CONCORD

CONCORD ELECTRONICS CORPORATION

809 NORTH CAHUENGA BOULEVARD
• LOS ANGELES 38, CALIFORNIA

THE SIGNATURE OF QUALITY ■ Tape Recorders/Industrial Sound Equipment
Dictation Systems/Communications Devices/Closed Circuit Television

the CONCORD tape recorder line



Model 550-4 Stereo tape recorder with separated speaker. Under \$320.00.



Model 440 Stereo tape recorder with separated speaker. Under \$240.00.



Model 330 Automatic portable tape recorder. Under \$200.00.



Model 220 Transistorized mono tape recorder. Under \$150.00.



Model 104 Compact mono tape recorder. Under \$100.00.

A Re-Recording Filter

H. E. RIEKELS, JR.

A simple filter for general use in the audio system—reducing scratch, hiss, rumble, and such. It is especially valuable for re-recording poor recordings.

THIS FILTER started out as the Fisher 50-F, a unit which seems to have long since disappeared from the Fisher line of high fidelity equipment. We use two such circuits to be included in a stereo system, but the idea remains basically the same.

Fundamentally the unit can be described as a combination low- and high-pass filter. A look at the cut-off curves will show to what uses it may be put. It will be found that this particular type of filter system will do a very fine job for the cost involved.

* West Michigan Sound Co., 1932 Peck St., Muskegon, Mich.

The only part of the unit not readily available is the filter choke. This is obtainable from Fisher Radio Corp. as Part L-515-115-3. Two are required, one for each channel. The capacitors involved should be of the close-tolerance type to keep both channels as alike as possible in cutoff.

Power for the unit may be obtained from any convenient source. The filaments may be wired for either six or twelve volts and the plate voltage should be approximately 20 volts at 5 ma. My unit uses a Gates power supply which powers other parts of my audio system as well as the filter. It is advisable to use an external power source to keep

power transformers away from the chokes in the circuit. The chokes are glued in place with Pliobond cement which gave more working area around the selector switches. The chokes come with standard brackets which were removed.

Some applications of this unit are obvious. The high end will cut record scratch, tape hiss, and FM hiss. The low end will cut rumble, hum, and other low-frequency noise. The cut-off steps on the high end are perhaps extreme. However, for general applications, for which this unit was intended, it does a fair job.

(Continued on page 56)

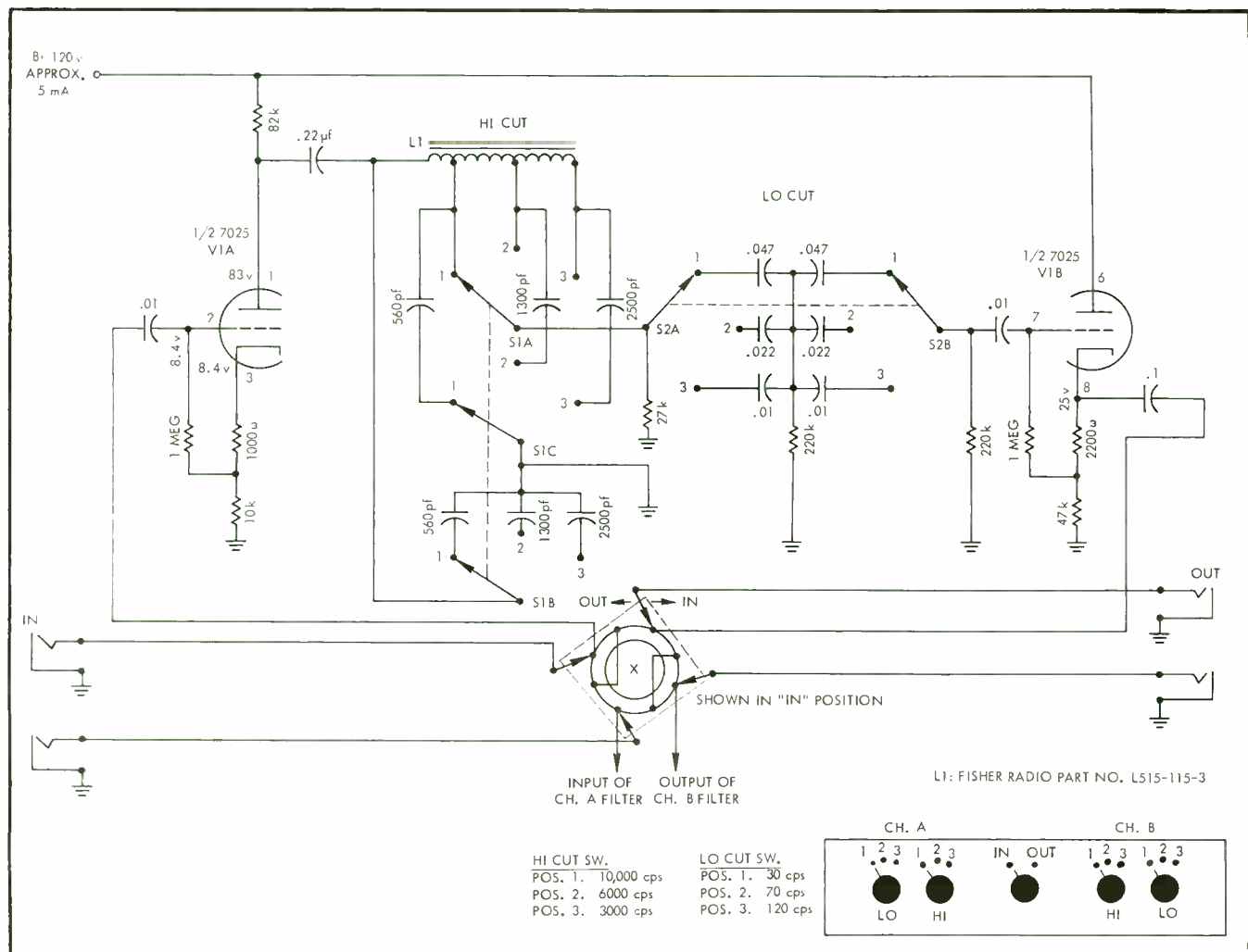


Fig. 1. Schematic of re-recording filter.

Basic Questions and Answers

CHRISTOPHER FAYE*

As we well know, dealers must bear the brunt of a seemingly inexhaustible series of questions concerned with technical and other aspects of high fidelity. As a service to the dealers who suffer this kind of continual harassment, here is a list of basic questions and their answers.

Instructions

This list has been prepared in such a manner as to include an answer for, or the basis for the answer of, many legitimate questions. Any customer who claims that his question is not covered is, of course, lying.

No Sound

Q. My husband, a professional wrestler of some 30-years experience, has always had good hearing. Yet he claims my Klipsch speaker system is absolutely inaudible. Even though he is a very heavy drinker, I don't think this has anything to do with it. What do you suppose is wrong, and what should be done about it?

A. About the only thing I can think of is that your husband's 30 years in the ring has resulted in his ears being bent. Sounds emanating from a folded horn which enter a folded ear tend to double back on themselves and thus become self-canceling. As your husband claims that the system is absolutely inaudible, the fold of his ears must be acoustically perfect. Since this is the case, consideration should be given to their utilization as an auxiliary speaker. Should you decide to take advantage of this fortunate aural accident, the installation of your husband into a corner mounting should be deferred until such time as his alcoholic input has been of sufficient magnitude to preclude a spirit of recalcitrance. In technical terms this is referred to as a properly loaded system.

Excessive Stylus Wear

Q. Last summer while on a Western trip, one of my friends discovered a rattlesnake basking in the heat of his amplifier. After capturing the snake, he was able to train him to serve as a tone arm and is now utilizing his twin fangs as dual styli for binaural playback. Due to the snake's extreme flexibility, my friend claims that he has achieved the ultimate in both vertical and lateral compliance. Unfortunately, ever since the snake mistook FM hiss for some

sort of mating call, he has been quite nervous and irritable. To add to his irascibility, my friend unknowingly rearranged his system in such a way as to introduce severe acoustic feedback. Lately, and I believe as a direct consequence of this rearrangement, he has been lashing out at all the neighbors (the snake, not my friend), and has generally assumed an anti-social attitude. While in no case have the wounds inflicted resulted in anything more serious than permanent spinal paralysis, I believe their occurrence should be minimized due to the unnecessary wear they are causing the styli. Since I am afraid of hurting my friend's feelings, I wonder how I should word the advice that he needs so badly?

A. Don't feedback the arm that bites you.

Might I also suggest that since reptiles removed from their native environment are bound to be moody, consideration should be given to the constrictor family when your friend decides to replace his present equipment. It is true that this might cause compression of certain of his visitors, but this would not result in any unnecessary styli wear.

Salty Sound

Q. Due to a misunderstanding, and during my absence, water softener salt rather than sand was poured into the panels of my "Briggs 3 Way Corner Enclosure." At first, I thought it wouldn't make any difference, but now I notice that the entire unit vibrates violently when reproducing tones lower than 100 cps. The fidelity does not seem to be greatly impaired, but I will not be able to endure my wife's satirical remarks much longer. Whenever we have guests, she calls the enclosure our "Salt Shaker." What should I do?

A. As you will remember from the directions that accompanied your enclosure, 25 pounds of sand was to be poured through an aperture in its top. The mechanical resonant vibration of your bass system is unfortunately only one of the vibrational troubles you are now having. Your other (and more annoying) vibrational problem is that of

your wife's vocal chords. Of course, the insertion of sand does help solve all vibrational problems. Fortunately, you still have the sand; and I believe your wife's needs should be considered first—especially since the proper insertion of sand is a delicate process and should not be attempted upon your valuable speaker system without prior experience.

Tilted Turntable

Q. I understand that a rather macabre European recently exhumed Tchaikovsky (coffin and all), introduced this alarming combination into a cafe where American popularizations of his works were being played, and then utilized the composer's naturally indignant turning over motion to serve as the rotary power for a turntable. While the unit is supposed to be free of all the customary motor-caused turntable problems, I have been told that its unusual height (it must stand on end for playback purposes) makes it difficult to estimate visually whether or not the attached turntable is horizontal. Do you have any idea what should be tried?

A. A spirit level.

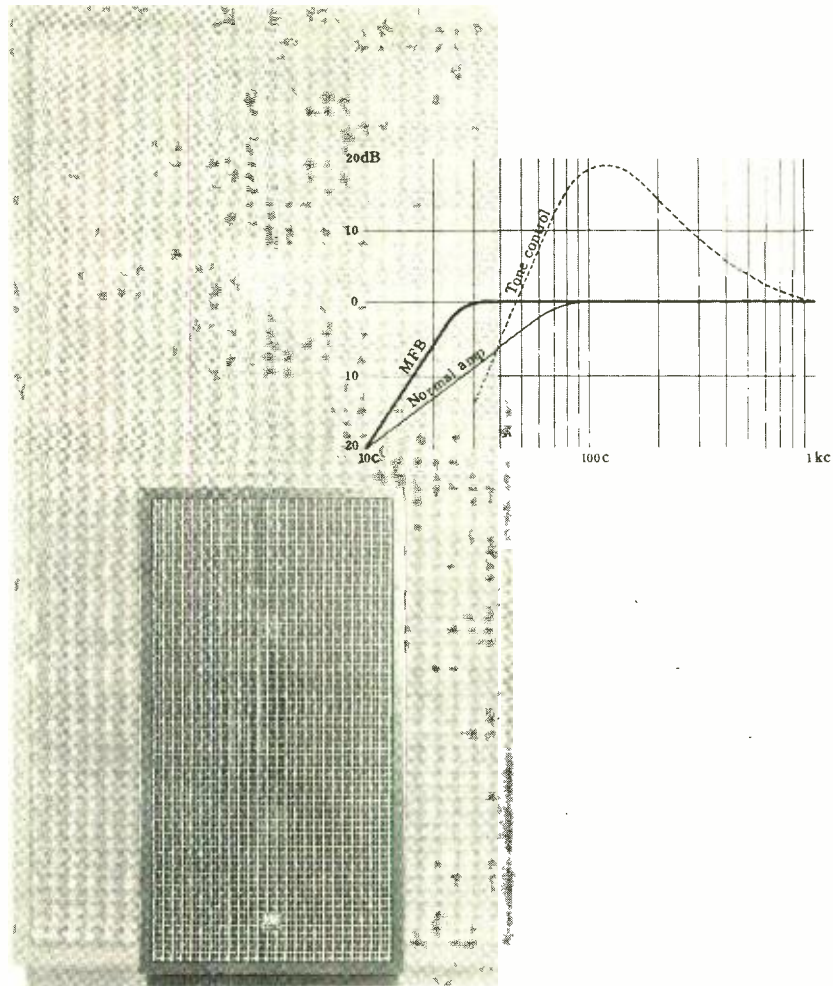
Rotating Stylus

Q. My dentist, a hi-fi fan, says that he has eliminated the troublesome problem of obtaining absolute uniformity of turntable rotation simply by playing his records with an ordinary dentist's diamond-tipped drill. He says that since his drill does the rotating, the record should be kept stationary. He has built a platform on which he clamps the record when he plays them. He seems to have a mad look in his eye when he talks about this, and almost everyone is afraid of him when he gets this way. Should I let him play my records with this equipment, or do you think it might damage them?

A. It makes little difference whether the record is rotated with the stylus motionless or the stylus rotated with the record motionless. I am glad to hear that your dentist believes in protecting his records by using diamond tips. One advantage of the method you are questioning is that it should help in the early discovery of vinylite decay.

(Continued on page 55)

*825 Main, Mankato, Minn.



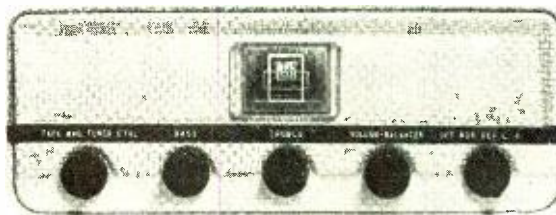
FIRST STEREO AMP WITH MFB DOUBLES ANY SPEAKERS' LOW FREQUENCY RANGE

Now Hi-Fi can be low-cost. Because this new stereo amp makes inexpensive, smaller speakers work just like the big, expensive ones. Here's how:

The LUX SQ63 Stereo Amp is equipped with MFB—or Motional Feedback. It's the world's first stereo amp which incorporates variable cross-over MFB. If a speaker's normal bass response is to 80 cycles per second, MFB will extend it to 40 CPS or less.

For true Hi-Fi, you need bass frequencies in the 20-30 CPS range. But such speakers are big and costly. With MFB in your amplifier, you can choose inexpensive speakers whose normal range is only to 60 CPS. MFB brings it down to the 30 CPS you want.

With the new LUX SQ63 and MFB, you'll save money and get true Hi-Fi from a far more compact system.



C. ITOH & CO., LTD.
(ITOCHU SHOJI KAISHA, LTD.)

HEAD OFFICE: C.P.O. Box 117, Osaka, Japan Cable: "CITOH OSAKA"

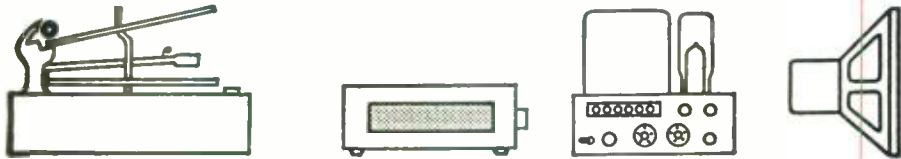
CHICAGO OFFICE: C. ITOH & CO., (AMERICA) INC.

38 South Dearborn St., Chicago 3, Ill. Phone: STate 2-7195/6



LUX CORPORATION Osaka, Japan

EQUIPMENT



PROFILE

McINTOSH FM-STEREO TUNER, MODEL MR67

The McIntosh MR67 is an FM-stereo tuner intended for the very finest of high-fidelity systems, and well qualified for its role.

Unquestionably, it fulfills its design goal visually; it is as elegant in appearance as any unit we know of. (Glance at Fig. 1.) That black upper portion, contrasted against the gold-colored metal of the bottom section, plus the greenish indicators on the left and the red FM MULTIPLEX legend on the right (in the presence of a multiplex signal), all combine to make an impressive facade.

But there's more to the MR67 than meets the eye. Underneath that gold and black exterior beats an FM tuner that is unexcelled by any other tuner we have had occasion to test in recent years. In details, perhaps one brand or another may provide slightly better performance, but in aggregate the MR67 is superb.

One non-performance feature of the MR67 was most impressive: The Panloc mounting system. Fundamentally this mounting system is similar to the professional rack mount shelf, with the added convenience of being able to slide the tuner in and out by pressing two buttons on the front panel. This mounting system makes the tuner easily available for servicing, or whatever. We would like to see this mounting method used on all components.

The performance feature of the MR67 we think most ingenious is the multipath indicator. The upper green bars of the tuning indicator play a dual role: A signal-strength indicator and a multipath indicator. Either of these functions is selectable by means of a slide switch. Of course, being able to locate the antenna at the minimum multipath position is extremely valuable in locations where multipath is a problem, such as in metropolitan areas. It is even more valuable to be able to do this at the tuner by means of a rather simple visual indication.

Circuit Description

The front end of the MR67 is quite straight-forward in concept; tuned input circuit feeding a cascode r.f. amplifier consisting of two triodes, plus a triode oscillator and a triode mixer. The unusual part of this arrangement is that a 6DS4 Nuvistor is used as the "cas" section of the cascode amplifier, with the "code" section being half a 12AT7. The remaining half of the 12AT7 is used as a low-noise mixer and a 6AB4 is used as an oscillator.

Following the front end are four i.f. stages, the last two also acting as limiters. The first three i.f. stages use 6AU6's and the last i.f. is a 6SC6. The latter is also part of the unusually effective muting circuit, in conjunction with a 6AV6. The stage after the i.f. is the discriminator utilizing a pair of 1N542 diodes.

The multiplex decoder is of the peak detector variety. This type of circuit, as used in the MR67, does not require any critical adjustments and is quite reliable. The triode section of a 6U8 is used as a 19-kc amplifier to drive a rather clever circuit utilizing a transistor as a switch to turn the multiplex indicator lamp on or off.

The output of the decoder is supplied to a pair of 6BL8 triode-pentodes, each being a single-ended audio amplifier. Feedback is used to reduce distortion and lower the output impedance.

The signal strength-multipath indicator circuit is rather simple and clever; it consists of a signal-strength indicating circuit (from second i.f. to indicator tube) with the final capacitor switchable—in for signal strength, out for multipath. With that capacitor out of the circuit, the signal to the indicator tube varies when the multipath signals are closer in level to the primary signal and settles down when the strongest signal is located by the antenna position. With that capacitor in the circuit, the variations are removed and only the maximum signal at the particular antenna position is shown. As simple as this system sounds, it does work and is worthy of

nomination for the "Clever Circuit of the Year" award.

A feature of the circuit which doesn't appear on the schematic is the unusually high quality of components and construction practice; unquestionably this feature is of paramount importance in making the intelligent engineering of the circuit available to the user and for a long, long time. In our opinion it is precisely this, quality construction and parts, which make the MR67 a superb product, as contrasted to a well-engineered product.

The Panloc System

Installing the MR67, because of Panloc system, is a simple procedure. A heavy plastic template makes it easy to lay out the cutout and hole locations, and the only tool required is a pencil (that pencil does need a sharp point though). After the cutout is cut out, and the mounting holes drilled, one need only mount the supplied metal shelf, slide in the MR67, and that is all.

The simplicity of this installation is overshadowed in our mind by the sheer accessibility of the unit afterwards. No more groping around in dark and relatively inaccessible places with one hand while trying to balance a heavy piece of equipment with the other. No more scratched up furniture, and resultant ruffled female feathers. That alone is worth the price.

Performance

The tuning "feel" of the MR67 is the most perfect we have experienced; it is neither too easy nor too difficult to tune. The importance of this feature is that it facilitates accurate tuning. For instance, suppose the tuning indicator informs us that we must rotate the tuning knob in order to achieve the exact position where the eye-tube bars are closest. Most of us have experienced the free-wheeling effect of some flywheel energized knobs which make it nearly impossible to stop at the exact place you want to. Probably you have also experienced the other end of the scale, where so much force is required that it is almost impossible to tune sensitively. And there are many gradations in between. In our estimation, the MR67 is just perfect in this respect. And it is important. What good is an accurate electronic tuning indicator if the mechanical tuning arrangement doesn't let you take advantage of it?

The measured performance of the MR67 is quite consistent with the claims of the company; sensitivity 2.4 μ v by the IHF method, total harmonic distortion less than 0.4 per cent, audio frequency response within 0.5 db from 20 to 20,000 cps (both mono and stereo), capture ratio 1.9 db, hum and noise 72 db down (100 per cent modulation), stereo separation of 35 db at 1000 cps (measured from either right to left or left to right), 63 db of quieting between stations with the muting circuit on, drift a maximum of 22 kc, and AM suppression of 41 db.

Of course, as we have noted before, measurements do not necessarily tell the quality of an FM tuner. In fact we have heard a story about a tuner deliberately designed to have excellent statistics. It can be done, and probably is. The McIntosh MR67 is certainly not in that category. Indeed, in over-all performance it seems to be better than the measurements indicate. For instance, the sensitivity figure doesn't appear to be unusual compared to many another we have reported on. Yet, on our standard antenna, we are able to receive 37 stations loud and clear, more than most of the apparently more sensitive units. Obviously, in



Fig. 1. The McIntosh FM-Stereo Tuner, Model MR-67.

The JBL Energizer/Transducer raises audio reproduction to a degree of perfection and precision never before available to the home listener. You hear music re-created in all its detail, rich and splendid, life size, without hum or distortion. The Energizer/Transducer sets new standards for fully controlled bass, completely realistic mid-range, immaculate highs, and transient reproduction without equal.

An Energizer/Transducer has its own source of power: the Energizer. The Energizer is exactly matched to the specific loudspeaker-and-enclosure system in which it is used. Energizer and transducer are engineered as a unit. Given a flat, pure signal from a preamplifier, the Energizer/Transducer delivers sound that is perfectly flat and pure — an exact replica

NOW! ALL ARE AVAILABLE SELF- ENERGIZED

— with exactly the right amount of damping at all frequencies. No other home high fidelity equipment can give you these results.

The JBL Energizer is a stereophonic all-solid-state device of scientific-instrument quality. Devoid of microphonics, generating negligible heat, it can be mounted within an acoustical enclosure. All JBL loudspeaker systems are available as Energizer/Transducers. The JBL loudspeaker system you now own can be made into an Energizer/Transducer. When ordering your matched Energizer, you need only provide your Audio Specialist with the complete model number of your system. Write for your free copy of the new Energizer/Transducer six-page brochure.

**JBL SOLID STATE
ENERGIZER**

Energized C38

Energized C53

Energized Olympus

Energized Paragon

Back view of Energized Olympus

Energized Trimline 54

James B. Lansing Sound, Inc., L.A. 39. ©

this case numbers do not really indicate relative performance.

In any case it is quite clear that the McIntosh is a superb FM-stereo tuner. The sound it produces is excellent, it is staunchly resistant to interfering noises, and it adds virtually no distortion of its own. Combining these factors with its ability to pull in a large number of stations makes the MR67 well worth the consideration of the audiofan. The price is about \$300, including the Panloc equipment. **B-16**

DAVID CLARK STEREO HEADPHONES, MODEL 100

The David Clark Model 100 stereo headphones are designed to overcome some of the problems which have plagued headphones over the years: Specifically they aimed their sights at phone-to-ear coupling without fatigue, attenuation of outside noises, and elimination of high-frequency resonances resulting from the rather small enclosure (formed by tightly coupling the phone to the ear).

Surprisingly, the use of PVC (polyvinyl chloride) for the ear-cushion material seems to have solved two of these problems, and helped with the last. The soft and foamy PVC material makes it easy to couple to the ears tightly for good bass response, and is also rather comfortable for extended listening. We found it so.

As for its ability to attenuate ambient noise, in comparison with several other good headsets, the Clark 100 had a decided edge. We must admit to being somewhat surprised at this result, because we thought some of the other headsets were rather good in this characteristic.

The tendency toward some roughness in the high frequencies is a well-known characteristic of headphone listening. Possibly some of this high-frequency resonance is unavoidable because of the physical size and makeup of the ear cavity in relation to headphones. In any case, we found this tendency at a minimum while listening with the Clark 100's. We are not in a position to know why they should induce less high-frequency resonances than other headphones, but they do.

The Clark phones, require a one milliwatt input to produce 100 db (ref. 0.0002 microbar) at 1000 cps in each phone. The maximum power input to each phone is 1 watt. Distortion is stated to be 0.2 per cent at the 100-phon level over the useful frequency range (10 cps-16,000 cps). We were unable to corroborate this by measurements



Fig. 2. David Clark Stereo Headphones, Model 100.

(our instruments are at fault), however listening tests did indicate an extremely low level of distortion.

The company states the frequency response is within 3 db from 20 to 10,000 cps average real ear response. The company further states that this response is measured subjectively. Frankly, we were intrigued by the rather unusual method of rating these headphones and inquired further. It seems that they have developed a new way of testing headphones which more nearly simulates actual use than the previous "dummy" tests. Sounds fascinating. We will investigate further.

The David Clark Model 100 is a very fine sound reproducer; lows solid, mid-range and highs unusually smooth. On music they were superb. The price is about \$40. **B-17**

EICO IM & HARMONIC DISTORTION METER, MODEL 902

In general, test equipment is available in about two categories—the top-quality laboratory models, and a low-priced line primarily intended for the experimenter. There has never been a thoroughly reliable line of equipment intermediate to these two groups. Now we will agree that laboratory accuracy is not necessary in the measurement of voltages for general servicing applications, since it is rarely necessary to know if the voltage at a plate is 92 or 93 with 1-per-cent accuracy—the serviceman wants, or at least only needs, to know whether it is, say, 7 volts, or about 92 volts. In the realm of distortion measurements, more accuracy is required, since evaluation of an amplifier, for example, can be changed appreciably by a 1-db error in the measurement of output level.

The new EICO 902 IM/Harmonic Distortion Meter and a.c. VTVM falls between the high-priced laboratory equipment and the "economy" lines. Available only in factory-wired form, it is strictly professional in appearance, as shown in Fig. 3, finished in two tones of gray, and measuring 12½ in. wide, 9¼ in. high, and 9½ in. deep. It combines, for the first time to our knowledge, both IM- and harmonic-distortion-measuring facilities in the same instrument. (We have long objected to the need for getting down five or six separate instruments to make a set of measurements.) In addition, there is an IM generator providing 60 and 7000 cps mixed at ratios of either 4:1 or 1:1, as desired, and since metering facilities are required for the distortion measurements, these are made available as a sensitive VTVM, with full-scale ranges in 10-db steps from 10 millivolts to 300 volts, and flat from 10 cps to 100 kc. Input impedance is 2 megohms, shunted by 15 pf.

In the distortion-measuring modes, the input impedance is 500 k ohms, and the minimum input level for these measurements is 0.7 volts. Ranges of measurement extend from 0.3 to 30 per cent on IM and from 0.3 to 100 per cent on harmonic.

Circuit Description

One pair of input terminals is used for all functions. The incoming signal is routed to the appropriate section by the function switch. For distortion measurements, it goes to a level-setting potentiometer consisting of two ganged 500-k potentiometers. In the IM section, the signal is then fed to a cathode (½ of an ECF80) and thence through a high-pass filter to eliminate the 60-cps carrier. The remaining 7000-cps signal is amplified by the pentode section of the ECF80 and fed to a plate-circuit



Fig. 3. The EICO Model 902 IM/Harmonic Distortion Meter and a.c. VTVM.

detector, one section of a 6D10 compactron, and the resulting signal is filtered to remove the 7000 cps. The modulation is then fed to the range switch and thence to the metering circuit which employs the pentode section of another ECF80, a second section of the 6D10, a full-wave diode bridge, and the 200-µa meter.

In the harmonic-measuring section, the signal is amplified by one section of a 12DW7 and fed to a feedback amplifier consisting of a 12BY7 with a Wien-bridge (of which more later) in the feedback circuit. This is the only practical type of circuit for harmonic measurement which will permit operation at any desired frequency, and while filters can be employed to remove the fundamental, they are usually bulky and expensive, and they are limited to a few discrete frequencies. The distortion product remaining is then further amplified by an EF 86, detected by the second section of the 12DW7 and then fed to the metering circuit.

In the VTVM mode, the incoming signal is fed directly to the metering circuit.

The Wien bridge referred to previously consists of three sets of range-selecting resistors with a two-gang variable capacitor as the frequency-determining element. The capacitor is driven through a 6:1 vernier dial which results in a minimum of backlash and provides exceptionally smooth operation.

The IM test signal is furnished by a 6C4 operating as a 7000-cps oscillator, the output being mixed in a resistance network with a well-filtered 60-cps voltage derived from the power transformer secondary, although provision is made by means of two jacks on the front panel for externally furnished low- and high-frequency signals, thus permitting the choice of any two frequencies for the test signal. Output level is controlled by a 600-ohm L pad, giving a signal anywhere from 0 to 5 volts. One switch position connects the metering circuit to measure the 7000-cps signal level, and another permits measurement of the low-frequency signal level, which is adjustable from the front panel. The selection of a 4:1 ratio or a 1:1 ratio is made by a slide switch, and once the relative level between low and high frequencies is adjusted, the ratios can be changed quickly by operating the switch. Another slide switch permits the generator output to be internally terminated or open circuited.

An additional output terminal gives access to the output from the metering circuit so that the distortion products can be observed on an oscilloscope.

We have used this instrument for about four months without changing the calibration setting once. Furthermore, in checks with laboratory instruments of known accuracy, the EICO 902 has been consistently within its specification of 5 per cent accuracy on distortion measurements and 4 per cent in the VTVM function. **B-18**

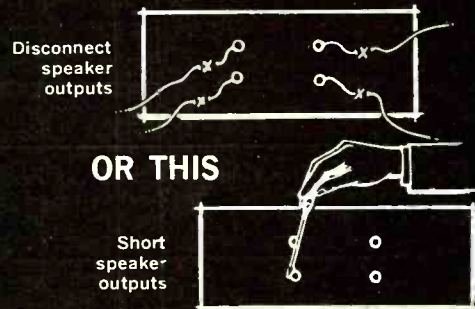
Once in a Lifetime...for a Lifetime

THE NEW ALL SOLID STATE INTEGRATED

PARALAN 730 AMPLIFIER



We DARE YOU to do this



to any solid state amplifier, integrated or not, while the power is on.

You can on the PARALAN and you will not blow any fuses, activate any relays or ruin any expensive silicon-semiconductors . . . why??? Because in the PARALAN THERE ARE NONE . . . THEY ARE NOT NEEDED.

Forget any amplifier you have ever seen or heard about.

Now a completely new concept, the Paralan 730 is ready for you after years of intensive research.

Don't even think about other amplifiers — now or to come; because the Paralan 730 is years ahead of its time, and the 5 Patents Pending will keep the critical factors of the totally new circuit construction exclusively for Paralan and for Paralan owners . . . for years to come.

Yes, entirely new planning, designing and building give Paralan 730 the newest, never before used, all solid state circuit for a major breakthrough in perfection of audio reproduction.

The Paralan 730 sets a high goal for others to shoot at —but not reach—the 5 Patents Pending insure Paralan's leadership.

THE PARALAN CARRIES A 3 YEAR DOUBLE WARRANTY. Paralan Electronics Manufacturing Corporation of New York will repair at no charge for parts and labor any unit returned in accordance with the warranty instructions enclosed with each Paralan unit for a period of THREE YEARS. WE WILL SHIP THE UNIT BACK PREPAID AND INSURED ANYWHERE IN THE CONTINENTAL UNITED STATES.

A 20 DAY MONEY-BACK GUARANTEE IF YOU ARE NOT DELIGHTED AND COMPLETELY SATISFIED.

The almost unbelievable low price of the Paralan 730 (not a kit)
 Shipped Prepaid and Insured **\$249.50**
 Complete with metal enclosure
 Oiled Walnut enclosure (optional) **\$14.90**
 Also available at 50 cycles, 220 volts for export. On special order.

Exclusive
PARALAN
 REPRESENTATIVES
 DEVELOPMENT CORPORATION

Paralan
 ELECTRONIC CORP.
 New York, U.S.A.
 Designers and manufacturers of solid state circuitry.

SPECIFICATIONS LISTED BELOW ARE GUARANTEED

POWER OUTPUT TOTAL BOTH CHANNELS: 100 WATTS INTO 4 OHMS IHF MUSIC RATING.

Most low efficiency speakers are 4 or 8 Ohms; the Paralan 730 will deliver 100 watts total and 75 watts total, respectively, into these low efficiency units. 16 Ohm speakers are high efficiency and require only a few watts to drive them; the 50 watts total for 16 Ohm speaker systems usually exceeds their power requirements. THE PARALAN 730 WILL DRIVE ANY SPEAKER SYSTEM MADE, WITH THE FINEST TRANSIENT RESPONSE AND CLARITY.

100 WATTS into 4 Ohm Speakers
 75 WATTS into 8 Ohm Speakers
 50 WATTS into 16 Ohm Speakers

FREQUENCY RESPONSE
 ±2 db from 5 cps to 100,000 cps at 100 Watts
 ±0.5 db from 20 cps to 20,000 cps at any power up to 100 Watts

TOTAL HARMONIC DISTORTION
 Less than 0.2% at 100 Watts
 Less than 0.7% between 20 cps — 20,000 cps up to 100 Watts

TOTAL INTERMODULATION (IM) DISTORTION
 Less than 0.2% at 100 Watts

HUM AND NOISE
 At least 80 db below 1 volt, high level inputs
 At least 60 db below 10 mv (1,000 cps), Phono Input

TONE CONTROLS
 ±20 db of range at 20 cps to 20,000 cps

INPUT SENSITIVITY FOR 100 WATTS
 2 mv, Magnetic Phono (1,000 cps) RIAA Equalization
 2 mv, Tape Head (400 cps) NAB 7 1/2 ips equalization
 0.3 volt High Level

INPUT IMPEDANCES
 47K Magnetic phono
 220K Tape head
 220K All high level inputs

SIZE
 15 1/4" wide x 6 1/4" high x 8" deep with enclosure

—20 DAY MONEY-BACK GUARANTEE—

Exclusive world-wide representatives

PARAN DEVELOPMENT CORP.

150 Ninth Avenue
 New York, N. Y. 10011

Enclosed is \$249.50

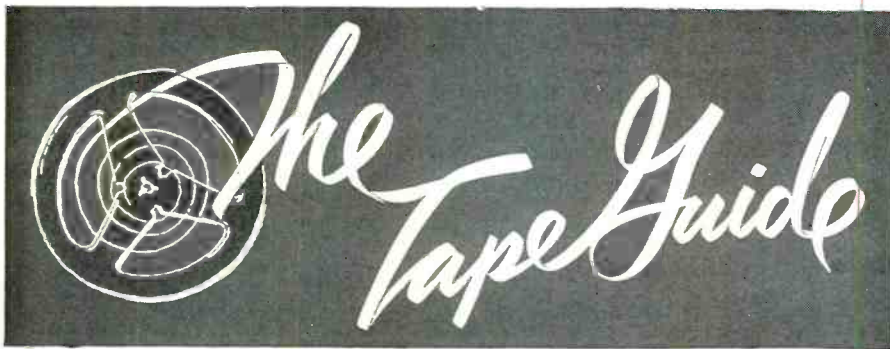
Please send me the Paralan 730. I understand I can return this unit within 20 days for a full refund if not completely satisfied. I further understand that the Paralan 730 carries a double 3 year warranty as stated in this ad.

Put me on your mailing list for future Paralan product literature.

Name _____

Address _____

City _____ Zone _____ State _____ A



The Tape Guide

HERMAN BURSTEIN*

(Note: To facilitate a prompt reply, please enclose a stamped, self-addressed envelope with your question.)

Using Condenser Microphones

Q. I am the proud owner of a pair of U67 condenser microphones and wish to use these in conjunction with a transistorized tape recorder amplifier described in the May 1963 issue of AUDIO. I wonder if it would be possible to use the unpadded output of the condenser microphones into a revised first stage, preferably using a matching transformer such as the UTC-A-20?

A. The U67 is a Neumann microphone, and the importer informed me that the U67 has a sensitivity rating of -35 dbm, which means it probably has enough voltage output to be fed directly in the microphone input of the tape amplifier described in the May issue of AUDIO. However, the U67 is designed to be loaded by 1000 ohms or more. The input impedance of the above amplifier is 10,000 ohms, so that you are wasting 20 db of signal-to-noise ratio by connecting the microphone directly. The best thing would be to use a microphone transformer with a primary impedance of 1000 ohms and a secondary impedance of 10,000 ohms.

"Typically European"

Q. I often read that some piece of equipment is "typically European," especially tape recorders. Once I read that an operating manual was "poorly written by American standards." I would like to know what the difference is.

A. By "typically European" I think three things are principally meant so far as tape recorders are concerned: 1. The connectors (plugs and jacks) are of European rather than American type. 2. Equalization at 7.5 ips is based on the European CCIR curve rather than the United States NAB curve. The NAB curve requires more base boost in playback and more treble boost in recording, resulting in higher signal-to-noise ratio but also in greater accentuation of playback hum and greater possibility of distortion in recording. A number of experts believe that the CCIR curve is preferable at 7.5 ips, but the NAB curve is the accepted standard in America. 3. European tape machines tend to use symbols rather than words to designate the functions of the various controls.

Flutter and Wow

Q. When measuring the over-all response of my tape decks the output, as read on a VTVM, constantly varies, sometimes by as

much as 1 db. Furthermore, a steady tone recorded on the tape and then played back seems to have a slight unsteadiness about it. With the audio generator connected directly to the VTVM, the pointer of the latter is rock steady. Is this normal for a tape machine or is it something that should be rectified?

A. The amplitude variation you describe is fairly normal. It is due partly to irregularities in the tape's magnetic coating and partly to imperfect contact between the tape and the tape head. The higher the frequency, the greater is the variation apt to be. The unsteadiness you refer to—unsteadiness of pitch rather than of amplitude—is the result of wow and flutter. Only the finest, most expensive tape machines approach the rock steadiness of the original signal.

Mismatch?

Q. When I play my tape recorder from the tape head output into the tape head input of my receiver, I have to turn the volume all the way up, and hum occurs. I think there is an impedance mismatch, so that I lose gain. Can you help me correct this? When feeding my phono cartridge into the receiver, I get plenty of volume.

A. Following are some possible causes of your difficulty:

1. The playback head may be defective.
2. Something may be preventing the tape from making good contact with the head.
3. The magnetic coating (dull side) of the tape may be away from the head instead of against it.
4. Perhaps you have the tape head connected to the receiver's "tape recorder" jack instead of its "tape head" jack.
5. There may be something wrong with the receiver's switching facilities. Since you are getting good results on phono, see what happens when you connect the tape head to the magnetic phono input.

Planned Tube Replacement

Q. Since tubes are so cheap, I've often wondered why they are not replaced entirely every five or six years. A leading TV man in town says he's never heard of such a thing, although he replaces the oil in his car regularly.

A. Not a bad idea, particularly for the rectifier tube and the power output tube (or tubes), which could profitably be replaced about once a year. The other tubes might be replaced about every two years. Some tubes, however, loaf in the circuits in which they are used, and can give good service for substantially more than two years. Incidentally, some companies do have systematic replacement policies for certain kinds of electronic or electrical equipment.

Monophonic Difficulty

Q. I recently purchased a tape deck. The problem is that I wish to record four tracks monophonically, but have run into trouble. The controls for play and record are level controls, not the on-off type. There is a control for recording, playback, and a sound-on-sound control Play 1, Record 2. I have been using this control to record the second track in the same direction. As can be seen, I have no trouble recording four tracks monophonically, but in playback I always hear Track 1. The amplifier I am using is the type where tape playback is heard by using the tape-monitor switch. I have no means of controlling the playback from the playback amplifier. With the level control turned all the way down, Track 1 is still slightly audible. Short of pulling the playback lead from Channel 1, is there anything I can do? Is it possible to ground out the audio at the playback level control? Of course, by putting my amplifier in the Channel B mode, I will get just Track 2 but only on one speaker.

A. I am afraid that your description of the controls available in your tape electronics, the controls available in your audio amplifier, and the manner in which the tape electronics are connected to the audio amplifier are not completely clear to me. Your letter implies that you are able to play Track 2 through both channels of your audio amplifier and thus through both speakers. This would mean that you hear Track 1 superimposed on Track 2. The cause might be crosstalk in your tape head or in the tape electronics rather than level controls that fail to go to zero. Or the cause might be crosstalk in your audio amplifier, in which case you would want to do something about the level controls in the tape electronics. You can install a switch that grounds the hot lead of the volume control.

High-Pitched Tone

Q. I record from a Dynatuner into a Dyna PAS-2 preamp. The tape output of the PAS-2 feeds an EICO tape recorder, which can record and play simultaneously. The output of the EICO goes to the tape input jack of the PAS-2. By using the tape-monitor switch of the PAS-2, I can listen to either the original signal from the tuner or the playback signal from the tape recorder. The preamp is connected to an EICO HF89 power amplifier. When simultaneously recording and playing back, I put the tape-monitor switch in tape position, so that I hear the tape playback through the power amplifier and loudspeakers. No problem so far. However, if I disconnect the power amplifier and connect the preamp output to Koss SP-3 headphones via T-1 transformer, the recording level drops substantially and there is a high-pitched moderately loud tone.

A. Apparently the transformer and headphones are loading the preamp in an adverse manner. Have you reversed the connections to the headphone transformer? This would place a very heavy load on the preamp.

I have spoken about your problem with Joseph Giovanelli (who conducts the Audio-Clinic in this magazine), and he states: "You are on the right track when you suggest that the transformer is heavily loading the Dyna preamp. This preamp must look into a load of 0.5 meg. The load your correspondent is using is indicative, and this probably is tuned by some element in the preamp circuit, causing the preamp to oscillate. . . . The Dyna preamp should be isolated from the headphone transformer via a cathode follower or a stage of gain."

AE

* 280 Twin Lane E., Wantagh, N. Y.

Now... a new EASTMAN Sound Recording Tape!



LISTEN... New "R"-type Binder Assures Long-Term Sound Clarity...

AT LAST, a much superior binder—one that provides a super-smooth, tough, homogeneous oxide layer which dramatically suppresses tape noise and intermodulation distortion! You'll notice this in the new sound clarity.

At the same time, extremely abrasion-resistant, it prevents oxide build-up on the recording head, assures long-term excellence of performance.

Equally important are outstanding magnetic characteristics which make possible two superlative tapes of widely different performance characteristics: a superb low-noise, high-output tape and an extra low print-through tape.

STRONGER: DUROL support material, a specially prepared form of cellulose triacetate, is a good 40% stronger. *When it breaks... it breaks clean.*

For details, see your electronic supplier or write:
Magnetic Product Sales

EASTMAN KODAK COMPANY
Rochester, N.Y. 14650

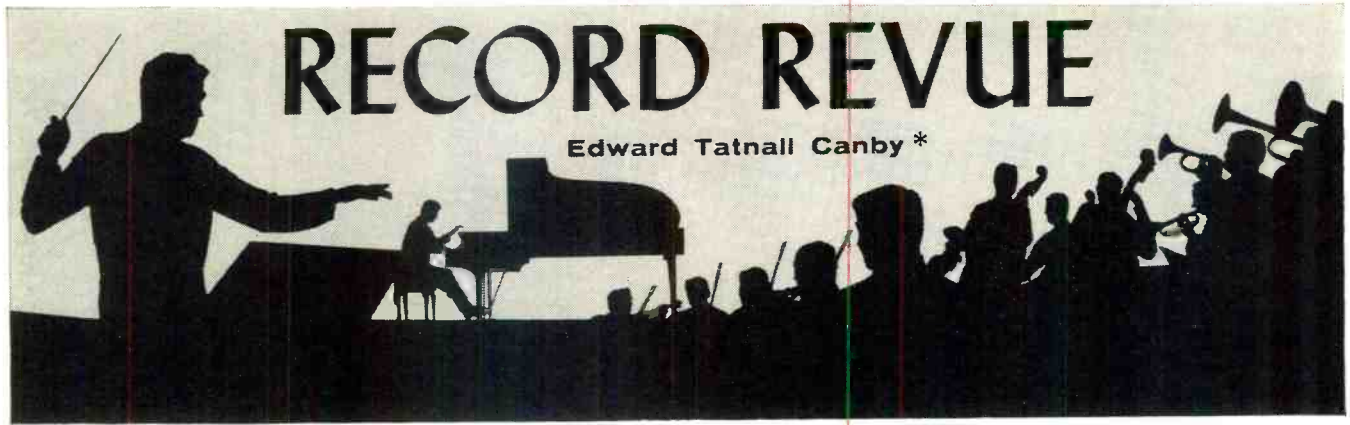
MORE CONVENIENT: A continuously repeated permanent legend on the back of the tape offers a means of indexing.

Ask for EASTMAN Tapes at leading electronic supply houses: Type A303, a superior low-print tape with output comparable to a fine general-purpose tape... also Type A304, a high-output tape with low print-through.

©Eastman Kodak Company, MCMLXI.



For fast threading and extra convenience—the unique, handy, Thread-Easy Reel with indexing scale and built-in splicing jig.



RECORD REVUE

Edward Tatnall Canby *

TODAY

Charles Ives: Pieces for Chamber Orchestra; Songs. Boston Chamber Ensemble, Farberman; Corrine Curry, sopr. Luise Vosgerchian, pf.

Cambridge CRS 1804 stereo

Old Charles Ives, the independent-minded modernist of the turn of the century who lived in Danbury, Conn. and ran himself a successful insurance business while turning out quantities of music which was exactly the way he wanted it, and hence remained virtually unplayed, is now getting to be a musical national hero. There are plenty of aesthetes and would-be bandwagon-climbers who speak of him in hushed breaths; for Charles Ives now can do no wrong, where once he did no right. Silly, isn't it.

Well, he did both. He was a dad-blasted eccentric, but a very American one. He had a classical education, such as they gave in those days (Yale), but he loved old fashioned gospel hymns, band music, Salvation Army serenades and, indeed, any music that came his way in daily life. Most of it got mixed into his violently "modern" experiments—hence the slightly chaotic mixture we find today, brilliantly original, skillfully scored and textured but often aesthetically disorganized.

Not all of it. This record, I think, gives a better idea of the old man's real power than anything I've yet heard anywhere. My respect for him has decidedly increased after listening to it. "Chamber music," so-called, always tends to bring out the more thoughtful abilities of today's composers—for better or worse. Here, it is for the better, for the best.

It's hard to be scared of this rugged American any more today, and if you have been frightened off by too many highbrow lip-service-payers, remember that old Ives was very much himself and always will be, not one bit ashamed of being an insurance executive though perhaps occasionally embittered by having to write his music for an audience of zero listeners. Who wouldn't be. You can trust him and enjoy him too, straight from this record.

Antal Dorati: Symphony (1957); Nocturne and Capriccio for Oboe and String Quartet (1926). Minneapolis Symphony, Dorati; Allegri String Quartet, Roger Lord, ob.

Mercury SR 90248 stereo

This one should make eyes pop among those who are reasonably versed in the classical record field. Antal Dorati, *the composer*. He's well enough known as a conductor, but . . . A good many prominent musicians have similarly been composers on the side, unpublicized beyond a relatively small musical inner circle. Artur Schnabel, the famous pianist, was one. Goddard Lieberson, president of Columbia Records, is still another. Their music, generally, is not of a popular sort and so seems to contradict the public image of the person in question—Schnabel, the great Beethoven player, wrote very dissonant "modern" stuff that would have appalled his Beethoven audiences.

Dorati, a good Hungarian is a good follower of the only two great modern Hungarians, Kodály and, of course, Bartók. His Symphony is astonishingly complex and outstandingly effective in terms of its very involved scoring (a facsimile score was sent to some of us to go with this record). After all, Dorati hasn't been operating symphony orchestras all these years for nothing. The tradition of complexity, though, is also out of Bartók, whose scores are miracles of precise musical engineering. As in Bartók's music, the Dorati detailwork in terms of exact directions, profusely complicated special effects, must be seen—and heard—to be believed.

For the ear, the music is easily digestible. The mood is dissonantly modern but with much of the neo-Romantic in it, as in Bartók. Sometimes almost too Bartók, though skillfully so. A bit of good Hindemith mixed in, too; Dorati isn't a one-man imitator and his music isn't slavish nor unoriginal. It is harder, less deeply human than Bartók's, at least on scant hearing.

The much earlier oboe work is still close to the late-impressionist school, dissonant but with a gorgeous sense of mood, and of the abilities for color and atmosphere in the strings-and-oboe combination. A bit of leftover Schoenbergian "Transfigured Night" in this music. Lovely sounds.

Three Contemporary Canadian Composers (Adaskin, Papineau-Couture, Somers). CBS Orchestra, Susskind.

Columbia MS 6521 stereo

These recordings of contemporary music are I suppose highly worthy ventures, but I find them pretty painful in many a way. It's not that the music is always at fault. Some of it is excellent. Some is, as I hear it, pretty dismal, and even more is far beyond the average listener, and deliberately so intended.

What matters is that in the name of culture, or something, these works are "given a recording" the way contemporary music is "given a performance," not with an audience in mind but as a sort of abstraction, a mumbo-jumbo. (Also, of course, to help get other performances, in the nature of publicity.) You can tell this because nine out of ten records, this one included, contain music of such wildly different sorts that virtually nobody in his right mind would enjoy each of them, and so everybody who puts cash on the line loses a hunk of it.

Of course, nobody buys these things, I suspect, except (a) libraries, music schools (a good idea, of course), (b) the composers and their friends. They aren't really intended for listening as such. Otherwise, some attempt to make an artistic unity out of the recording would surely be made—as it is in every other sort of recording.

Canadian? Anybody could guess that merely being Canadian isn't going to ensure artistic unity, any more than being French or Congolese or what-have-you! It's a free country. They compose as they please. Thus if you like one of these, you're sure to dislike the other two, or vice versa.

Harry Somers writes an expertly scored Suite for Harp and Chamber Orchestra, more pretentious than its somewhat diffusely mod-

ern content warrants—a Shostakovich-like technique with brilliant harp writing, a proper touch of neo-Romanticism and the expected nervous, American jitters in the fast movements. Murray Adaskin, an older man (b. 1906) writes a charmingly short and quite old-fashioned little Serenade Concertante for small orchestra. And the French representative, Jean Papineau-Couture, contributes a *very* pretentious big work. "Piece Concertante No. 1," with piano solo, the whole of which, half way through, gets played backwards right out to the beginning. For my ear, you may have both ends of it.

Nope, I'm neither against dissonance nor Canada! Far from either one. I just don't like pretentiousness in any music, and I don't like unpalatable mixtures in the name of modernity, even with good ingredients.

Bartok: Divertimento for String Orch. Music for Strings, Percussion and Celesta. Cologne Philharmonic, Gunter Wand.

Counterpoint/Esoteric 5607 stereo

Not only two excellent Bartok performances, intense but not overly high-powered as are some versions, but this gorgeous recording also makes a most happy choice of acoustical background, extremely important in Bartok. Just live enough to sound real, have presence; but dead enough, too, for excellent detailwork, with not a note of the extraordinary Bartokian instrumentation lost in the blur.

The Divertimento, perhaps more gracious merely because it is for strings alone, is given a fine stereo spread with lots of interesting detail and a good ensemble effect, the recording clean as a whistle. The smaller, more violent Music for Strings, Percussion and Celesta is more intimate—it has often been wrongly placed in a big, sloppy reverberation—and the fantastic piano, drum and solo string sounds come through each with its color perfectly rendered.

Both of these were once thought dreadfully "modern"—if you have any sense you'll forget all about that and just listen to some of the most amazing sound ever composed into music. Top music, too.

(Oh yeah—forgot to say: Counterpoint/Esoteric is Everest's new classical label, fancy-grade. Everest bought up the old Counterpoint, which had originally been called Esoteric.)

William Dawson: Negro Folk Symphony (1932, revised.) American Symphony Orch., Stokowski.

Decca DL 710077 stereo

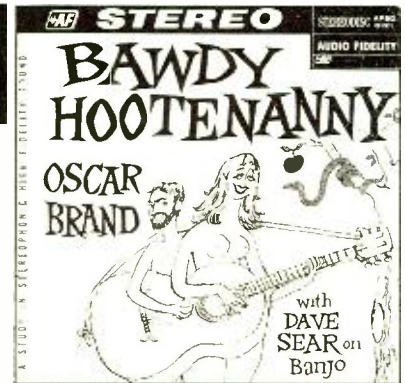
Ever one to seize the moment, Leopold Stokowski took on a timely show-piece in staging here a somewhat modified version of this Negro symphony, which he first introduced with considerable éclat back in 1934. Timely enough—but the music, alas, is dated and rather embarrassingly so, I'd say.

The trouble is that this work, hailed in its time as a pioneer symphonic effort by a Negro, reappears in a world where the Negro composer has moved a long way forward into sophistication, where in truth a composer's color no longer need be of any moment in view of more important matters—musical

NEW Record Entertainment!

AF AUDIO FIDELITY RECORDS

This collection of folk songs is as valid a manifestation of America's culture as any other. They've been sung around the country for hundreds of years while the nation was being built, and some of them date back hundreds of years before then. A few of the songs are to be found in a famous collection in the British Museum entitled "Pills to Purge Melancholy—a collection of old songs," dated 1607.



BAWDY HOOTENANNY, Oscar Brand—Cindy, Winnipeg Whore, Erie Canal, Money Rolls In, Charlotte The Harlot, Chicago, Gathering Of The Clans, Susie, AFLP 2121 / AFSD 6121



FOREIGN FILM FESTIVAL, Jo Basile, Accordion & Orch.—La Strada Theme, Never On Sunday, La Dolce Vita, Mondo Cane: More, Rififi Theme, 8½. AFLP2124/AFSD6124



BERMUDA IS PARADISE, Ross Talbot & Orch.—Sunset In Bermuda, Bermuda Is Paradise, Scotch and Soda, Calypso Cha Cha Cha, Castro Twist, etc. AFLP2125/AFSD6125



SOUND EFFECTS: Daytona Speedway—Sports Cars—Roaring, whizzing, explosive sounds and excitement of a day at the Daytona Races! DFM3031/DFS7031



SOUNDS FROM RIKERS ISLAND, Elmo Hope Ensemble—One For Joe, Ecstasy, Night In Tunisia, It Shouldn't Happen To A Dream, Kevin, Groovin' High. AFLP 2119 / AFSD 6119



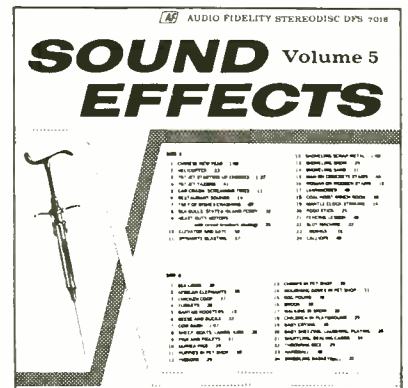
NOW HEAR THIS! Bill Barron—Ted Curson & Orch.—Around the World In 80 Days, Hurdy Gurdy, Big Bill, Jes Swingin', In A Monastery Garden, etc. AFLP2123/AFSD6123



AT THE SANTA TECLA, Romano Mussolini & Orch.—Blues at Santa Tecla, How High the Moon, Angel Eyes, Come Out, Ow! Honeysuckle Rose, Lover Man. AFLP2126/AFSD6126



SAHDA, Naif Agby & Orch.—Music of the Middle East. Recorded in Lebanon. Sahda, Kadwiyeh, Am-El-Kahla, Wardy Had-El-Bait, Baalbakiyeh, etc. AFLP2122/AFSD6122



SOUND EFFECTS, Volume 5—Fireworks display, Astronaut Cooper's Broadway Parade, Police Cars, Tobacco auctioneer, Model airplanes, Motorcycles. DFM 3016 / DFS7016



Wonderful BELGIAN BAND ORGAN, Vol. 2
When You Wore A Tulip, Down Yonder, Smiles, Skaters' Waltz, etc. AFLP 2118/AFSD 6118

RECORDS OF SPECIAL INTEREST TO COLLECTORS.

THE INVESTIGATOR, John Drainie—A political satire. #6834

**JOHN BARRYMORE READS SHAKESPEARE, Vol. 1—LPA2280
Vol. 2—LPA2281**
Hamlet, Twelfth Night, Richard III, Macbeth.

**AR2330
HELEN MORGAN SINGS** Songs She Made Famous Can't Help Lovin' That Man, Body and Soul, Something To Remember You By, Bill, Don't Ever Leave Me, Why Was I Born? Mean To Me, The Little Things You Used To Do, More Than You Know, Sand In My Shoes, When He Comes Home To Me, I See Two Lovers, Winter Over Night, What Wouldn't I Do For That Man.

Please write for FREE complete record catalog.

\$4.98—MONO or STEREO / AVAILABLE AT LOCAL RECORD SHOPS OR WRITE TO:

AUDIO FIDELITY RECORDS 770 ELEVENTH AVENUE, NEW YORK 19, N.Y.



gifts and a thorough education. Plenty of Negro young people have both.

In 1932 the piece may have seemed significant. Now, it is touchingly demeaning, so to speak. For it is sad that music so full of skillful but outdated clichés, so dependent on the white man's idiom (European), from Dvorak (of course) through Debussy, should still be presented as a Negro triumph. With all due respect to a sincere musician, I must note that Mr. Dawson's symphony, though harmonized and scored with professional and even dramatic know-how, is still, in the balance of international composition, no more than a blown-up pastiche of neo-Romantic ideas organized in marginal fashion and presented on much too big a canvas for their own good.

There are, you see, two sides to the racial coin of today. If we are to eliminate skin color as a criterion for judgments of a man's worth, then we must apply our philosophy without reservations—for nothing could be more damning than to say, "pretty good. con-

sidering that he's a Negro." I think Mr. Stokowski should have thought twice before he re-kindled any such ideas among our symphonic listeners.

(Well—perhaps Stokowski genuinely thinks this work is a fine one, "irregardless." If so, he's entitled to his opinion as conductor of the excellent American Symphony, his own latest creation. I'm entitled to mine, too.)

Six Centuries of the Viola. Milton Thomas; Georgia Akst, piano.

Counterpoint/Esoteric 5605 stereo

A chicken-title, this, though the playing is splendid and the recorded sound excellent. Six centuries, my eye! Five of them are whisked through in six minutes and a bit. The whole second side is contemporary—good contemporary and good listening. Somebody didn't dare say so.

The five centuries consist of three little Italian dances played by unaccompanied viola, all of them "arranged"—though a 14th cen-

tury one is said to have been written for the viola. An earlier ancestor, maybe. The 14th century *Saltarello*, the performer may be surprised to hear, is already on records in a more authentic form, I think via the Belgian Pro Musica.

Then comes a set of viola and piano pieces by Schumann, quite lovely if not earthshaking (and why should they be that?). Nicely played. And so, on into the two biggish present-day works, both very interesting and highly listenable. The first is a "12-tone" piece by Henri Lazarof, very expressive and quite passionate in feeling. 12-tone or no, and as far as this ear says, quite beautifully written. Then a solemn and—for him—unusually dissonant piece by Benjamin Britten, "Lachrymae," subtitled "Reflections on a song of John Dowland." The song, by the prince of Elizabethan song composers, appears muttering in the bass and in many a fragmentation, then at the very end is offhandedly played straight, in its original harmonies. Nice—reminds me of the Alban Berg Violin Concerto, which ends up with a Bach chorale, part of which had served as a section of the 12-tone row upon which the music is based. Also of Hindemith's pleasing viola piece with orchestra, based on folk tunes "Der Schwanendreher," reviewed here recently.

Thomas, by the way, is a splendid violist, one of those who play a tune and with a smooth, non-scratchy tone. Some violists (notably Hindemith himself) play like a cold in the head and seem proud of it.

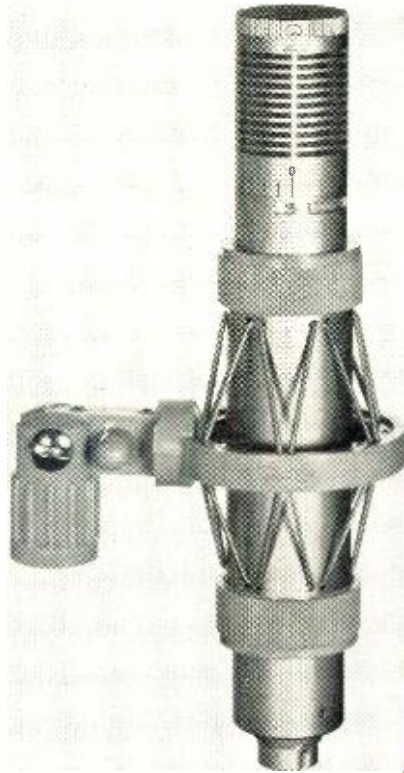
Schoeps Microphones Selected For Mitch Miller Tour

The success of Mitch Miller's recent national tour was the result of many factors... not the least of which was the experience and know-how of sound director Adjutor "Pappy" Theroux. Adjutor, knowing how essential *true* sound is, insisted that SCHOEPS Condenser Microphones be an integral part of the sound system at all performances. While every auditorium on the tour's circuit had its own sound system completely set up, perfectionist Theroux replaced each with his own, using SCHOEPS Microphones as the source.



Why Pappy chose Schoeps

"My insistence on SCHOEPS mikes was not for their sound quality alone," he explained. Obviously it was necessary to select a system which would pick up all the varied voices of the Sing Along Group with equal smoothness. But there was also the problem of setting up for every performance in a different hall. Mike positions had to be chosen so rapidly that normally, feedback would have been inevitable. "But," emphasized Theroux, "not with SCHOEPS microphones." Unlike most microphone systems, SCHOEPS' extraordinarily smooth response did not reinforce peaks and resonances that exist in all auditoriums; therefore they insured a higher sound level. The high front to back ratio (over 26 db) assured pickup of the music from the stage while rejecting the sounds of the loudspeakers and audience. "Because the SCHOEPS maintain this discrimination



down in the low frequencies," continued Adjutor, "I knew that the system would not produce reverberant boom."

Drawing on his years of experience in location recording, "Pappy" attacked the problem of setting up the soloist's mike. "I knew this mike's output would overbalance the stage mikes if not attenuated right at the capsule. This was easily solved because the SCHOEPS microphone has a switchable attenuator between the capsule and the preamp which prevents overload of preamp or mixer."

Adjutor Theroux selected SCHOEPS Microphones because he listened and heard the difference. SCHOEPS' direct American representatives are: International Electroacoustics, Inc., 333 Avenue of the Americas, New York, New York 10014. WAtkins 9-8364

JUGS, RAGS, BRAVOS

Jim Kweskin and The Jug Band.

Vanguard VSD 2158 stereo

One after another, the various mellow styles of pops and folk music in our recent past are being taken up by the unlikely new young folk artists in beards, mustaches, blue jeans and black glasses who are so immensely active these days in and around our big cities. Blue grass was a recent fashion note in the area—now, a bit further back and cornier, out of country music, comes—jug. Yep, jug. That's the generic name, though you'll hear kazoos, washboards and other dizzy instruments included in the pot-pourri of sound, along with the vocals and the banjos that are so characteristic (in the original) of...

Well, darn it, the jug band stuff in its new guise really isn't all jug, in the old style; for like most new folk music it enthusiastically tosses in anything else that appeals to the performers' sense of artistic unity. The banjos here have a rag-time sound to them, out of the city, or even a bit of Gershwin, early-type. So what! Throw it in and pile on the harmonica too. And the jug, too—some old bottle or another into which the performer makes weird gulping sounds that come out even weirder gulping noises. Like an elephant swallowing mineral oil.

The singers? Those who play also sing, of course. One of the strangest aspects of this ardent new school of performance is that, though most of the boys who do the singing are highly intelligent and nominally well educated (with a couple of years of college), they invariably sound like a batch of cross-eyed half-wits fresh out of some primeval backwoods, untouched by civilization! It'll maybe shock you at first, and it *is* an affectation, but in the long run the style is as musical as any.

I'd guess it's a reasonably honest reaction to a world which these people find entirely too slick and professional. Some of us elders occasionally agree with them.

Blues, Rags and Hollers. "Spider" John Koerner, Dave "Snaker" Ray, Tony "Little Sun" Glover.

Elektra EKL 240 mono

More of the young fellows, these from Elektra via E. D. Nunn's Audiophile label out in Wisconsin. Blue jeans, of course, and lots of hair on the head, but in this case no

beards nor mustaches. Just three obviously bright and obviously musical souls, ranging from 19 to 23, one married to a student of classical ballet, one whose ambition is to be a doctor—which means, of course, college, medical school and internship sometime in the next dozen years. . . . That's the way they come, these folk singers.

All three of these have an excellent and precise sense of style; all build their own stylings upon the work of the older generation of real "native" singers, the ones who didn't aspire to be doctors, etc.

As always, these boys sound superficially like so many inspired bums, but as always, you must not be misled. Again—it's a musically sophisticated and emotionally very human reaction against too much witless, hard-toned musical commercialism, both in the pops and the classical areas. For with a few years' worth of musical training in the conventional fashion any one of these fellows might have found himself a not-very-good classical singer or performer, lost in the big rat race! Better this—much, much better.

Curtain Up! Bravos in Brass. (Band music). Eastman Wind Ensemble, Fennell.
Mercury SR 90360 stereo

If quantity released is any indicator, the Fennell band music must sell like hot cakes. Can't possibly mention all the releases—this one mixes Sousas and other less known but solid marches in a typical pot-pourri—the style as always crisp, high-powered, virtuosic and, sometimes, a bit on the dry side. Somehow I always feel they do Sousa the best—but this is surely because Sousa is the best and thus sounds it! Good enough reason.

NOISES, SMELLS

Curtain Up! Heroic Overtures (Wm. Tell, Orpheus in the Underworld, Poet and Peasoant, La Patrie). Detroit Symphony, Paray.

Mercury SR 90359 stereo

A brace of mellow overtures from mid-19th century France (not counting the Rossini, which is if not French, decidedly Latin). They are played with a chromish and glittering finish, splendid in the showier parts, rather too hard and unyielding for the music in the more mulling sections. Some listeners will be just as glad; but others will feel that if you're going to melt, you might as well melt with thoroughness. Not Paray.

Songs From the Garden of Love (perfumed recording). H. Jefferson-Jones, Playboys and Orch.

Cook 1281 stereo

Emory Cook is at it again. His last leg-puller (?) boasted a whacky dialog between two computers (?) and a marathon telephone talk about buying a funeral, ostensibly real though how it could be is worth another(?). Now, the zany recordman has a further and even more questionable gimmick (?), the permanently perfumed record. The casbah scent in this one is "encapsulated" in the record material or so we are told by the Cook Press (?) Department, which says it goes in with the Microfusion powder and oozes out of the pores, forever and ever and especially when the disc is in play. Poddon me while I take a sneeze.

Music? It ain't music for my ear, but it is hi fi. I mean sterio. Compatible Super Stereo (?).

I.S. The disc does smell faintly. It has for two days already. So far so good. Others are available with other perfumes. Also with other contents. I prefer the perfume.

The Sea at Castle Hill. The Alexander Hamilton of the Hudson River Day Line.
Droll Yankee DY 15 mono

Ocean on one side, an old-fashioned side-wheel Hudson River steamer on the other. This small outfit in Providence, R. I. seems to be running on a track parallel to Emory

Cook's, if with a different train of cars, generally speaking.

I'd say Emory Cook has the better know-how. His ocean record—a whole LP side of straight ocean, broken only by one dog that barks and barks and barks, off in the distance, is a good deal more impressive than this LP side of the same sounds. Why? Well, Damn Yankee—poddon me, I mean Droll Yankee—puts mikes so close to the water that you hear the dribblings and sloshings mainly about six inches from your nose. Slurp slurp. Sort of out of focus. And there are not-very-gainly cuts from one scene to another, including occasional screeches from a batch of gulls, plus a fog horn. Fine idea—not very good recording drama.

The other side depicts a long day in the huge Hudson River boat, complete with a very large tape mileage of slap, slap, slap, slap, slap, slap, slap, slap . . . the big wheels going 'round. Some nice scenes with people talking, as they work on the boat or

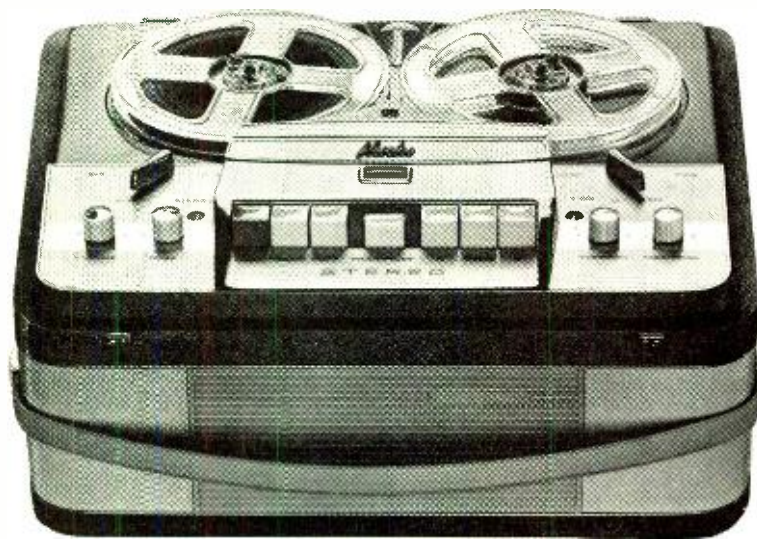
head for the gangway to shore, etc. But again, dramatically not always convincing. It isn't easy to convince, of course, in terms of sheer sound minus visual impact. Who could do better? Maybe Emory Cook Or O. Winston ("Railroad") Link?

Twilight of Steam, Vol. 1.
Mobile Fidelity MF 13 stereo

This is a tie-in. Book by the same title, written and photographed by a youngster just out of school, Ron Ziel, and a beautiful job too, if somewhat of a vast helter-skelter in its organization. He travelled many thousands of miles, he took all the excellent photos, and he is real passionate and genuinely sincere in his distress over the scrapping of the great giants of steam in such a precipitate haste these last few years. His facts are voluminous, his writing easy to read and convincing . . . but that's the book. "The

(Continued on page 63)

all signal no noise



The most noise-free recordings you have ever heard are to be made on the new all-transistorized Norelco Continental '401' Stereo Tape Recorder, the only recorder using the newly developed AC 107 transistors in its two preamplifiers. The only transistor specifically designed for magnetic tape head preamplifiers, the AC 107 utilizes specially purified germanium to achieve the extraordinary low noise figure of 3 db, measured over the entire audio band (rather than the usual single frequency). This noise figure remains stable over large collector-emitter voltage swings and despite large variations in source resistance.

Hear the new transistorized Norelco Continental '401' • 4-track stereo/mono record and playback • 4 speeds: 7½, 3¾, 1½ and the new 4th speed of 15/16 ips which provides 32 hours of recording on a single 7" reel • fully self-contained with dynamic stereo microphone, two speakers (one in the removable cover for stereo separation), dual preamps and dual recording and playback amplifiers • self-contained PA

system • mixing facilities • can also play through external hi-fi system • multiplay facilities.

SPECIFICATIONS: Frequency response: 60-16,000 cps at 7½ ips. Head gap: 0.00012". Signal-to-noise ratio: better than -48 db. Wow and flutter: less than 0.14% at 7½ ips. Recording level indicator: one-meter type. Program indicator: built-in, 4-digit adjustable. Inputs: for stereo microphone (1 two-channel); for phono, radio or tuner (2). Foot pedal facilities (1). Outputs: for external speakers (1 two-channel); for external amplifiers (1 two-channel); headphone (1). Recording standby. Transistor complement: AC 107 (4), OC 75 (6), OC 74 (2), OC 44 (2), 2N1314 (2), OC 79 (1). Line voltage: 117 volts AC at 60 cycles. Power consumption: 65 watts. Dimensions: 18½" x 15" x 10". Weight: 38 lbs. Accessories: Monitoring headset and dual microphone adapter.

For a demonstration, visit your favorite hi-fi or camera dealer. Write for Brochure **A-2**. North American Philips Co., Inc., High Fidelity Products Division, 100 East 42nd St., New York, N. Y. 10017.



ALTEC SOUND TALK

WHY ALTEC DROPPED "HI FI" IN FAVOR OF "PLAYBACK."

There was a time when the term "hi fi" commanded an awed respect; but today its application can be virtually meaningless. So misleading, in fact, that the Federal Trade Commission is attempting to establish a binding definition of "high fidelity"—one on which the FTC can issue a ruling that will protect the buying public against the increasing horde of inferior products that are being advertised as "hi fi."

But a simple, workable definition that would adequately classify truly dedicated high fidelity components is not easy to come by. On request, the EIA composed a definition which was so loose that we understand the FTC found it entirely unacceptable and have now turned to other industry bodies for suggestions in the hopes that someone can come up with an industry solution that can be used to clearly identify those products that are capable of music reproduction above the ordinary.

WHAT'S THE ANSWER?

For Altec, the solution was so obvious we're rather embarrassed that we hadn't thought of it before. We simply dropped "hi fi" and replaced it with the original generic term for all Altec recording studio equipment... **PLAYBACK.**

PLAYBACK is the one definition that cannot be compromised or falsely exploited. For **PLAYBACK** is the term used in the recording industry to designate the studio sound reproducing equipment relied on by conductors, performing artists and recording engineers to accurately compare the realism of a recording with the live rendition.

Only *genuine* **PLAYBACK** components have been able to meet or surpass these critical demands.

THE ASSURANCE OF PROFESSIONAL ACCEPTANCE

Since the beginning of modern sound reproduction, **PLAYBACK** has been directly associated with Altec Lansing. For Altec, and only Altec, sells 80% of its products to the professional usage market. This is your assurance that any Altec component you choose for your home is of genuine studio **PLAYBACK** quality. You need only ask yourself this: Who should be better judge of audio components than the user whose living depends on them?

The more you think about it, the more you'll appreciate why Altec dropped the term "high fidelity" and has returned to its original genre. "Hi fi" is a matter of personal interpretation. **PLAYBACK** is a matter of *fact*.

Altec Lansing Corporation
Anaheim, California

© 1963 ALC



ABOUT MUSIC

Harold Lawrence

The Unseen World on Records

W DELIBERATELY avoid *watching* an artist during a "take." The visual element plays little or no part in my evaluation of his performance. When the lights are switched off in the control booth and the machines begin to roll, I am literally all ears. Some performers who generate considerable excitement on stage lose much of it during the stage-to-disc transfer; others save their best moments for the microgroove disc; a few are equally at home in the theatre and the recording studio. My job is to present the artist at his sonic best."

The pop A & R man who made these remarks to me a few days ago chooses to operate in a partially sightless world in order to focus aurally on the performer. The classical recording director also prefers to work in a monitor room apart from the recording hall. Alone with his score, take sheets, stopwatch and playback gear, he can start or stop the music with a flip of the intercom switch or a word on the telephone. He sits in front of a battery of loudspeakers, his nose buried in the score—the picture of objectivity. No soloist can throw significant glances at him through a glass panel. He will not be distracted by the conductor who cuts a dramatic figure on the podium, moves gracefully, and embellishes his cues and tempo indications with appropriate facial expressions. He could easily get the erroneous impression that exciting things are happening out there. They are, but not necessarily to the music.

Remembrance of Things Recorded

While the A & R man is preoccupied with recorded sound, the record collector can become totally involved in it. There is the classic story of the discophile who attends his first concert at Carnegie Hall. Moments after the program has gotten under way, he leans over and whispers to his companion: "What's wrong? I don't seem to hear any highs... and the orchestra sounds so soft!" The trouble is that he has come to know orchestral music through the distorted aural prism of his "hi-fi." A cartridge with a walloping peak

at 5000 c.p.s., a pair of bass-deficient loudspeakers—with components like these, reality is bound to be a letdown. Fortunately, concert attendance relies on better ears than these. But the fact remains that recordings, whether they are heard on the air or through one's own audio system, dominate the musical lives of most people.

Charlie McCarthy Sings

In the world of the popular song, the record is king. The personal appearance of the latest idol of the teenagers frequently is nothing more than a lip-synchronization exhibition. While the hit record is playing over the loudspeaker system, the star shakes his hips, waves his arms, rolls his eyes, and mouths the words of the song. He is playing Christian to his own recorded Cyrano.

It is paradoxical that, in spite of the advent of television, many performers have become international stars on the basis of their records alone. One of the best-selling discs of 1963 was taped by a nun whose face and identity were unknown to the nearly two million people who bought her LP and single. Her real name is Sister Luc-Gabrielle, otherwise known as Soeur Sourire and the Singing Nun. A Dominican nun, Soeur Sourire (Sister Smile) lives in a convent in Belgium. Before entering the religious order at Fiehermont, she bought a Spanish guitar and christened it Adèle. The songs she composed and sang herself captivated the novices and young girls who came to the convent in temporary retreat. When the girls asked her to record a souvenir disc for her lighthearted, religiously-themed chansons, Soeur Sourire went to Brussels with the consent of the Reverend Mother, and arranged with Philips Records to cut a disc for private distribution. The recording director at the first session was so enthralled with what he heard that he asked the blonde, blue-eyed Sister to grant Philips permission to release the disc commercially. The Dominican order signed a contract specifying that Sister Luc-Gabrielle would never appear in public, that the records would never carry her real name, and that all royalties would go into a special fund for Dominican missionaries.

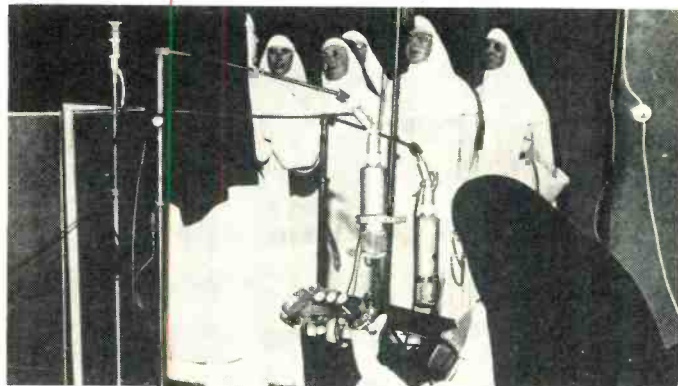


Fig. 1. Soeur Sourire at a recording studio in Brussels.

"Dominique" Hits the Charts

When the LP of the Singing Nun was first released in the U. S. last August, the response was as muted as a convent at prayer time. Phillips' West Coast distributor "reluctantly took 25 of the album," *Variety* reported, "hoping to sell them to Catholic institutions." Then, on October 14th, the record firm extracted two songs from the album (one of the tunes was "Dominique"), and brought them out on a 45 r.p.m. single. The record "broke" on radio; within days, "Dominique" ruled the air waves, and both the album and the single zoomed to the top of the charts.

"Who could have predicted it?" the A & R man asked in bewilderment. "Would you have guessed that a record made by a nun, with religious lyrics, and sung in a foreign language, would become the pop hit of the year? Yet here is a perfect example of the power of records: an artist who became world famous on the basis of her sonic image alone. Until she appeared on the Ed Sullivan show (January 5), the only evidence of her existence, apart from the records themselves, was a pair of shots taken by a Paris-Match photographer. But Sœur Sourire didn't have to be seen to be believed—just heard."

The Invasion of the Discs

In recent years, records have been infiltrating one of the last strongholds of 'live' entertainment: the night club. It seems to have started in Paris in the small ancient *caves* (cellars) of the Left Bank, although a Chinese restaurateur I know told me that he had operated a dance-to-records club in Canton Province shortly before the Communist takeover. Called *discothèques*, these clubs feature jazz combos alternating with records. In most Parisian *caves*, it's sometimes hard to tell the musicians from the discs because of the smoke and the tightly-clasped couples. The fact that the loudspeakers relay both the 'live' and recorded music adds to the confusion.

Three *discothèques* are flourishing in New York City. At the Village Vanguard, the disc invasion has had a profound effect on the 'live' portion of that club's entertainment. Herbie Mann, the jazz flutist, faces the challenge of records realistically. Acknowledging that those who want to listen to jazz can usually hear better performances under better listening conditions and at less expense on records than in clubs, Mann told John S. Wilson (of the *New York Times*) that "if a jazz group is to attract an audience to a club it must offer something that is not available on records." Obviously, the 'something' is visual excitement. To his regular sextet, Mann added a pair of dancers, three specialists in African and Afro-Cuban drumming, and showers of confetti; and, as icing on the musical cake, a pair of trumpets. Despite the lively audience response to Mann's new format, dancing to discs, reports Wilson, has an appeal that is more lasting than simply listening to a live jazz group. Listeners leave early, the Vanguard has found, but dancers stay late.

Radio disc jockeys generally program the records for a *discothèque*. On the air, the disc jockey measures his success in terms of mail, phone calls and ratings; in the *discothèque*, he knows within minutes whether his selections are right. If they consistently fill the dance floor, he is doing fine. By a process of elimination, the star (recorded) performer at the Vanguard turned out to be Trini Lopez, a singer who has never appeared there. Æ



PROFESSIONAL QUALITY STANDARDS

HIGH ATTENUATION OF AMBIENT NOISE

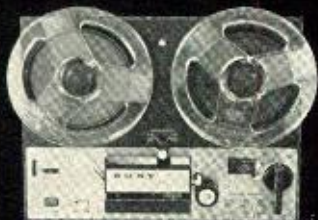
ACOUSTICAL DAMPING FOR SMOOTH HIGHS

LESS THAN 1% DISTORTION AT MAXIMUM OUTPUT

**That's how
Koss
does it!**

KOSS ELECTRONICS INC., 2227 N. 31st STREET, MILWAUKEE, WISCONSIN 53208

All
new
from
Sony



a stereo
deck
with
3 heads!



and
stereo
recording
amplifier

Now you can add famous Sony 4 track stereo tape playback to your present hi fi system. Handsomely styled in gold and grey, with 3 heads, 2 speeds, vertical or horizontal mounting, automatic shut-off, tape counter and pause control, the new Sony 263-D is a remarkable value.

Less than \$119.50

For stereo recording, add the new Sony SRA-2L recording amplifier that instantly connects to the 263-D. Its matching gold and grey decor makes a handsome companion for your 263-D. All new from Sony!

Less than \$99.50

■ All Sony Stereorecorders are Multiplex Ready! ■ In New York visit the Sony Salon, 585 Fifth Avenue
■ For literature or name of nearest dealer write Superscope, Inc., Dept. 7, Sun Valley, California.

SONY SUPERSCOPE

The Tapeway to Stereo

JAZZ and all that

Bertram Stanleigh



Big Brubeck

This reviewer encountered a large sized surprise last December when he visited Columbia's recording studio on East 30th Street in New York for a session by the Dave Brubeck Quartet. The Quartet was there, but the group that had been assembled to augment it for the waxing seemed quite amazing, since it consisted of an orchestra of somewhere between 75 and 90 classical musicians. Ample sections of strings, woodwinds, brasses and percussion were supplemented by harp and celeste for this recording of *Emissions*, a work by Brubeck of about 20 minutes duration for the Brubeck Quartet and full orchestra.

To record this huge contingent, Fred Plaut, Columbia's veteran sound recordist, employed a total of 16 microphones—all condensers. They included U47's, M49b's, U67's and Sony's. These were fed through a sixteen channel mixer and into four Ampex 300 recorders: a full-track quarter-inch mono, two three-track half-inch stereo, and an eight-track one-inch stereo. The Quartet was enclosed on three sides by large screens with the open fourth side facing conductor Ray Wright and the orchestra.

In charge of the session was Teo Macero, a highly-charged bundle of energy in a small, plump package. Unlike most recording directors who remain calm and detached while storms of temperament rage all around them, Macero appears to get results by functioning as the taut, excited nerve center of a session. A perfectionist, who is unwilling to allow even the smallest of fluffs to get by, he worked ceaselessly to achieve a balance that would permit each detail to emerge in proper perspective. And he called for retake after retake to correct small spots at section entrances that less demanding musicians would be inclined to overlook. Each error seemed to burn into his psyche like a white hot pain, and

when a difficult passage was finally taped successfully, his pleasure was made manifest in beatific grins and murmurs of exaltation.

When his impatience to keep the session moving resulted in the accidental erasure of the end of a take, he had a tantrum, but his mood changed quickly as he followed the complicated score, beating time vigorously and calling out cues for changes of level and balance to Fred Plaut. And no matter how the moods varied, how quickly the adjustments had to be made, Fred Plaut remained rock steady, quick to cope with each situation and outwardly as calm as if he were an observer rather than a participant.

The music? Well, it had approximately the same proportion of jazz in it as there were jazz performers at the session—roughly twenty parts classical to one part jazz. Most of the piece sounded like re-hashed Sibelius with the addition of some brass riffs from the big band era of the thirties. From time to time Brubeck and Paul Desmond played brief solos, and near the end there was a wild drum solo, also reminiscent of the big band arrangements. Much of the thematic material was attractive, but its employment was too eclectic, resulting in a patchwork with interesting detail but little apparent structure.

Dave Brubeck has been moving in this direction for some time. While the current results are less than successful, it seems likely that the present experiments are a transitional phase in the development of this important musician, and as he becomes more closely associated with these larger forces and new voices, he can be expected to handle them in a more directly personal manner. In the meantime such works as *Emissions* and *Brandenburg Gate: Revisited* are valuable guideposts in contemplating Brubeck's future development.

Joe Williams: At Newport '63
RCA Victor Stereo LSP-2762

Lambert, Hendricks and Bavan: At Newport '63

RCA Victor Stereo LSP-2747

RCA Victor continues its documentation of the 1963 Jazz Festival at Newport with these two live recordings. As a document of the occasion these releases may serve a worthwhile function, but as representations of the work of these performers, they fall well below the level of Victor's usual high standards. The problems inherent in any live recording before an audience are very substantial, and although the stimulation of an enthusiastic throng frequently brings forth an extra measure of effort on the part of the performers, more frequently performers prefer

the privacy of a recording studio where they can patiently rework difficult details in order to impart the kind of high polish to the final result that is not always possible during the stress of a concert. Furthermore in the case of a live recording, it is most unlikely that the sound quality will compare favorably with a studio taping. Microphones must be set up in advance by technicians who can only guess at the location of the performers during the concert, and mixing facilities are generally not as elaborate on such remote sessions as they are in a well-equipped studio control room. Such problems as the elimination of background noise often make it desirable to employ microphones that are more outstanding for their ability to respond to sound from a limited angle than for their frequency and transient response. And the acoustic problems that reveal themselves only

after the audience has been seated and it is no longer possible to alter the arrangement of equipment add further to the hazards of location recording. These two discs are unhappy examples of the kind of sound that can result from such live sessions. Bass response is thin and lacking in presence, high frequencies are overly bright, and there is a cold, detached quality to the over-all sound that is in sharp contrast to the wild enthusiasm of the audience.

The Dave Brubeck Quartet: Brandenburg Gate: Revisited

Columbia Stereo CS 8763

A melody of haunting beauty provides the principal thematic material for this Brubeck composition, and it receives full-blown string orchestra treatment with additional rich accents supplied by a section of French horns. The orchestra seems smaller than that employed in the forthcoming *Emissions* disc, but many of the same basic elements are involved, and the same problems are posed and unresolved. The poised, graceful string melody is more than a bit reminiscent of the late-Victorian salon pieces of Sir Edward Elgar, but a span of eighty-odd years lies between the two dates of composition, and what must have seemed a dreamlike idyll in the 1880's now takes on the unhealthy aspect of a rejection of reality. Against this gentle, easy-flowing melody, Brubeck interjects short, related melodic piano phrases, and further brief comments from Paul Desmond's alto punctuate the progress of this 20-minute composition. The flip side consists of four shorter works in the same nostalgic mood. Alas, this reviewer's nostalgia is for the Dave Brubeck Quartet of yesteryear.

The Three Sounds: Some Like It Modern
Mercury Mono MG 20839

A bright, bouncy beat and some real cool phrasing result in a pleasant album for easy listening or energetic dancing. This piano, tom-tom, and bass trio is out to entertain, and it succeeds in doing just that. Pianist Gene Harris has occasional tendencies toward broad retards on slow numbers, but his flirty style on *Let's Dance*, *Elbows and Armpits*, and *Kat Down Front* is highly infectious. Hardly an indispensable jazz classic, this album is simply good jazz and good fun.

Les and Larry Elgart: Big Band Hootenanny

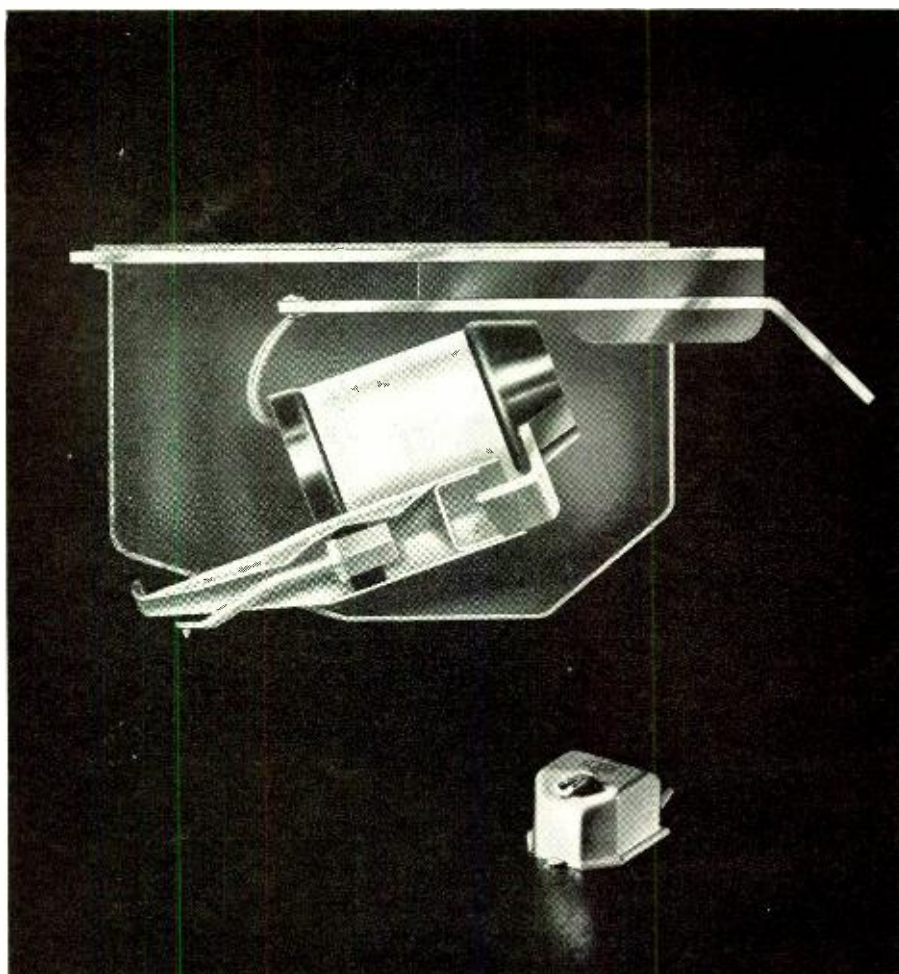
Columbia Stereo CS 8912

The Folkswingers: 12 String Guitar, Vol. 2

World Pacific Stereo 1814

The television popularity of the folk song show called *Hootenanny* has thrown this word into the vocabulary of millions of Americans who had not previously heard the term or who had associated it with a tool used by plumbers. As used in the folk music area, it means a get together by a number of different singers and performers. Consequently, its use in the title of this new Elgart disc is deceiving, since only one band is involved. But language is a living, changing thing, and it is probable that before long hootenanny will come to mean any folksong performance or collection of folk tunes. That's what we encounter on these two discs, collections of some of the most familiar and popular folk items of the moment, performed in instrumental arrangements. The Les and Larry Elgart disc features a big band that swings gently, easily and with a solid beat for dancing—not exactly folk music, but a very satisfying disc for folk song fans. The Folkswingers' record for twelve string guitars and banjo has much more authentic flavor, since these are instruments generally associated with music of this type. It makes a delightful disc for background listening and can also serve successfully as an accompaniment for spontaneous group singing. As a matter of fact, this group of performances is so infectious that it's extremely hard work to listen without filling in the words. Sound on each of these two stereo waxings is bright, clean and agreeably spread out.

(Continued on page 59)



less
than 2%
i/m distortion
but...

this alone is not enough. For optimum stereo performance, a cartridge must have stereo integrity as well as fidelity—spatial quality as well as sound quality.

The new Elac 322, with less than 2% intermodulation distortion, and less than 1% harmonic distortion, is capable of producing an almost perfect waveform replica of the sound groove—from 20 to 20,000 cycles, ± 2 db. Moreover, it provides effective crosstalk damping over the most directional frequencies of the spectrum—way out to 20,000 cycles. Channel separation is practically complete: better than 25 db at 1000 cycles, 20 db at 10,000, and an astonishing 12 db at 20,000 cycles.

The 322 tracks at from 1.5 to 3 grams with most arms (1 gram with some). Price with .52 mil diamond stylus and universal mounting bracket is \$49.50.

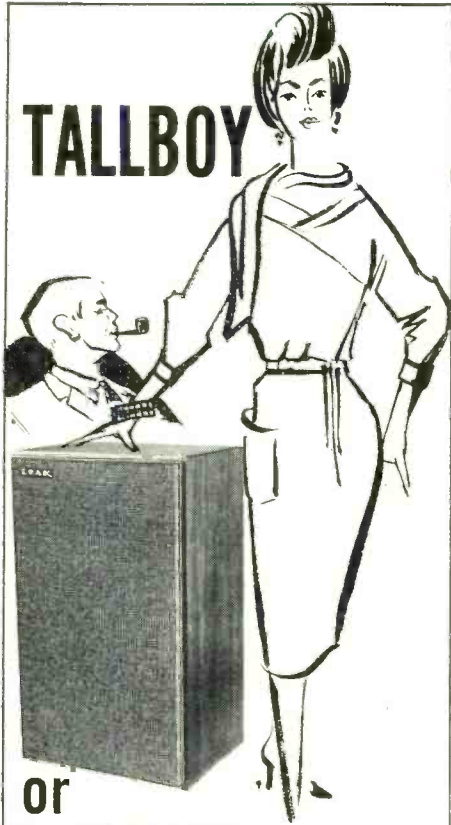
Also hear the new, compatible mono/stereo Elac 222, \$39.50 with .7 mil diamond.

At your hi-fi dealer now. For complete details, write to: BENJAMIN ELECTRONIC SOUND CORP. 80 Swalm Street, Westbury, N.Y./U.S. distributor for Miracord and other Electroacoustic (Elac)[®] Record Playing Components.

**BENJAMIN
ELAC**

NEW ELAC 322 STEREO CARTRIDGE

TALLBOY



or LOWBOY



It's still THE BEST SOUND

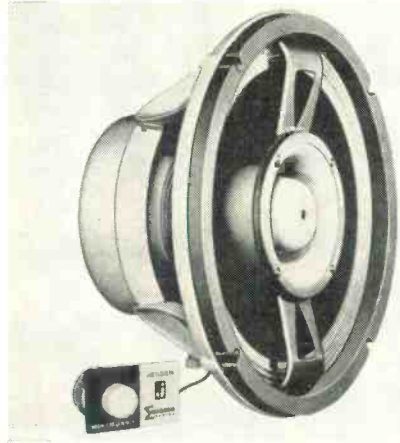
HE wants SOUND. . . **SHE** wants **STYLING!**
HIS masculine ear listens to the unexcelled sound of the **LEAK PISTON ACTION SANDWICH SPEAKER**. . . **HER** feminine eye sees the beautiful, award winning decorator design . . . the rich, deep grain, custom Scandinavian furniture. **SHE** visualizes the speakers in at least four different room decors. . . **HE KNOWS** wherever it's placed—whatever size room: the **LEAK SANDWICH** will deliver the **BEST** in **SOUND!** **THEY BOTH AGREE** . . . in sound and style, **LEAK SANDWICH** is indeed the "universal" speaker system!



Brochures and Test Reports Available at your local Leak Authorized Sound Specialist, or write
ERCONA CORPORATION
 432 Park Ave. So. New York 16, N. Y.

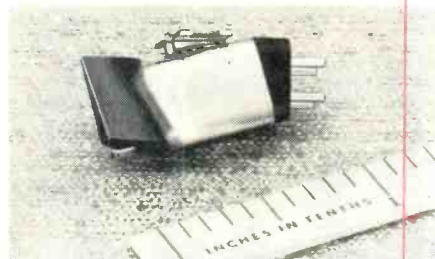
NEW PRODUCTS

• **Series of 8 and 12-inch Speakers.** Jensen has just introduced the Sigma Series of unitary high-fidelity loudspeakers. This group consists of seven completely new 8 and 12-inch models (shown). Ranging in price from \$16.50 to \$69.50, the new series



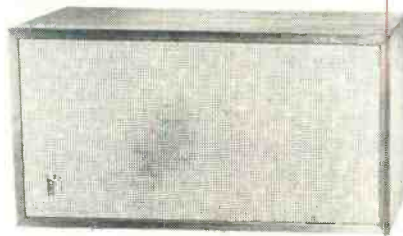
features: Heavy duty die-cast alloy housings; high-energy magnets; carefully formulated cones; special cloth suspensions to permit free cone movement; low-crossover tweeters (2000 cps); separate remote high-frequency control supplied with every coaxial speaker. Jensen Mfg. Co., Chicago, Illinois. **B-1**

• **Miniature Stereo Pickup.** Stanton Magnetics, Inc. has developed a truly sub-miniature stereo pickup, the 500AT "Micro Fluxvalve." Thumb-nail in size and with a total weight of less than five grams, the 500AT still retains the high output and high performance standards of the Stanton "Stereo Fluxvalve." The 500AT is designed for the new generation of auto-



matic turntables utilizing low-mass tone-arm systems. Laboratory tests over a period of several months indicate that the improved sound from this pickup results from its new magnetic circuit, different from any cartridge available. In addition, the 500AT Micro Fluxvalve incorporates the recommended RIAA 15-deg. playback angle (proposed EIA standard). Stanton Magnetics, Inc., Terminal Drive, Plainville, L. I., New York. **B-2**

• **Relatively Small Speaker System.** The new Frazier Mark V is designed to produce the widest range of musical sound from the smallest enclosure. A special 12-in



woofer permits reproduction of 16-foot pipe tones. The mid-range system is designed to give body to the brass, woodwinds, and strings. The high-frequency horn handles frequencies to the extent of human hearing. Compensators are provided for the mid-range and treble frequencies so that proper balance can be made for room acoustics and individual taste. The Mark V has a usable frequency response from 30 to beyond 17,000 cps, an impedance of 16 ohms, and a power handling capacity of 20 watts on speech and music. Two crossover networks are provided—at 200 cps and at 3300 cps. Dimensions are 14-in. wide; 26½-in. high; and 12-in. deep. The Mark V is available in an oil walnut finish with cane fiber grille, or a black utility finish. Frazier, Inc., 2649 Brenner Dr., Dallas, Texas. **B-3**

• **New Amplifier, New Manufacturer.** Pure Sonics Inc., a new manufacturer in the components field, is now producing what they call the "Quadramatic" amplifier. The Model 402-C stereo power amplifier shown (40 watts per channel), and Model 110 stereo control center are the first units to be produced. Each boasts "zero distortion." The systems are entirely self-balancing, even after years of service and feature high-stability metal-film resistors,

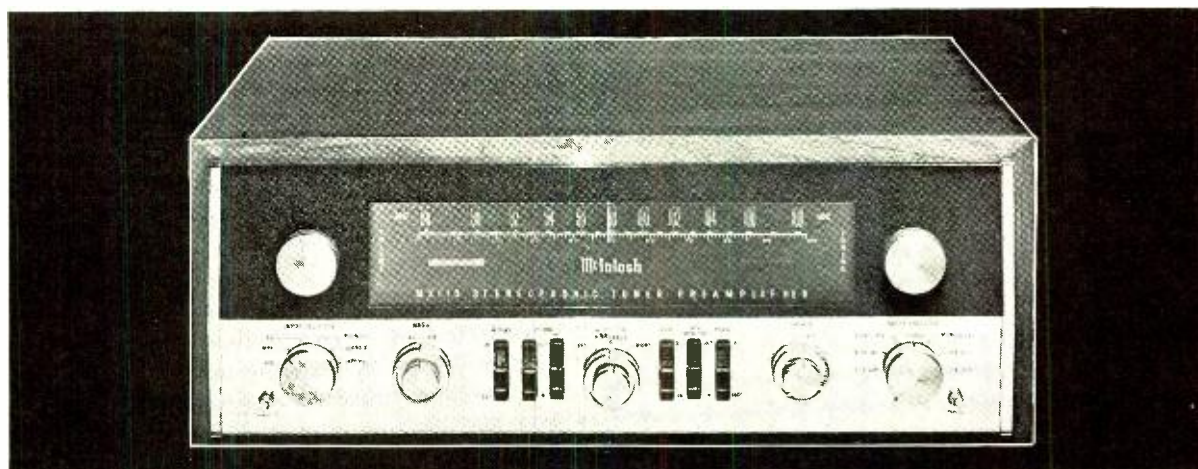


pull-out type electrolytics, compactrons, and circuitry that operates components at 50 per cent of rating. Pure Sonics sells their units on a lifetime 100 per cent parts and material guarantee. Other features are: Low noise level, exact matching of the RIAA and NAB curves, tracking within 2 db, simplified controls, light weight, compact and modern design. Pure Sonics, Inc., Box 88, Oak Park, Illinois. **B-4**

• **Two-Manual Kit Organ.** Artisan Organs has announced a new two-manual theater-styled kit organ known as the Empress. It features full 61-note manuals, a 32-note concave-radiating pedal board, and a curved "horseshoe" stopboard with 40



multi-colored stop tablets. The console, styled after the theater organ of the silent movie era, is modified for the home and offers a stop list of authentic theater voices reminiscent of the 1920's. Other features include dual expression pedals, separate vibrato on each manual, and independent oscillators for each note. Accessories offered, also in kit form, are the Band Box, Orchestra Bells or "Glockenspiel," and the "Electro Vibe" or vibra harp. These accessories add a variety of instrumental effects patterned after the old theater organ. Artisan Organs, 2476 North Lake Ave., Altadena, Calif. **B-5**



your search is over

You'll never be satisfied with anything less than McIntosh quality once you've heard it. You'll put an end to stepping up to something better in your search for the ultimate, because McIntosh is the best. There are good reasons: Exclusive, patented circuits set new standards in performance. Careful engineering and conservative design practices ensure long term dependability. Consider amplifier output stages, for example, that need no bias or balance adjustment, no tube selection or matching, to deliver rated performance. McIntosh components are devised to fulfill every present need, anticipate your future ones. Like the classics, they endure.

ILLUSTRATED ABOVE:

Model MX110 Stereo Tuner-Preamplifier and Model MC-240 Dual 40-Watt Power Amplifier. You need only add speakers.

Model MX110: A single chassis combines the quality and flexibility of a separate multiplex tuner in the broadcast-monitor class with a professional stereo control center ----- \$399.00

MC-240: Superb, distortion-free, two channel model, conservatively rated at 40 watts per channel. Flat frequency response well beyond the limits of the audio spectrum with negligible phase shift. ----- \$288.00

McIntosh LABORATORY INC.

6 CHAMBERS STREET, BINGHAMTON, N. Y.

Phone—Area Code 607-723-5491

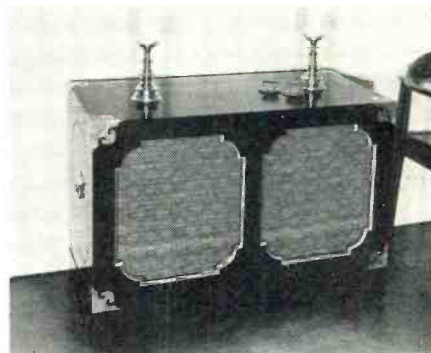
● **Transistor 70-Watt Stereo Amplifier.** The Knight-Kit KG-870 70-watt stereo amplifier (22 transistors, 4 silicon diodes) incorporates the latest developments in transistorized audio technology according to Allied Radio. The manufacturer emphasizes special advantages of compact design, cool operation, virtually no hum or noise, no microphonics, low current drain,



instant sound, and flat frequency response resulting from elimination of capacitors and transformers in output stages. For easier assembly, this new 1964 model in-

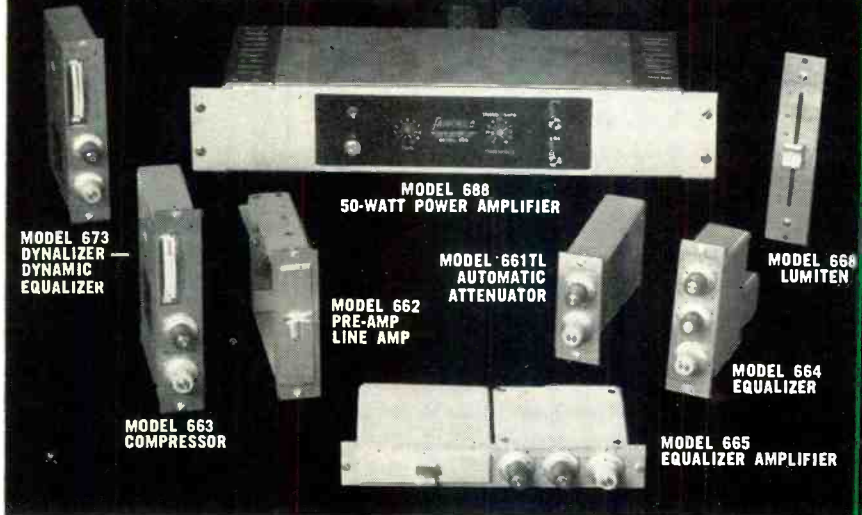
cludes modular printed circuits and plug-in transistor sockets. Price of the Knight-Kit KG-870 is \$99.95 in kit form, \$149.95 factory assembled. Deluxe brown metal case, \$6.95; oiled-walnut case, \$12.95. Allied Radio Corp., 100 N. Western Ave., Chicago 80, Ill. **B-6**

● **Large Speaker System.** The Hartley-Luth "Concertmaster," a full-sized multiple speaker system is now available from Hartley Products Company of New York. The speaker system features the new 218-MS speaker, an 18-in. woofer with bass response down to 16 cps. The middle and high frequencies are handled by the Hartley 220MS, a 10-in. unit widely used as a full-range speaker in many high fidelity installations. The Concertmaster is available in two different versions. One is housed in a decorative Chinese chest enclosure (shown), 40 x 28 x 20-in. The second is styled in a modern oiled-walnut cabinet, size 36 x 36 x 18-in. Inner acoustic treat-



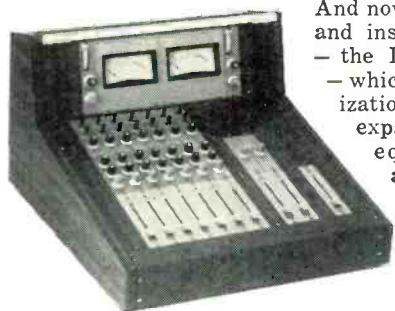
ment is provided in both enclosures by means of the Hartley "Soundsorber." The complete speaker system in the Chinese chest lists for \$795. The oiled-walnut style is priced at \$595. Individual components are also available separately. Hartley Products Co., 519 East 162 St., Bronx, New York 10451. **B-7**

FAIRCHILD IS FIRST!...



with professional audio equipment
COMPLETELY TRANSISTORIZED
from microphone input to loudspeaker terminals!

FAIRCHILD IS FIRST with professional quality preamps, line amps, compressors, equalizers, noise reduction systems, anti-feedback devices, apparent loudness controls and power amplifiers!... *all transistorized!* Advanced engineering concepts assure ultimate performance and thermally stable maintenance-free operation. Each FAIRCHILD transistorized device is compatible with each other and even more amazing each device is compatible with other existing conventional vacuum tube equipment.



And now FAIRCHILD offers a new design and installation boon to sound engineers — the **INTEGRA/CONSOLE CONCEPT** — which allows complete housing and utilization in a functional, attractive and expandable package of all speech input equipment needed for the most advanced recording, broadcasting or sound reinforcement installation. **INTEGRA/CONSOLE CONCEPT** allows expansion at a later date if desired — minimal investment for maximum utilization.

FAIRCHILD

RECORDING EQUIPMENT CORPORATION
1040 45th Ave., Long Island City 1, N. Y.

● **Mono Tape Recorders.** The new Tandberg tape recorder Models 921 and 921-F are 3-speed, 2-track, mono record-playback units. These additions to the Tandberg line are in keeping with the new styling of all Tandberg equipment, and will replace the models 3B and 3B-F. The Model 921 features a pause control switch and two heads, one for record-playback and the other for erase. The 921-F model features



remote control, reverse solenoids, and a foot-pedal control. The company stated that a 4-track model of the series 9 equipment will be produced at a later date. Tandberg of America, Inc. Pelham, N. Y. **B-8**

● **70-Watt AM-FM-Stereo Tuner Amplifier.** H. H. Scott, Inc., announces the introduction of their new Model 380 70-watt AM-FM stereo tuner-amplifier. This single compact unit features new decorator styling, slide-rule tuning, convenient front-panel low-level output for private listening, and Auto-Sensor circuitry which automatically switches to stereophonic or monophonic mode of operation depending on which type of broadcast is being received. Operating in conjunction with the Auto-Sensor is a signal which lights



when stereo is being received, and is automatically extinguished when Auto-Sensor switches to monophonic mode. Additional features include: bandwidth selector for best reception of local and distant AM stations, illuminated d'Arsonval meter, silver-plated rf circuitry, massive power and output transformers. Net price east of the Rockies is \$459.95. For further information write: H. H. Scott, Inc., Dept. P, Powdermill Rd., Maynard, Mass. **B-9**

BASIC Q & A

(from page 36)

Clean-Shaven Tape

Q. I inadvertently plugged my tape recorder in the A.C.-to-D.C. converter that I use for my electric razor. It doesn't record anymore, but it sure makes a sound like a razor. Do you have any suggestions?

A. Replace the recording heads of your recorder with the cutting heads of your razor. You will then have a tape shaver which you will find useful in converting your old style tapes into the new double play width.

Replace the cutting heads of your razor with the recording heads of your recorder. You will then have a whisker recorder which you will find useful in magnetizing your beard. Shaving then becomes simply a plucking action performed merely by thrusting your head into a powerful electro-magnetic field.

Hissy Amplifier

Q. This morning, my wife remarked that my amplifier produced flatness at the rate of one-tenth cps. I hastened to correct this typically feminine terminological misuse by explaining that the amplifier did not produce flatness at the rate of one-tenth cycles per second, but rather the output of the amplifier was essentially flat at ten cycles per second. My wife then explained that she had been using the amplifier as an electric iron. She said that since it took her about ten seconds to iron my collars, her original statement to the effect that the amplifier produced flatness at the rate of one-tenth cps (or collars per second) was exactly what she meant; and that furthermore if I would quit spending all my time on high fidelity and buy her some electrical appliances, she wouldn't have to do her housework in such ridiculous ways. My amplifier still seems to work alright, but I do notice an inordinate amount of hiss. What should be done?

A. Buy your wife an iron. What you believe to be hiss is actually live steam escaping under pressure as a consequence of your wife attempting to convert your amplifier into a steam iron.



small size

BIG SOUND

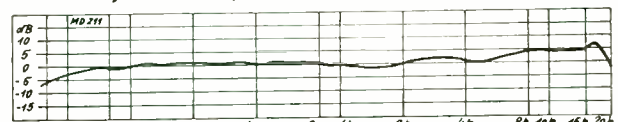
SENNHEISER Type MD 211

Studio Quality Omnidirectional
Dynamic Microphone

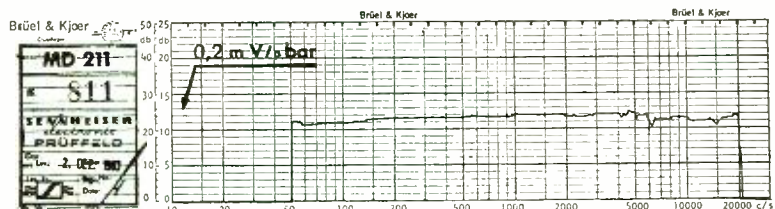
Shown Actual Size - Professional Net \$115.00

Inconspicuous appearance without sacrifice in quality. The compact design of type MD 211 renders it an excellent choice for stage use or any application where minimum obstruction of visibility is desired. This has been achieved without compromising the smooth extended range, the generous output level, and the almost completely omnidirectional pickup that contribute to outstandingly natural reproduction.

Frequency range extends smoothly from 40 to 20,000 cps, as shown on the nominal response curve. Each type MD 211 is supplied with a signed curve, individually recorded in an anechoic chamber. Compare the typical, random-selected curve with the nominal curve. It is your proof of Sennheiser uniformity and quality. The sturdy case, with satin chrome finish, is practically unbreakable. Type MD 211 is insensitive to humidity and atmospheric conditions.



Nominal response curve, Type MD 211



Random-selected, individually drawn curve, Type MD 211

TECHNICAL DATA

Frequency range..... 40 to 20,000 cps
 Deviation from nominal response curve..... ± 2.5 db from 40 to 17,000 cps
 Sensitivity at 1000 cps..... -57db re: 1mw/10 dynes/cm²
 Directional characteristic..... Essentially spherical (omnidirectional)
 Impedance..... 200 ohms
 Dimensions..... Length: 4 $\frac{3}{4}$ " , diameter: $\frac{7}{8}$ "

For complete technical specifications, call or write to:



25 West 43rd Street, New York, N. Y. 10036
(212) LOnacre 4-0433

Plant: Bissendorf/Hannover, West Germany

A RE-RECORDING FILTER

(from page 35)

One recent application was in a language lab recording setup. The producers of some of these tapes for language classes were rather lax in their production standards. Hiss and hum were so prominent at times that steps had to be taken to separate the "words

from the noise." This unit did just that. In extreme cases it may be cascaded. It may be cascaded also for use in producing telephone-type sound effects.

The "In-Out" switch takes the unit out of the circuit completely. By patching, it can be used for other arrange-

ments. The circuit of the filter is such that it neither has an insertion loss or gain when in the circuit.

For complete consideration of the possibilities of this unit, comparison should be made between the curves presented for the filter and standard tone controls, as shown in *Fig. 3*. Æ

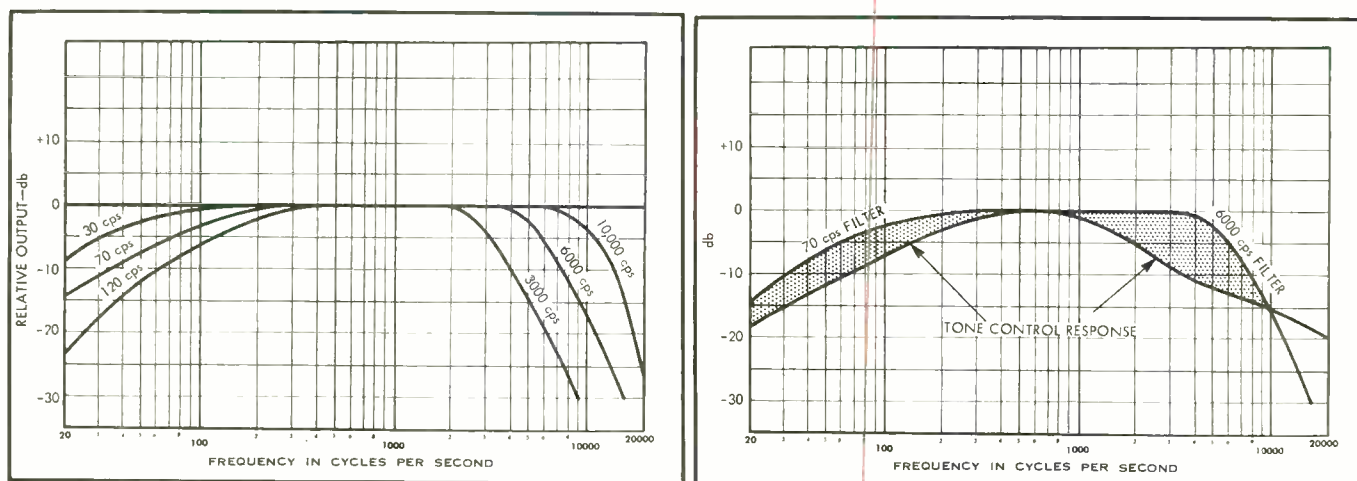


Fig. 2. (left) Filter characteristics. Fig. 3 (right) Filter compared with usual tone-control characteristics. Shaded area indicates difference.

CONDENSER • DYNAMIC MICROPHONES



AKG, manufacturer of renown quality microphones, is now represented by a distributing organization—AKG of America, a Division of North American Philips Company, Inc., with general offices at 125 Park Avenue, New York 10017.

Complete inventories, repairs and service facilities will be maintained at the AKG Service Center in nearby 30-10 Review Avenue, Long Island City, N.Y.

AKG of America

Division of North American Philips Company, Inc.

REDUCING DISTORTION

(from page 32)

and technical know-how are now available to permit this achievement, and there are indications the traffic on this road to progress is becoming heavier.

To Be Concluded

REFERENCES AND BIBLIOGRAPHY

1. H. G. Baerwald, "Analytic Treatment of Tracking Error and Notes on Optimal Pickup Design." *Jour. Soc. Mot. Pic. Engrs.*, 37, 591 (1941).

2. B. B. Bauer, "Tracking Angle in Phonograph Records," *Electronics*, 18 110 (March 1945).

3. In the present context, intermodulation products are considered to be all spectral components which are generated by the interaction of two or more signals of different frequencies, whether due to the amplitude modulation, the frequency modulation, or the phase modulation of one signal component by another. In more usual contexts the IM includes only the AM due to simple nonlinear transfer characteristics of systems.

4. J. B. Halter and J. G. Woodward, "Measurement of the Distortions Due to Vertical Tracking Angle Errors in Stereodisk Systems," Presented at the October 1963 Convention of the Audio Engineering Society in New York, and scheduled for publication in the January 1964 issue of the *Journal of that Society*.

5. E. C. Fox and J. G. Woodward, "Tracing Distortion—Its Cause and Correction in Stereodisk Recording Systems," *Jour. Audio Engng. Soc.*, 11, 294 (October 1963).

6. M. S. Corrington and T. Murakami, "Tracing Distortion in Stereophonic Disc Recordings," *RCA Review*, 19, 216 (Jan. 1958).

7. D. H. Cooper, "Integrated Treatment of Tracing and Tracking Error," Presented at the October 1963 Convention of the Audio Engineering Society in New York.


8. J. G. Woodward and E. C. Fox, "A Study of Tracking-Angle Errors in Stereodisk Recording," *IEEE Trans. on Audio*, AU-11, 56 (March-April 1963).

9. B. B. Bauer, "Vertical Tracking Improvements in Stereo Recording," *Audio*, 47, 19 (February 1963).


10. B. B. Bauer, "The Vertical Tracking Angle Problem in Stereophonic Record Reproduction," *IEEE Transactions on Audio*, AU-11, 47 (March-April 1963).

11. J. G. Woodward and E. C. Fox, "A Study of Program-Level Overloading in Phonograph Recording," *Jour. Audio Engng. Soc.*, 11, 24 (Jan. 1963).


12. D. H. Cooper, "Tracking Distortion as Phase Modulation," *IEEE Transactions on Audio*, AU-11, 41 (March-April 1963).




Speakers




THE Super Widget
7-3/16" H x 15 1/8" W x 9 1/2" D
For limited space or as auxiliary unit.




THE Bel Aire
19" H x 23 3/8" W x 5 3/8" D
Thin line styled for wall mounting. Floor stand available.



THE La Fiesta
10 1/2" H x 23 3/8" W x 11 1/8" D
Unique design for bookshelf mounting.



THE Mark V
26 1/2" H x 14" W x 11 3/8" D
A truly remarkable speaker.



FRAZIER
INCORPORATED

FOR THE LOVE OF Sound

From the lowest rumblings of the organ pedal notes to the whispering overtones of the flutes... FRAZIER offers a complete series of full range, two-way, and three-way wide range speaker systems employing both the modified Helmholtz principle, and the exponential horn... Assuring the ultimate in smoothness, balance, and cleanliness from as low as 28 cycles, to 22,000 cycles in the larger systems. Oil Walnut hand crafted cabinetry. Some models available unfinished. Complete Music Wall "Playmate" Systems available in Oil Walnut and Burma Teak.

Price Range \$26.95 to \$310.00.
Write for complete details on all models.
Over 350 Dealers in U. S. Alone.

2649 BRENNER DR. DALLAS 20, TEXAS
CIRCLE 57

vernon 47/26

STEREO TAPE RECORDER AND AUDIO CENTER

- 47 transistors, 26 diodes
- all-electronic computer-type switching
- dual record/playback amplifiers
- 10 watt output per channel
- wide-range monitoring speakers



Many Vernon 47/26's are owned by those whose previous tape equipment cost far more than the Vernon's \$600. You'll know why after one visit to your dealer. Or write for brochure. Vernon Audio, 144 E. Kingsbridge Road, Mt. Vernon, N.Y.

CIRCLE 67

COMPOSERS

(from page 22)

IV. Maurice Ravel (1875-1937)

For the first half of the present century, a steady procession of young American composers trekked to Paris to study and worship at the feet of Ravel. He had a book (now it would be an album) on the subject of orchestration, and like Richard Strauss, he was an outstanding craftsman in orchestral scoring. Also like Strauss, he lived at a time when he could have been influenced by the excesses of late Romanticism. You

will have an opportunity to decide whether he was able completely to overcome the temptation toward overcomplication in his scores, with the inevitable intermodulation.

Many of the available recordings of Ravel music are as clean as the tooth of a basset horn. (The author obviously means a basset hound. A basset horn is a rare alto clarinet in F. Eb.) Not so in the case of *La Valse* (17), the piece selected for this scrutiny of bad sound. This ballet is the apotheosis of Dance, and at the beginning, Dance emerges from a morass of mud. Here Ravel's music is good and muddy—entirely by intent. The intent is obvious to the lis-

tener, and this is a neat trick; it is not easy to write bad sound and have it seem to be other than an unfortunate accident.

But . . . in the remaining 15 minutes of playing time, does Dance ever succeed in getting her hands thoroughly washed? The subject is admittedly controversial, and you must form your own opinion. *La Valse* is a very popular piece, and many recordings of it have been made. The 17 versions which are now available are only a small part of the whole, most of which were retired after a short life. Can this popular work be recorded well?

Fortunately there is another Ravel piece appropriately available for comparison, his *Valses Nobles et Sentimentales* (8), written nine years earlier than *La Valse*. This comparison may help you to decide whether, like Strauss, Ravel eventually acquired the grandeur complex and gave in to the influences of super-Romanticism.

Ravel's original inspiration was Debussy, and you might like to compare *La Valse* with Debussy's "Fetes," the middle movement of his *Nocturnes* (16). The comparison is not exactly parallel, but "Fetes" is at least evidence that good clean dance music can be written in the Impressionistic tradition.

Ravel's *Bolero* (33) is the next bad sound to be sampled, but here the composer is unquestionably bad by intent and entirely successful in bringing it off. The episode is brief, about 2/3 of the way through. On top of the many-times-repeated melody, Ravel introduces a woodwind on *sol* instead of the expected *do*, and this voice persists through the strain, maintaining the same exact level above the other melody instruments. The effect is an entirely new orchestral voice, and it is produced synthetically by a kind of super intermodulation distortion. The stunt can easily be performed with the draw-bars on a Hammond organ, but Ravel's use of the technique is the only example to be found in widely played orchestra music.

V. Johann Sebastian Bach (1685-1750)

The intermodulation in Bach is all there by intent. Everything about Bach is there by intent. Bach understood the effects of intermodulation if not its scientific causes, and like all of his other tools, this was something to be used for good effect.

The suggested samplings are all taken from his organ music. The organ, as an instrument, owes a lot to intermodulation. Many of its voices are created by the mixture of primary tones, and the result is intermodulation in massive proportions.

Bach was not content with the intermodulation supplied by organ designers. He encouraged it and expanded it by the way he wrote his music. His organ works,



It took Audio Magazine 1,457 words to describe it.

"...practically any use that can be imagined is possible with the Uher 8000."

stated Audio Magazine about the Uher 8000 by Martel

"There are seven position-four speeds with three OFF positions between. Selecting the speed also adjusts equalization for each. A second switch together with an interlocked RECORD button, controls all of the electronic functions in its eleven positions, which are marked: 1-4—mono record or play on upper track; 2-3—mono record or play on lower track; STEREO—record or play; MULTIPLAY I—permits recording on the upper track from microphone and mixing with material from lower track; MULTIPLAY II—permits recording on lower track and mixing material already recorded on upper track; DIA-PILOT I—used for recording from microphone and/or from phono record or another tape machine on upper track as commentary for slides; DIA-PILOT II—after making recorded commentary on upper track, this position is used to record sub-sonic tone on lower track at points where a slide is to be changed and for playback with slide projector thereafter, with the slide changing at each point when the tone button was depressed in the second run-through; ECHO 1-4—permits adding delayed sound to an original recording on upper track, the amount of delay depending on the speed of the tape; ECHO 2-3—same operation for lower track; SYN-PLAY I—used for recording on one track for later recording another signal in synchronism with the first but on a second track when the switch is turned to the SYN-PLAY II position. Thus, practically any trick type of recording can be made with no external interconnecting or switching.

Akustomat makes it possible to use sound as a controlling medium for the recording operation. The machine can be used as a dictating machine, for example, without the need for a start-stop button—one simply speaks and the machine starts recording, and when the dictator pauses, the machine stops. Thus it may be used to monitor and record sounds of an intermittent nature over a long period of time without actually running except in the presence of some sound. We know no other machine which has this feature.

At the slowest speed and in the echo mode, the machine can be used to check pronunciation in the study of languages. One simply says a word, and then hears it back a fraction of time later. The various features of the machine provide a wide range of facilities useful in the study of music or languages. In short, practically any use that can be imagined is possible with the Uher 8000.

If you're interested in the complete review of the Uher 8000, Write for nearest dealer and reprint of complete review.

MARTEL ELECTRONICS / HOLLYWOOD
645 N. Martel Avenue
Phone (213) 938-2803

CHICAGO
1141 Merchandise
Mart Plaza
Phone (312) 644-0430

NEW YORK CITY
1199 Broadway
Phone (212) 684-0943

intended to be played in churches, are written for church acoustics as well as church organs. The echo, the reverberation and the intermodulation are all part of the score, and the modern organist is often surprised to find that he brings them out just by playing the notes.

The Bach samplings are to be *Preludes and Fugues for Organ* (13), *Fantasia and Fugue in G, "The Great"* (11), *Passacaglia and Fugue in C* (17), and *Tocatta and Fugue in D* (25). Some of them are of course duplicated in other collections of his organ music, of which there are 22 available. These works are not to be compared with anything in particular. Just turn up the volume, settle back, and revel in the "bad" sound. Æ

JAZZ

(from page 51)

Barney Kessel's Swingin' Party Contemporary Stereo S7613

In a more successful effort to combine the excitement of a live performance with the superior audio quality of a studio-engineered recording, Contemporary had the happy thought to bring the audience into the recording studio. Tables, chairs, food, drink and an invited group of enthusiastic friends were all moved into its back-room studio for a session

by guitarist Barney Kessel and his quartet. Both sonically and musically the results of this experiment are a huge success. A mood of happy excitement pervades all six selections on this disc, and the recording has captured some of that rare feeling of impetuosity, that occurs when jazzmen are engaged in total collaboration and each is impatient to commence his solos. The group consisting of Marvin Jenkins, piano and flute, Gary Peacock, bass, and Ron Lundberg, drums, functions smoothly as a unit, and their styles are well matched to Barney Kessel's up-tempo swagger. Sound is quite directional, but the center is well filled in, and audience noises are not obtrusive.

Dexter Gordon: Our Man in Paris Blue Note Mono 4146

In recent years a number of the most talented of America's jazz greats have relocated in Paris where they have not only made a major contribution to European musical performance, but have, in a number of instances, added to their own stature as a result of their contact with different culture and surroundings. Dexter Gordon is one of the most outstanding of this coterie of expatriate jazzmen, and this latest recording, made in Paris with Americans Bud Powell, piano, Kenny Clarke, drums, and French bassist Pierre Michelot, is ample demonstration of the loss suffered by stateside enthusiasts. The five tunes on this waxing: *Scrapple From the Apple*, *Willow Weep for Me*, *Broadway*, *Stairway to the Stars*, and *A Night in Tunisia* present opportunities for music making in a variety of moods, and Gordon does not fail to speak out with eloquence in each of them. Sound is good on this mono recording, but not all of Bud Powell's fine backing comes across. His solos emerge clearly, however, and the sound of the bass is always crisp without receiving undue prominence. Let's hope that this is just the first of a long series of releases with these four men whose closely-related ideas and splendid teamwork make this disc such a rewarding experience. Æ

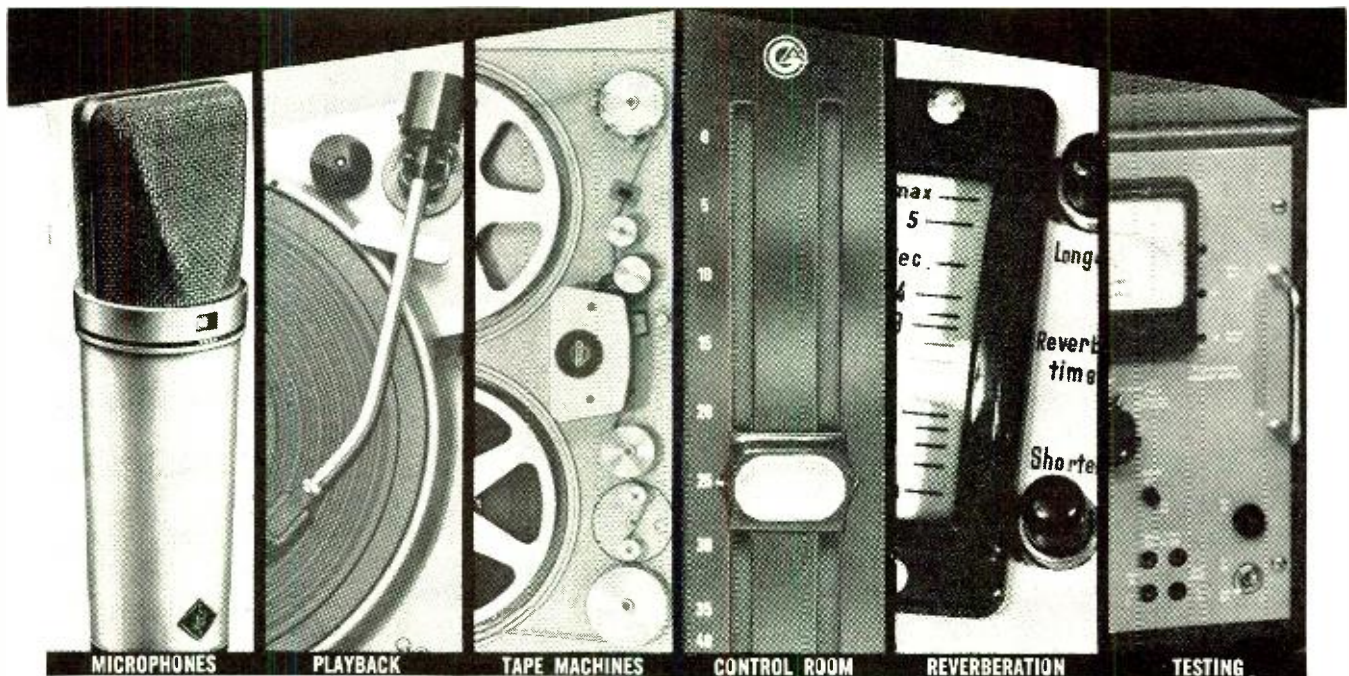
Unlike
any speaker
you've ever
heard...



The New
Empire

Grenadier

CIRCLE 68



MICROPHONES

PLAYBACK

TAPE MACHINES

CONTROL ROOM

REVERBERATION

TESTING

SATISFYING THE HIGHEST QUALITY DEMANDS OF BROADCAST TECHNOLOGY

GOTHAM

AUDIO CORPORATION

2 WEST 46 STREET, NEW YORK 36, N. Y. • 212-CO 5-4111

In Canada: J-Mar Electronics Ltd., P. O. Box 158, Don Mills, Ontario

CATALOG ON LETTERHEAD REQUEST

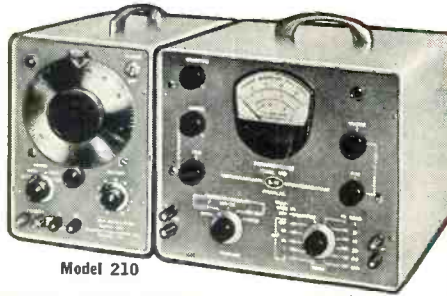


CIRCLE 59

New!



**INSTRUMENTS
for AUDIO
MEASUREMENTS**



Model 210

Model 410

MODEL 410 DISTORTION METER

• Measures audio distortion, noise level and AC voltages • Also a versatile vacuum tube voltmeter. • Distortion levels as low as .1% can be measured on fundamental frequencies from 20 to 20,000 cps, indicates harmonics up to 100,000 cps • Distortion measurements can be made on signal levels of .1 volt to 30 volts rms • The vacuum tube voltmeter

provides an accuracy of $\pm 5\%$ over a frequency range from 20 cps to 200 KC. For noise and db measurements, the instrument is calibrated in 1 db steps from 0 db to -15 db, the built-in attenuator provides additional ranges from -60 db to +50 db in 10 db steps.

MODEL 210 AUDIO OSCILLATOR

• Provides a sine wave signal from 10 cps to 100 kc • Output level within ± 1 db when working into 600 ohms (reference 5 kc) • Power output, variable to above 150 mw • Hum and noise, -70

db at 5 volts output • Distortion is less than .2% at 5 volts output from 50 to 20,000 cps, slightly higher at higher output and frequency extremes.

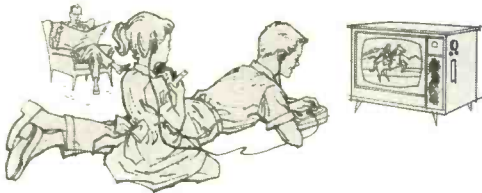
These instruments are supplied with many B.C. station installations for FCC Proof-of Performance tests.

BARKER & WILLIAMSON, Inc.
Radio Communication Equipment Since 1932
BRISTOL, PENNSYLVANIA • STILwell 8-5581



CIRCLE 69

NOW PERSONAL TV LISTENING



You Can Enjoy TV... Or Ignore It With the

TELEX TV LISTENER

Enjoy television in private without disturbing others. Full rich sound through a comfortable, lightweight individual earphone. Others don't hear a thing. Keeps house quiet and peaceful during noisy Westerns and children's programs. Ideal for late night viewing after family is asleep. Switch sound on or off, and control volume remotely from your chair.

15 ft. listener cord and 5 ft. Earset® cord. Tune down commercials. Perfect for the hard of hearing, motels, institutions. With extra Earset® two can listen. See your local dealer.

A Product of Sound Research



COMMUNICATIONS ACCESSORIES

3054 Excelsior Blvd. • Minneapolis 16, Minn.

CIRCLE 60

MASTER TIMER

(from page 20)

Applications

The described equipment will find uses almost anywhere recording is performed and the musical material possesses a regular beat or tempo. In portable form, it may be taken to "on location" recording sessions. In such instances, the program is usually "live," and it is not feasible to control the individual performers. The conductor usually establishes (mentally) the required tempo, prior to commencing a selection, by use of a watch metronome. He relies solely on human timing to maintain this tempo subsequent to initial reference. A 2000-ohm headset jacked into the output of the master timer will not only provide him with the desired tempo, but will insure regularity throughout the performance. The headset may be worn partially over one ear so as not to impair his hearing with respect to the performers.

Anyone questioning the value of such an arrangement would do well to conduct some personal experiments at live performances. Military band type of program material offers the best opportunity for this observation and, supposedly, presents less problems to the musicians with respect to maintaining tempo. Use of some standard tempo device during such performances will reveal the tempo irregularities of most performed selections. Particularly noticeable will be the (natural) increase in tempo associated with most crescendo passages.

Studio use of the master timer offers not only the assured regularity, but the accuracy of the total running time of the recorded material. In commercial recording, this results in a saving in studio time, which is a valuable commodity to the recording company. For example, recording Chopin's "Minute Waltz" using a headset and the timer (set to the proper tempo) would undoubtedly reduce the studio time required.

The same philosophy applies to 10 and 20 second spots and commercials. Normally, when recording popular material, a considerable amount of time can be saved (exclusive of better performance results) by correlating score to actual tempo and desired playing time prior to initial "takes." This procedure usually causes chorus numbers, bridge inclusions or eliminations, and general overhaul required for proper length to occur before much time is consumed in trial "takes." It also offers the performers a chance to hear actual tempo required before any changes are made in score.

As mentioned earlier, use of the timer



**PORTABLE...
PRECISION-MADE!**

NEW BUTOBA model MT-7F



Lowest priced modern, battery operated, transistorized portable of superb quality — ideal for music or speech. Built-in remote control facility . . . stop-start switching on the microphone for dictation in the office or car!

SPECIFICATIONS:

Records 2 full hours • Power supply: rechargeable battery, or 6/12 V car battery, or AC converter • Push buttons enable easy operation while in carrying case • Safety record lock • Microphone and Radio Phono inputs • Headphones/external speaker connections • Pause control • 3 1/4 and 1 1/2 ips. • Frequency response: 100-12,000 cycles at 3 1/4 ips. • Recording level indicator • 4" x 6" heavy duty loudspeaker • Transistorized speed regulator.

BUTOBA model MT-5



BUTOBA is a precision tape recorder, quality-engineered and hand-crafted by skilled West German technicians, offering performance and features never before found in portable recorders! **New Reduced Price!**

UNEQUALLED FEATURES:

6 hrs. recording on 5 inch reels • Fast forward and rewind • 2 motors with transistorized electronic speed control • tone control • push-pull amplifier • 5" x 7" heavy-duty speaker • Tape counter • 40 hrs. on 8 ordinary flashlight batteries • Transistorized, battery or AC.

SPECIFICATIONS:

Response: 50-13,000 cps. @ 3 1/4 ips., 60-6,000 cps. @ 1 1/2 ips. • Half track • Compact • Lightweight • With dynamic mike • Full line of accessories.

BOOKLET FREE!
"25 WAYS TO USE YOUR TAPE RECORDER" and color folder. Yours for the asking. Write . . .

STANFORD INTERNATIONAL
569 Laurel Street • San Carlos, Calif.
Telephone: 591-0339

Circle 61

also offers the ability to isolate the individual performers for better microphone placement and control, and still maintain accurate tempo.

Still another use, would be that of recording the output of the timer either through the console or from microphone pickup from studio speaker. When the signal is routed through a variable equalizer prior to final output, a wide variety of sounds can be obtained to provide, or augment the rhythm section, and, since it is studio controlled, it can be used intermittently or continuously on the tape, while being used continuously to the performers through the use of headsets.

Combined use of variable equalizers and pan pots offers a fertile area in multi-track "gimmick" recordings, particularly when coupled with tape reverbation or repetition.

The applications listed are only those used to good advantage by the author and many other beneficial uses certainly may present themselves with the continued use of this piece of equipment.

In any event, while providing only those functions previously mentioned, this small unit can easily become the basic "work-horse" of the musical recording studio, and is well worth the small output of time and expense required for its construction. Æ

ADVANCE ORDERS

BOUND VOLUMES

**1963 Issues
Audio Magazine**

Order Now*

**LIMITED NUMBER
AVAILABLE**

**\$10.00 EACH POSTPAID
U. S. DELIVERY ONLY**

**Send Order
and Remittance Today**

**Book Division
Radio Magazines, Inc.**

**P.O. Box 629
Mineola, N. Y.**

*Delivery January 15, 1964

**Unlike
any speaker
you've
ever seen...**



**The New
Empire
Grenadier**

Circle 70

Permoflux

**Dynamic
HEADPHONES**



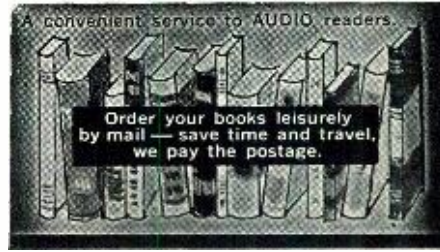
**THE ONLY HEADPHONES WITH A
LIFETIME GUARANTEE**

Permoflux presents . . . Absolutely the finest sound in stereo high fidelity today. Professional quality sound with exciting features that add up to the greatest value in stereo listening.


- TONAL STABILITY
- COMPARATIVE FREEDOM FROM HARMONIC DISTORTION
- WIDEST FREQUENCY RESPONSE
- BEST POWER HANDLING
- LONGEST LIFE

Feature for feature your best headphone buy is Permoflux—with a lifetime warranty. Write for free details.

PERMOFLUX CORPORATION
P. O. Box 1945, Glendale, Calif.
Circle 80



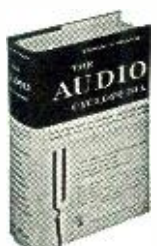
Maintaining Hi-Fi Equipment
Joseph Marshall
 A valuable reference for anyone whose living or hobby is servicing hi-fi equipment. Outlines the professional approach for servicing all types of hi-fi components. Covers trouble-shooting of electronic, mechanical and acoustic problems. 224 pages.
No. 58 Paperback \$2.90*



Designing and Building Hi-Fi Furniture
Jeff Markel
 Written by a professional hi-fi furniture designer who has taught furniture design at leading colleges, this book is an authentic reference of value to the hi-fi fan and professional custom builder. Covers everything from types of woods to furniture finishing for the mechanically adept; design principles, styles and arrangements for the decor minded. 224 pages.
No. 79 Paperback \$2.90*



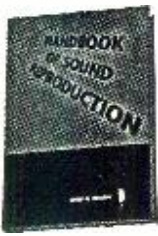
"The AUDIO Cyclopaedia"
Howard M. Tremaine
 Here is one single volume with the most comprehensive coverage of every phase of audio. Concise, accurate explanations of all audio and hi-fi subjects. More than 7 years in preparation—the most authoritative encyclopedic work with a unique quick reference system for instant answers to any question. A vital complete reference book for every audio engineer, technician, and serious audiophile.
 • 1280 pages
 • 3400 topics
 • 1600 illustrations
No. 123 \$19.95*




McProud High Fidelity Omnibook
 Prepared and edited by C. G. McProud, publisher of Audio and noted authority and pioneer in the field of high fidelity. Contains a wealth of ideas, how to's, what to's, and when to's, written so plainly that both engineer and layman can appreciate its valuable content. Covers planning, problems with decoration, cabinets and building hi-fi furniture. A perfect guide.
No. 115 \$2.50*




Handbook of Sound Reproduction
Edgor M. Villchur
 Right up to date, a complete course on sound reproduction. Covers everything from the basic elements to individual chapters of each of the important components of a high fidelity system.
No. 110 \$3.75*




The 5th AUDIO Anthology
 Edited by C. G. McProud, publisher of AUDIO. An anthology of the most significant articles covering: stereo recording and reproduction; stereo multiplex; measurements; stereo technology, construction and theory — which appeared in AUDIO during 1958 and 1959. The 5th is truly a collector's item and a valuable reference for the professional engineer, teacher, student, hobbyist and hi-fi fan. 144 pages.
No. 125 \$3.50



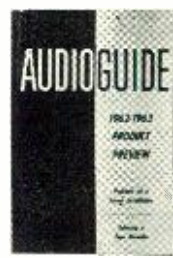
Tape Recorders and Tape Recording
Harold D. Weiler
 A complete book on home recording by the author of *High Fidelity Simplified*. Easy to read and learn the techniques required for professional results with home recorders. Covers room acoustics, microphone techniques, sound effects, editing and splicing, etc. Invaluable to recording enthusiasts.
No. 112 Paper Cover \$2.95*



"the best of AUDIO" —
 edited by C. G. McProud
 A new compendium of AUDIO knowledge. Here is a collection of the best of AUDIO — The AUDIO Clinic by Joseph Giovanelli . . . noted audio engineer and the original high fidelity answer-man — EQUIPMENT PROFILES edited by C. G. McProud . . . Editor of AUDIO. Here is a wealth of hi-fi and audio information. Answers to the most important issues in high fidelity and a valuable reference.
No. 124 Volume I \$2.00*



AUDIOGUIDE
 By the editors of AUDIO, the original magazine about high fidelity. A 1962-1963 product review of stereo high fidelity components. Valuable reference for the high fidelity enthusiast and hobbyist. Part I contains a thorough discussion of the *Problems of a Stereo Installation*; Part II is a complete treatise on *Selecting a Tape Recorder*. Indispensable to the prospective buyer of stereo components and tape recorders. Includes a section on where to buy various stereo hi-fi components and accessories. 156 pages.
No. 127 \$1.00



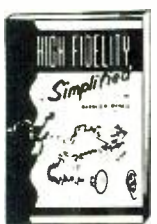
● MONTHLY SPECIAL! SAVE \$5.25

Save over 45% with this collection of AUDIO Books.
 Handbook of Sound Reproduction (\$3.75) "best of AUDIO" (\$2.00)
 McProud High Fidelity Omnibook (\$2.50)
 Tape Recorders & Tape Recording (\$2.95)

TOTAL VALUE OF ALL FOUR BOOKS \$11.20
Your cost ONLY \$5.95 POSTPAID

This offer expires February 29, 1964. Good only on direct order to Publisher
CIRCLE OS300

High Fidelity Simplified
Harold D. Weiler 3rd Edition
 The complete hi-fi story — answers all questions about tuners, changers, amplifiers, tape recorders, speakers, record players, etc. Lots of ideas for custom installations. Tells how to achieve concert hall reception in your home. 216 pages.
No. 142 \$3.30




AUDIO Bookshelf — RADIO MAGAZINES, INC.
 P. O. Box 629, Mineola, New York 11502
 Please send me the books I have circled below. I am enclosing the full remittance of \$..... (No C.O.D. or billing.)

58	79	110	112	115	123
124	125	127	142	251	OS300

NAME _____
 ADDRESS _____
 CITY _____ STATE _____ ZIP _____

*All U.S.A. and CANADIAN orders shipped postpaid.

Getting The Most Out Of Your Tape Recorder
Herman Burstein
 Written in "plain talk" for the man who has, or wishes to buy, a tape recorder. It answers the myriad questions raised by tape recording enthusiasts. Its chapters cover every phase of operation and maintenance—from adding a tape recorder to the hi-fi system, to a thorough dissertation on microphones. Lots of practical information on how to buy. 176 pages.
No. 251 \$4.25



THIS MONTH'S COVER

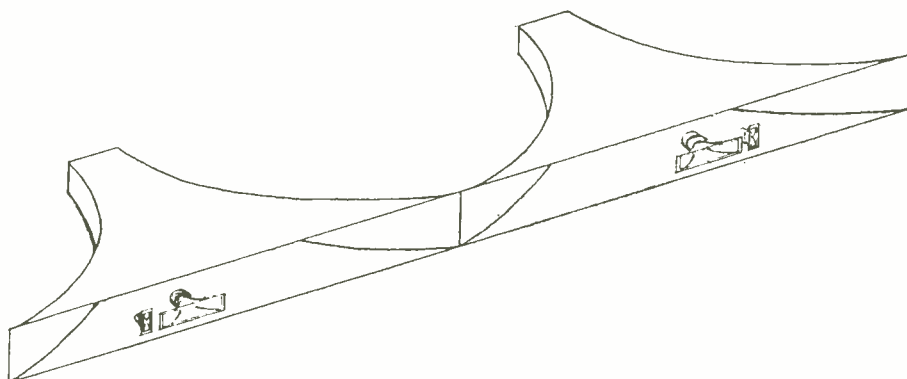


Fig. 1. Sketch of speaker shape and placement.

Dr. T. G. Patton of 5659 Sycamore, Rialto, California wanted quality music reproduction to be an integral part of the new home he was building. The resulting stereo speaker system conceived by William G. Dilley, Audio Consultant of San Bernardino, California fulfilled all his requirements in a most unique and unusual manner. The innocent looking grille panel above the fireplace belies the magnitude of the systems it hides. Two separate exponential horns, each having a mouth length of over eight feet, sit side by side and cover the entire width of the 17-ft. room (see Fig. 1 and 2). Each speaker system is 3-way: a 15-in. driver for the bass horn, with a mid-range horn and a horn tweeter both housed inside the large horn. The bass horns were constructed of 3/4-in. plywood (top and bottom) and 1/4-in. braced plywood (sides). The horns were designed for 40 cps, and the flare was calculated at each foot interval of length.

During installation, the "mid-range" and "hi" speakers were directed slightly inward and downward to converge on the listening area, and there is no resulting impression that the music comes "down" from above.

In addition to the fine quality derived



Fig. 2. During construction.

from the use of the horns, the system offers two additional advantages: (1) No valuable floor space is consumed; (2) no visual identification of separate speaker systems is possible.

This latter advantage prevents a "mental" channel separation by the listener and allows the music source to realistically position itself by hearing senses alone.

RECORDS

(from page 47)

Twilight of Steam Locomotives" (Grosset and Dunlap).

The record ties into a few pages of the book. Thus: (Side 2, Track One) "0-6-OT No. 13 of the Brooklyn Eastern District Terminal is the star of Chapter 12, pages 116-121. Here she makes her recording debut in the very last days of BEDT steam." Trouble is, the book's chapters are not numbered, and most of the pages aren't either. So by the time you've scrounged through fifty pages frantically looking for p. 116, chapter 12, we are chugging along three hands later! I gave up the tie-in after five minutes.

Boris Christoff—Songs of Glinka. Alexandre Labinsky, pf.

Angel 36133 stereo

Glinka was the first Russian "nationalist" composer, back in the early mid-Nineteenth century. To us today, his nationalism sounds

pretty much like any old Pan-European Romanticism and not particularly Russian; but that is our fault and time's fault. He was, indeed, the pioneer of the Russian style, leading onwards to such as Moussorgsky, even Tchaikovsky—who, oddly enough, sounds much more Russian today than he used to in his own time, when he was known as an "internationalist" of sorts.

All this Boris Christoff, the big bass, knows very well. His singing is exactly right for these somewhat dated Romantic songs written in the first half of the last century. They do, indeed, foreshadow "Boris Goudonov" of much later; they also suggest many a work by Schumann and even Schubert and anticipate such famous songs as "The Two Grenadiers," beloved of a million solo singers.

It is surely not very big music, and a few songs at a time are enough. But the good musicianship all around, the massively beautiful voice and, in particular, the delicacy of the historical re-creation, make this a fine record to own if you are interested in solo song.

Unlike
any speaker
you've
ever seen...



Unlike
any speaker
you've
ever heard...



The New
Empire

Grenadier

CIRCLE 63

SYMPHONIETTA

NEW
HIGH
FIDELITY
SPEAKER
SYSTEM



of the 3-way horn-loaded type. Expensive true-fidelity sound reproduction at a popular price. Further information available on request. U. S. and Canadian representation (importers and distributors) is wanted. Apply directly to:



YL ACOUSTIC CO., LTD.
19 Shiba-Tamura-Cho, Minato-ku, Tokyo, JAPAN

CIRCLE 71

Unlike
any speaker
ever
created...



3 acoustic
lenses

The New
Empire
Grenadier

Circle 64

SEE
YOUR
COSTS
SHRINK
WITH KEY
DISCOUNTS

Prove it for yourself! Rush us your list of stereo hi-fi components for an immediate price-busting quotation.

Enjoy these advantages:

- LOWEST PRICES
- SPEEDY DELIVERY
- FACTORY WARRANTY
- EASY PAYMENT PLAN

For a real eye-opener, send for our valuable money-saving audio discount catalog A-17, featuring the latest in stereo equipment.



KEY ELECTRONICS CO.
120 Liberty St., N. Y. 6, N. Y.

Circle 72

NEW LITERATURE

● **RCA Receiving Tubes and Picture Tubes Booklet.** Published by Electron Tube Division, Radio Corporation of America, Harrison N. J. July 1962. 8 3/8 x 10 7/8 inches, 64 pages, A new and enlarged edition of the RCA Receiving Tube and Picture Tube booklet is now available. The new edition, 1275k, contains: 1. New tube classification chart—arranged to permit a quick determination of tubes according to structure and characteristic. In this chart tubes having similar characteristics and the same filament or heater voltage are bracketed. 2. New tube application guide—arranged to provide a convenient guide for quickly selecting a tube type for a specific application or class of service. 3. Completely revised characteristic chart—gives characteristics, operating conditions, and basing diagrams on more than 1050 RCA receiving tubes and black-and-white and color picture tubes. Copies of the RCA Receiving Tube and Picture Tubes Booklet, Form No. 1275k, may be obtained from RCA Tube Distributors, or by sending \$0.50 to Commercial Engineering Electron Tube Division, Harrison, New Jersey.

● **Public Address Equipment.** A 6-page brochure describing their line of public address equipment is available from Newcomb Audio Products Co. Included are amplifiers, speakers, cabinet racks, and various panels. Newcomb Audio Products Co., 6824 Lexington Ave., Hollywood 38, Cal.

● **Brochure-Catalog of Electronic Measuring Instruments.** A 32-page brochure-catalog describes Waveforms, Inc. electronic measuring instruments and the theory behind their performance. The company specializes in the manufacture of oscillators, voltmeters, and transmission measuring sets. Each instrument is small in size and can be used in the field, on the bench or on a Waveforms standardized rack and panel mountings. The catalog-brochure emphasizes practical considerations of this type in addition to providing photographs, charts, complete specifications and a "back of the panel" discussion of design principles. Waveforms, Inc., 333 Sixth Ave., New York City, 10014.

● **Technical Bulletin.** The need for pedestal height adjustment in tape recorders is described in a technical bulletin prepared by the 3M Company. The company says adjustment provides for minimum tape wear, accurate response, and smooth tape motion. Of the recording inefficiencies resulting from out-of-tram situations, the bulletin says, those dealing with "Talk" Bulletin No. 39 are free from the rubbed-off coating are probably the most common. Deficiencies and corrections are examined in detail. Copies of "Sound 3M Company, Dept. Z3-499, 2501 Hudson Road, St. Paul 19, Minnesota.

● **Kit Furniture Catalog.** A new catalog is available from Furn-a-Kit describing their line of hi-fi furniture in kit form. This multi-color 12-page catalog details the various combinations of styles and interiors which are available in this easy-to-build line. Also includes other furniture for the modern home. Furn-a-Kit, 151 East 53 Street, N.Y.C., N. Y.

● **New Product Brochure.** A new 8-page brochure from Empire Scientific Corp. describes the technical features of their latest line of record playback components. Included are descriptions and diagrams of the Empire Troubador 398 and the new 488 Troubador, tailor-made for console or equipment cabinets. In addition there are specifications of the 880p mono-stereo cartridge and the 980 playback arm. Included in the brochure are helpful hints about the care and evaluation of record playback systems and recommendations for a basic stereo record library. Empire Scientific Corp., 845 Stewart Avenue, Garden City, LI, N. Y.

CLASSIFIED

Rates: 10¢ per word per insertion for noncommercial advertisements; 25¢ per word for commercial advertisements. Rates are net, and no discounts will be allowed. Copy must be accompanied by remittance in full, and must reach the New York office by the first of the month preceding the date of issue.

HIGH FIDELITY SPEAKERS REPAIRED
AMPRITE SPEAKER SERVICE
168 W. 23rd St., New York 11, N. Y.
CH 3-4812

ENJOY PLEASANT SURPRISES? Then write us before you purchase any hi-fi. You'll be glad you did. Unusual savings. Key Electronics, 120 Liberty St., New York 6, N. Y. CLOverdale 8-4288.

SALE ITEMS—tapes—package quotes. Bayla, Box 131-O, Wantagh, N. Y.

MILITARY DISCOUNT—name brands. Free recording tape and stereo handbook. Include rank, serial number. Electronics International, Inc. Box 3066, Charlottesville, Virginia.

WRITE FOR lowest quotations, components, recorders. No catalogs. HI-FIDELITY SUPPLY, 2817-BC Third, New York 55, N. Y.

HI-FI COMPONENTS, tape recorders at guaranteed "We Will Not Be Undersold" prices. All brands in stock. 15-day money-back guarantee. 2-year warranty. Write your requirements for quotation. No catalog. Hi-Fidelity Center, 1797-V 1st Ave., New York 28, N. Y.

HARPSICHORD. Same as owned by Philadelphia Orchestra and RCA Victor. In kit form for home workshop assembly, \$150. Clavichord kit, \$100. Free brochure. Write: Zuckermann Harpsichords, Dept. R, 115 Christopher St., New York 14, N. Y.

STEREO TAPES: 50% off. Send for free literature. Stereo Tape Supply Co., P. O. Box 3361, Orlando, Fla.

NEW IN SOUND FOR "64": Full fidelity loud-speaker systems. Brochure. Island Associated Industries, 1261 Staley Rd., Grand Island, N. Y.

FOR SALE: Butoba (German manufacture) portable, full track, transistorized tape recorder, type MT5, line or battery—with battery carriage M501. Weight 17 pounds. Used one hour. New condition. Shipped prepaid. \$210.00. Audiophile Records, Inc., Saukville, Wis.

WANTED: Pair Marantz Model 3 electronic crossovers, Lou Getman, 658 Huanakai St., Honolulu, Hawaii.

TWO BODINE TORQUE MOTORS for Ampex 350, for sale. Used but with new set of spare, noise-selected bearings and three capacitors. \$75, the pair. Francis Daniel, 207 West 106 St., New York 25, N. Y.

SALE: Harmon-Kadon Citation I preamplifier. 1 1/2 years, top condition, \$110. Joseph Roesmer, 1407 Marion Drive, Pittsburgh 36, Pa. (412) 665-7738.

WANTED: Monophonic tape recorder: Ampex 600, Concertone 1502 or similar. D. Peterson, 2172-B 45th, Los Alamos, New Mexico.

SALE: Marantz Model S, \$185; factory-wired Citation III-X, \$185; excellent condition. W. L. Torgeson, 4716 W. 60th St., Minneapolis 24, Minne.

● **Scott Guide to Custom Stereo.** H. H. Scott, Inc., announces the availability of their new 1964 "Guide to Custom Stereo." This 24-page handbook is completely illustrated; many of the photos are in full color. Typical chapters include: "How FM Multiplex Works," "Selecting an Amplifier," and "Selecting a Tuner." Also included are many photographs and suggestions on the installation of stereo in the home. In addition there is a buying guide to 1964 Scott tuners, amplifiers, tuner-amplifiers, kits, and speakers. There is a special section on transistor amplifiers and tuners. H. H. Scott, Inc., Dept. P, 111 Powdermill Road, Maynard, Mass.

B-10

save over 40% on hi-fi

WRITE FOR OUR PRICE NOW. YOU'LL BE GLAD YOU DID.

- Up to 24 mos. to pay
- * 15 day money-back guarantee.
- * Full 2 yr Warranty-Parts & Labor.
- * Factory Warranted all lines. We ship from stock.
- * Trade-ins Highest allowance-Send your list.
- * Citizens Band, P.A. Systems in stock.
- * 19th year of reliable service-world-wide.
- * We guarantee "WE WILL NOT BE UNDERSOLD."

HI-FIDELITY CENTER
"The House of Low Low Prices"

Best Buy.
Hi-Fi List Free.
1797-U 1st Ave.
New York, N. Y. 10028

Circle 74

AUDIO unlimited, inc.

Specializes in **SAVING YOU MONEY**

- FACTORY FRESH COMPONENTS
- LOWEST POSSIBLE QUOTATIONS
- FAST DELIVERY
- TIME PAYMENTS UP TO 36 MOS.

We are FRANCHISED by OVER 50 NATIONALLY FAMOUS MANUFACTURERS. WRITE FOR BARGAIN LIST.

Visit Our Warehouse 715A 2nd Ave., (N. 38th) New York 16, New York

Circle 75

FAST SHIPMENTS

RECORDERS • TAPES

COMPONENTS • KITS

- BEST-BY-COMPARISON PRICES.
- FACTORY SEALED CARTONS
- SEND FOR "QUOTES" ON PACKAGE DEALS AND SAVE MORE

WRITE FOR MONTHLY SPECIALS

CARSTON Studios

125-A East 88 St., New York 28, N. Y.

Circle 76

CANADA
High Fidelity Equipment

Complete Lines • Complete Service

Hi-Fi Records — Components and Accessories

ELECTRO-VOICE SOUND SYSTEMS

126 DUNDAS ST. WEST, TORONTO, CANADA

Circle 77

empty shoes

From braces to wheelchair to bed . . . that is the tragic life story of a child with muscular dystrophy.

Please contribute to the **MARCH FOR MUSCLAR DYSTROPHY**

Industry Notes . . .

• **Rheem Consolidates Control of Roberts.** Rheem Manufacturing Company has increased from 36 per cent to 99 per cent its share ownership interest in Roberts Electronics, Inc. **A. Lightfoot Walker**, Rheem president, announced today. Roberts, with headquarters in Los Angeles, markets tape recorders and accessories through more than 1800 franchised dealers throughout North America. In the transaction, holders of Roberts common stock are receiving Rheem common shares in exchange for Robert shares, as outlined in an offer by Rheem announced early in September. Mr. Walker said the acquisition would help Rheem "expand in the growing professional and entertainment market for tape recorders, as well as in the educational audio-visual field." Rheem Califone Corporation, another subsidiary based in Los Angeles, makes language laboratories, tape recorders, phonographs, sound systems and teaching machines and other audio-visual devices for education and industrial training.

• **EICO Warms House.** Cold outside and warm inside was the order of the day at EICO on January 7, 1964. That was the day that this fast-growing company invited friends to inspect their new, larger quarters in Flushing, N.Y.

EICO actually occupied the building in October, 1963, and the housewarming was originally scheduled shortly thereafter, but the tragedy of November 22, 1963 naturally caused it to be delayed.

The new EICO building is located at 131-09 39 Ave., Flushing, N.Y. and contains 100,000 square feet on two floors. 300 employees are housed in the building at present, but there is obviously much room for expansion. Perhaps that was the idea all along. Good Luck!

Unlike any speaker ever conceived... Acoustic flat frequency response



The New Empire

Grenadier

Circle 73

HERE IS A CHECKLIST OF MEANINGFUL FEATURES YOU SHOULD LOOK FOR IN A FINE QUALITY HEADSET RECEIVER



CONSTRUCTION The headset should be lightweight, yet substantially constructed to withstand continued use. Adjustment on the head should be almost automatic. Cables should be in a plastic jacket and reinforced at junction points to withstand wear. Ideally, it should have an 8-foot cable and a two circuit stereo plug.

COMFORT Extreme comfort is essential for many hours of continuous listening pleasure. Ear cushions should be highly compliant to conform to the contours of the head, even if the listener is wearing glasses. Pressure of the ear domes must be precisely set to avoid fatigue.

COUPLING Joining of the receiver to the ear is an important characteristic. Close, direct coupling is necessary to assure maximum abatement of external sounds and the reinforcement of bass and treble frequencies.

PERFORMANCE Sound quality — frequency and transient response with negligible distortion — must be equal to that of the best high quality speaker system . . . without the problems of room acoustics.

MORE IMPORTANT try the DAVID CLARK/100 at the start — for a true quality standard, a reference for judging the performance quality of all headset receivers.

Only the DAVID CLARK/100 features exclusive Direct Acoustical Coupling for truly private listening — provides a rich, natural quality of music only you can hear.

For stereo or mono
DAVID CLARK/100
\$39.50

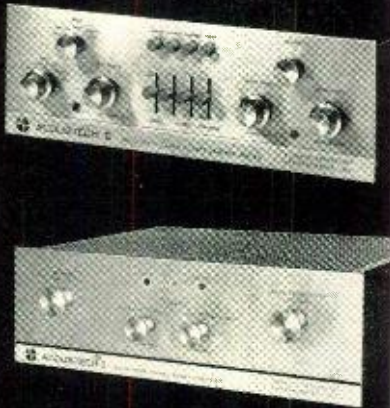
Supplied with 8-foot cable, 2 circuit stereo plug.

At DAVID CLARK franchised dealers.
FREE! Send for the David Clark Story of Personal Listening. Write Department A-24.

David Clark COMPANY
INCORPORATED
WORCESTER, MASSACHUSETTS

Circle 65

“...major
step
forward”*



ACOUSTECH SOLID STATE AMPLIFYING SYSTEM

“... better than the best** ...”
“... seems to ‘grab hold of’ and
control a speaker to a degree that
has led many listeners to remark
that the speaker itself ‘never sounded
better.’** ... the finest square wave
response I have ever observed** ...”

These are examples of the acclaim
accorded the Acoustech I Solid State
Stereo Power Amplifier since its in-
troduction at the 1962 New York High
Fidelity Show. Now the first “all-out”
solid state amplifying system is made
possible with the new Acoustech II
Stereo Decade Control Center. These
two units afford the listener a new
standard in music reproduction and
reliability possible only with solid
state circuitry throughout.

For full information on these remarkable
instruments, send coupon below.

Acoustech I \$395, Acoustech II \$348
(slightly higher west of Rockies)

*High Fidelity Magazine, August, 1962
**HiFi/Stereo Review, February, 1963



ACOUSTECH, Inc., 139 Main St.
Cambridge, Mass. 02142 Dept. A-2.

Name _____

Address _____

City _____ State _____

CIRCLE 66

ADVERTISING INDEX

Acoustech, Inc.	66
Acoustic Research, Inc.	29
Altec Lansing Corporation	14, 48
Ampex Corporation	5
Audio Bookshelf	62
Audio Fidelity Records	45
Audio Unlimited	65
Barker & Williamson, Inc.	60
Benjamin Electronic Sound Corp.	51
Bozak	15
British Industries Corporation	3
Carston Studios	65
Clark, David, Company	65
Classified	64
Concord	33, 34
Dynaco, Inc.	8
Eastman Kodak Company, Inc.	43
EICO Electronic Instr., Co., Inc.	11
Electro-Voice, Inc.	Cov IV, 1
Electro-Voice Sound Systems	65
Empire Scientific Corp.	59, 61, 63, 64, 65, 66
Ercona Corporation	52
Fairchild Recording Equipment Corp.	54
Finney Company	4
Fisher Radio Corp.	7
Frazier, Inc.	57
Garrard Sales Corp.	3
Gotham Audio Corporation	59
Harman-Kardon	9
Hi Fidelity Center	65
International Electroacoustics, Inc.	46
Itoh, C., & Co., Ltd. (Lux)	37
Key Electronics Company	64
Koss Electronics, Inc.	49
Lafayette Radio	66
Lansing, James B., Sound, Inc.	39
3 M Company	Cov III
Martel Electronics	58
McIntosh Laboratory, Inc.	58
Newcomb Audio Products Co.	13
North American Philips Co., Inc.	47, 56
Paran Development Corp.	41
Permoflux Corporation	61
Pickering & Company, Inc.	17
Pure Sonics, Inc.	12
Scott, H. H., Inc.	Cov I
Sennheiser Electronic Corp. (N. Y.)	55
Sherwood Electronic Laboratories, Inc.	18
Shure Brothers, Inc.	25
Stanford International	61
Stanton Magnetics, Inc.	27
Superscope, Inc.	50
Telex Acoustic Products	60
University Loudspeakers	31
Vernon Audio	57
YL Acoustic Co., Ltd.	63

Unlike
any magnetic
structure ever
constructed—
enough power
to lift a ...



The New
Empire

Grenadier

CIRCLE 78

LAFAYETTE

RK-140



Imported

ONLY **9950**
\$5 Monthly

Mikes and Case
OPTIONAL

LAFAYETTE PROFESSIONAL 4-TRACK STEREO RECORD and PLAYBACK TAPE DECK

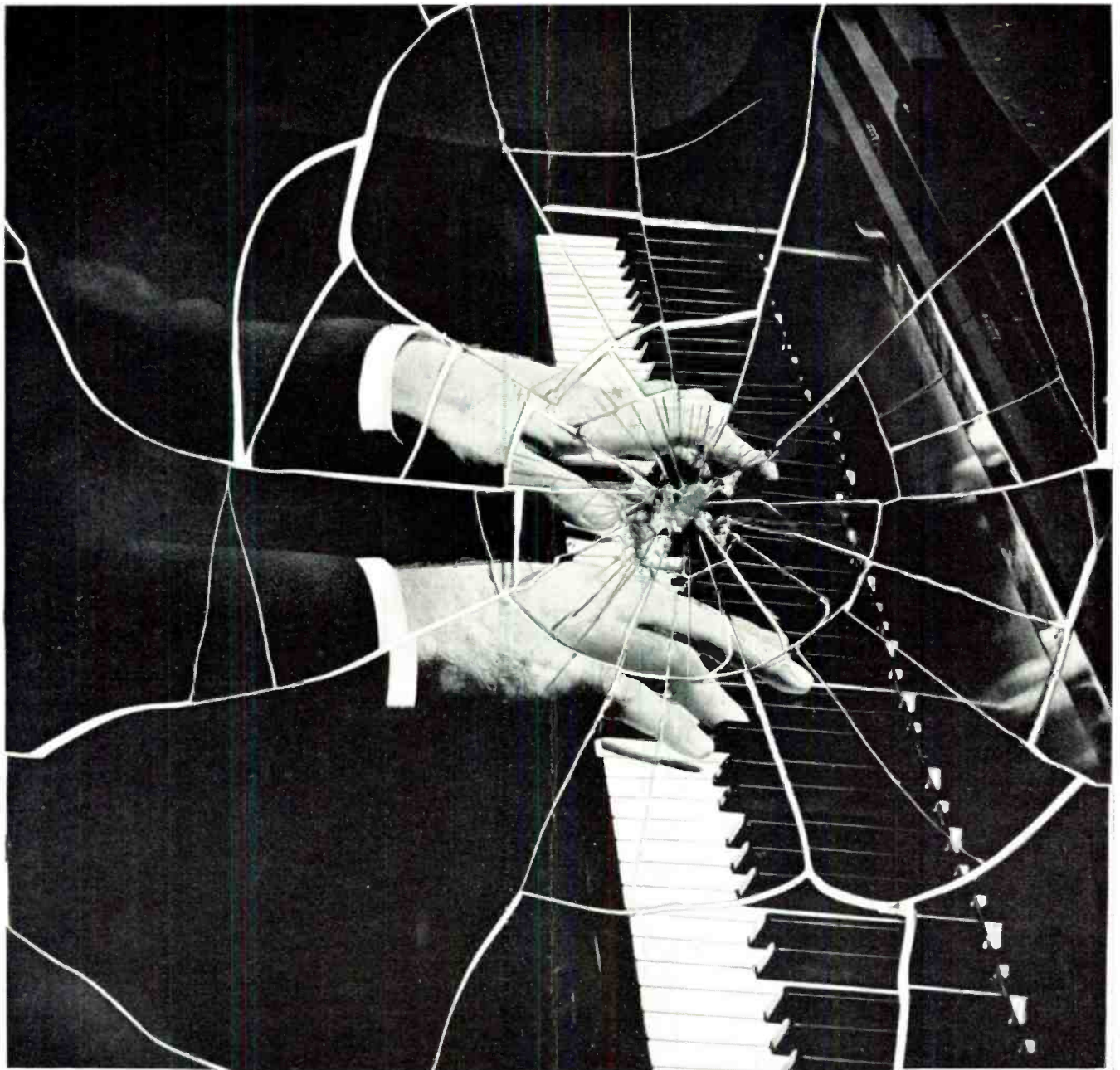
Complete with Built-in Transistorized
Record/Playback Preamps

- Records Sound-with-Sound • 2 Record-
ing Level Meters • Records 4-Track Stereo
& Mono • Plays 4 & 2 Track Stereo, 4, 2
and Full Track Mono • With Connecting
Cables and 7" Take-up Reel

Free! LAFAYETTE Radio ELECTRONICS
Dept. AB-4, P.O. Box 10,
Syosset, L.I., N.Y. 11791
 Rush me FREE Giant 422 Page 1964
Cat. 640
 RK-140 tape deck \$... Enclosed.
Shipping Charges Collect

Name _____
Address _____
City _____ Zone _____ State _____

CIRCLE 79



Cracked cadenzas in your concerto?

...then "bargain" recording tape's no bargain!

Mistakes you can buy cheap. And tape-making mistakes you're almost sure to get in recording tape sold dirt cheap without the manufacturer's name. The dangers for audiophiles? Fade out of high and low frequencies. Distortion. Background hiss. Even tape flaking, or worse, abrasiveness that can damage your recorder. Worth the gamble? Hardly.

You can make fine performance, long-life crystal-clear recordings a certainty by specifying "SCOTCH" BRAND Recording Tapes. All "SCOTCH" Tapes must pass over 100 quality tests to earn their "brand". . . tests no bargain tape could hope to pass!

Thinner, more flexible coatings of high-

potency oxides assure intimate tape-to-head contact for sharp resolution. Precision uniformity of coatings assures full frequency sensitivity, wide dynamic range, *plus* identical recording characteristics inch after inch, tape after tape. Lifetime Silicone lubrication further assures smooth

tape travel, prevents squeal, protects against head and tape wear. Complete selection of all purpose tapes—from standard to triple lengths, with up to 6 hours recording time at 3¾ ips. **See your dealer. And ask about the new "SCOTCH" Self-Threading Reel. Remember . . . on SCOTCH® BRAND Recording Tape, you hear it crystal clear.**



Magnetic Products Division **3M** COMPANY

"SCOTCH" AND THE PLAID DESIGN ARE REG. TMS OF 3M CO., ST. PAUL 19, MINN. © 1964. 3M CO.

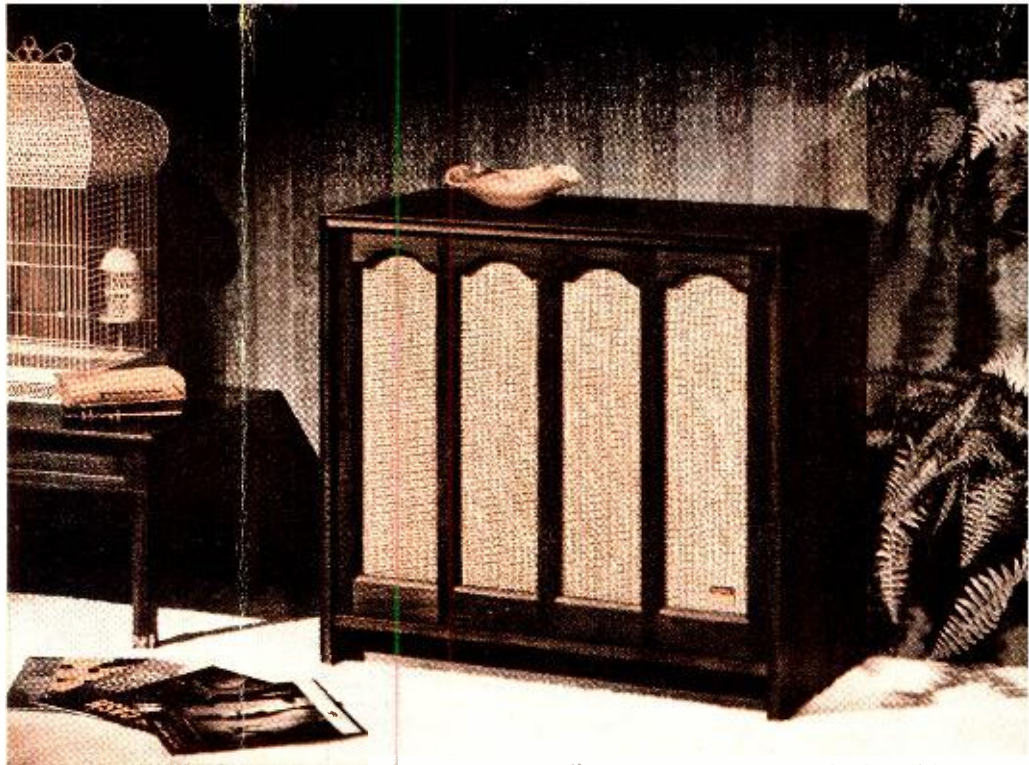
Resolved: The Conflict Between Compact Size and Big Speaker Performance!

The E-V SIX represents an entirely new trend in speaker system design: a creative synthesis of big system performance and compact convenience in an enclosure that fits all but the very smallest listening rooms.

The development of the E-V SIX was unique. As with all new E-V speaker systems, the initial concept underwent rigorous testing in the Electro-Voice laboratories. The prototype E-V SIX then went "on the road" for extended listening tests by a wide cross section of expert listeners. This testing probed for weak spots in sound character that cannot be revealed by the most exacting laboratory analysis. The final result left no doubt in the minds of listeners and engineers alike that here was a speaker system of moderate size, but with the performance attributes of a much larger system.

If this sounds like a new E-V doctrine, let's clarify a bit: we have always said — and still say — that, the larger the system, the better the sound in the fundamental first three octaves. While great strides have been made in reducing the limitations of small woofers and enclosures, a good big system is, all other factors being equal, much to be preferred over an equivalent small system. We know. We make them both. And now, with the E-V SIX, a third size emerges that combines the advantages of both sizes.

To get down to cases, only the E-V SIX uses an 18-inch woofer, over 2¼ times larger in area than the typical woofer in bookshelf-size systems. It is primarily this increase in area that contributes to unusually smooth bass response, extended range, and increased efficiency. The 18-inch diameter foam-plastic cone, combined with a long-throw voice coil, high flux magnetic system, and high compliance acoustic suspension allows the E-V SIX to move up to five times more air than competitively priced systems.



Distortion reduction is the result of about 50% less cone motion at every sound level. This means minimum nonlinearity due to excessive cone excursions. And you can hear this difference. Bass is "effortless" in sound as well as in fact. There is virtually no bass "doubling" that increases loudness at the expense of authenticity.

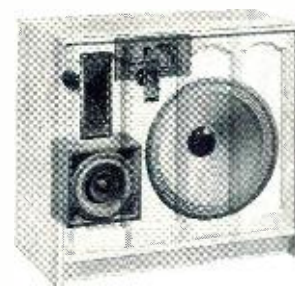
But a woofer properly designed for optimum bass performance cannot do justice to higher frequencies. In the E-V SIX there are three other component speakers — equally sophisticated — to handle the higher ranges.

Mid-bass frequencies from 250 to 800 cps are developed by a specially designed 8-inch speaker whose characteristics exactly complement the 18-inch woofer. From 800 to 3,500 cps a true compression-loaded driver with diffraction horn preserves the vital presence tones that add definition to both voice and music. The diffraction horn ensures uniform dispersion of sound throughout the listening area. The driver employs a "ring" diaphragm (lacking a central dome that is the frequent cause of distortion in this range.)

From 3,500 cps to beyond audibility (20,000 cps) a deluxe compression-loaded driver and diffraction horn completes the E-V SIX speaker complement. And all of these specialized audio instruments are combined and controlled by an electrical crossover network that utilizes the latest techniques in etched circuit board construction. A 5-position control is provided to discreetly balance the output of the E-V SIX to your listening room characteristics.

And what about E-V SIX appearance? No photograph can do justice to its hand-rubbed walnut or mahogany finish, or to the elegance of its traditional styling. And the moderate E-V SIX dimensions allow great flexibility of placement. Height is but 30 inches, width is 32 inches and depth only 17½ inches. The price is equally moderate: just \$330.00 in either finish.

We believe the E-V SIX heralds a new era in speaker system design, based on greater emphasis on performance. The task of providing a distinct improvement in sound quality with but a modest increase in size has proved both stimulating and rewarding. We urge you to consider carefully the advantages of the E-V SIX for your high fidelity system. You can hear it now at your Electro-Voice showroom. Write today for free catalog and name of the E-V dealer nearest you.



*E-V SIX components include:
18-inch acoustic suspension woofer
8-inch mid-bass speaker | Etched circuit crossover
Ring-diaphragm mid-range driver
Compression-loaded diffraction VHF driver*

ELECTRO-VOICE, INC.

Dept. 244A, Buchanan, Michigan



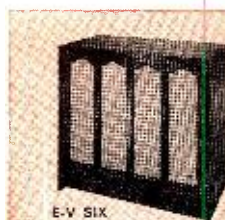
E-V TWO
\$108.00



E-V FOUR
\$136.00



REGINA
\$96.00



E-V SIX
\$330.00

Electro-Voice
SETTING NEW STANDARDS IN SOUND