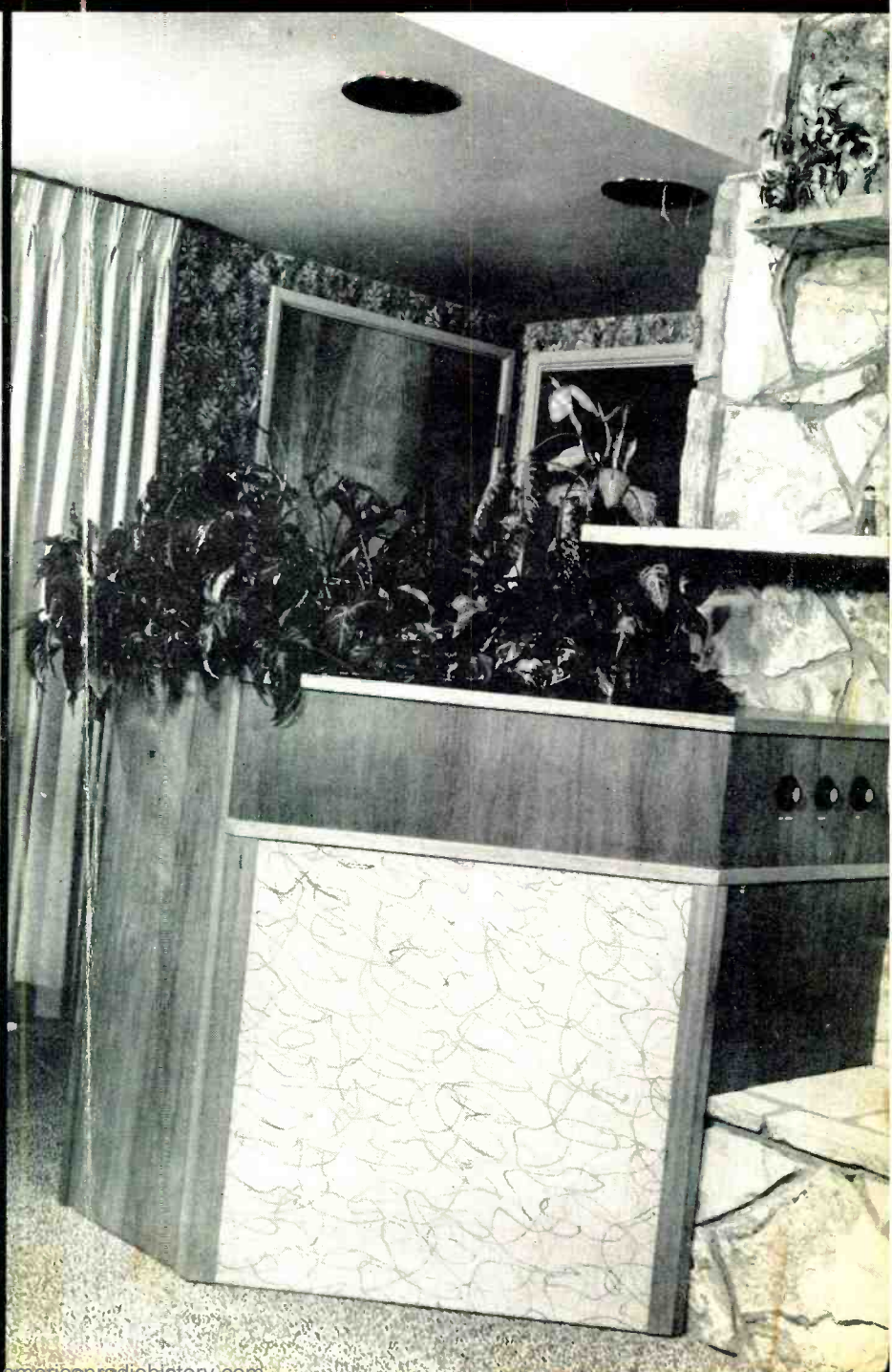


AUDIO

SEPTEMBER, 1959
50¢

...the original magazine about high fidelity!





QUIET...



as the
whisper
of a
butterfly's
wing...

because low noise and low hum are essential to hi-fi preamplifier performance, designers specify twin-triode

RCA-7025

The grace, lightness, and delicacy of the butterfly in flight seem to capture the *mood of quietude* so essential, so sought after by designers and by devotees of high-fidelity music reproduction.

Developed for high-gain, resistance-coupled "preamp" applications, high-mu twin-triode RCA-7025 is specially controlled for low noise and hum. A helical hairpin-type heater in each unit minimizes hum. In addition, RCA-7025 has an exceptionally sturdy cage assembly featuring short, stiff stem leads, oversized side-rods and micas of special design to reduce noise and microphonics.

You can fulfill the important requirements for a "quiet" preamplifier by designing around RCA-7025. Your RCA Field Representative has full information. For Technical Data, write RCA Commercial Engineering, Section I-91-DE, Harrison, New Jersey.

ANOTHER WAY RCA SERVES YOU THROUGH ELECTRONICS

EAST: 744 Broad St., Newark 2, New Jersey,
HUmboldt 5-3900

MIDWEST: Suite 1154, Merchandise Mart Plaza,
Chicago 54, Ill., WHitehall 4-2900

WEST: 6355 East Washington Boulevard, Los
Angeles 22, Calif., RAymond 3-8361



RADIO CORPORATION OF AMERICA
Electron Tube Division
Harrison, N. J.

RCA TUBES FOR HI-FI ALSO AVAILABLE AT YOUR RCA TUBE DISTRIBUTOR

AUDIO

ENGINEERING MUSIC SOUND REPRODUCTION

C. G. McProud, Editor and Publisher
 Henry A. Schober, Business Manager
 Harrie K. Richardson, Associate Editor
 Linda Sueskind, Assistant Editor
 Janet M. Durgin, Production Manager
 Edgar E. Newman, Circulation Director

Sanford L. Cahn, Advertising Director

Midwest Representative—
W. A. Cook and Associates
161 East Grand Ave., Chicago 11, Ill.
West Coast Representative—
James C. Galloway
6535 Wilshire Boulevard, Los Angeles 48, Calif.



CONTENTS

Audioclinic— <i>Joseph Gioranelli</i>	2
Audio Techniques— <i>Joseph Gioranelli</i>	6
Letters	10
Audio ETC— <i>Edward Tatnall Canby</i>	12
Editor's Report	16
Low-Noise AM Tuner Uses Triode Input— <i>Charles H. Chandler and Allen R. Greenleaf</i>	19
All for Once, Once for All— <i>Edwin F. Wirsing</i>	21
Contributory Infringement of Patents— <i>Albert Woodruff Gray</i>	24
What About Stereo Multiplexing and Matrixing?— <i>Norman H. Crowhurst</i>	26
Tape Guide—Incorporating Tape into the Audio System— <i>Herman Burstein</i>	32
A Ten-Watt All-Triode Amplifier— <i>Robert M. Voss and Robert Ellis</i>	40
A "Panphonic" Stereo Control Amplifier— <i>George Manning Lewis</i>	44
Equipment Profile— <i>Pilot SP-216-A stereo preamp-control unit; University TMS-2 Tridimensional stereo speaker; the Leak amplifier line; Dynaco Stereo 70 power amplifier kit</i>	48
Jazz and All That— <i>Charles A. Robertson</i>	56
Record Revue— <i>Edward Tatnall Canby</i>	66
Product Preview	69
Coming Hi-Fi Shows	83
AES Convention—List of Papers	84
Who's the first AUDIOMAN?	93
Errata	98
Industry Notes & People	99
Advertising Index	100

COVER PHOTO—Two of the elements of a home installation designed and built by William G. Dilley, Audio-Architectural Consultant, of San Bernardino, California. At the left is a combination end table, coffee table, and TV remote control housing; the unit at the right is one of two folded horn enclosures in his living room. This installation will be elaborated upon in the October issue. Photo by Dick Jones, San Bernardino.

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, \$4.00 for one year, \$7.00 for two years, all other countries, \$5.00 per year. Single copies 50¢. Printed in U.S.A. at Lancaster, Pa. All rights reserved. Entire contents copyrighted 1959 by Radio Magazines, Inc. Entered as Second Class Matter February 9, 1950 at the Post Office, Lancaster, Pa. under the act of March 3, 1879.

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

Discover for yourself why Sherwood is the most honored line of high fidelity components in the field. Sherwood Tuners (the first ever to achieve sensitivity under 0.95 microvolts) feature: Inter-Channel Hush, a noise muting system which makes FM tuning easier than ever • FM Multiplex Output • "Feather-Ray" Tuning Eye • Automatic Frequency Control • Flywheel Tuning. Combine these tuners with either of Sherwood's "mated" stereo amplifier choices; 20+20 watts or 36+36 watts. And only Sherwood offers all these features: Single/Dual Bass & Treble Controls • Mid-Range Presence Rise • Stereo-Mono Function Indicator Lights • Phase-Reverse Switch • Damping Factor selection. Sherwood also offers either 36 or 60 watt monaural amplifiers, FM Multiplex Adapters and a complete decorator-styled line of cabinetry and 3-way speaker systems—The Finest in High Fidelity. Sherwood Electronic Laboratories, Inc., 4300 N. California Avenue, Chicago 18, Illinois.

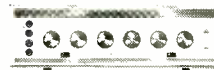
Model S-5000, 20 + 20W Stereo Dual Amplifier—\$189.50



Model S-3000 II, FM Tuner—\$105.50



Model S-4400, Stereo Preamp. + 36W Amp.—\$159.50



Model S-2000 II, FM-AM Tuner—\$145.50

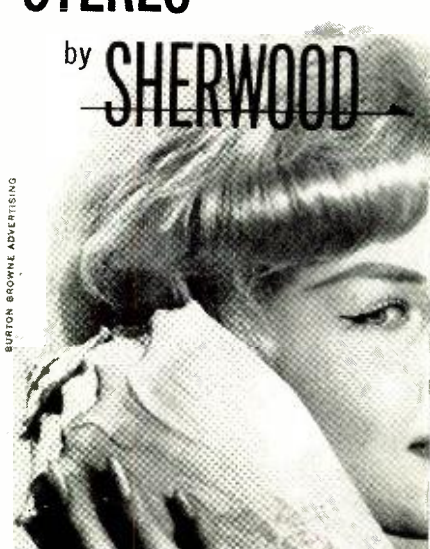


Model S-1000 II, 36W Monaural Amplifier—\$109.50

only for those who want the ultimate:

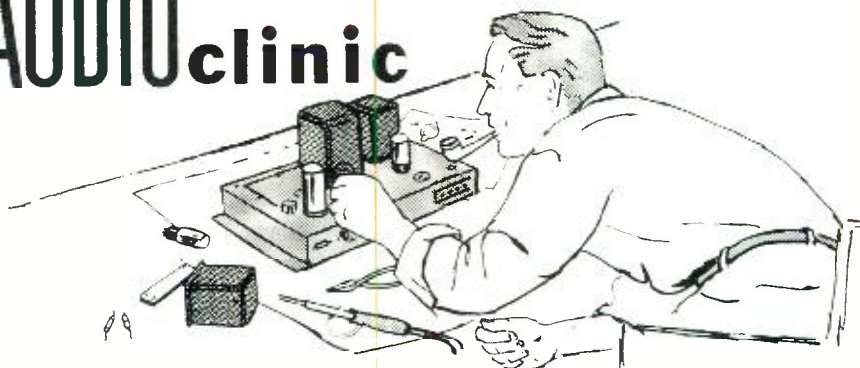
STEREO
 by SHERWOOD

BURTON BROWN ADVERTISING



For complete technical details write Dept. A-9.

AUDIO clinic



JOSEPH GIOVANELLI*

A Single Amplifier and Two Speakers

Q. I have a Bogen DB20DF 20-watt amplifier and two Jim Lansing D-123 16-ohm speakers in reflex enclosures. My desire is to hook up these speakers so that I may use a 3-position switch and play either one or both as desired. The Bogen amplifier has common, 8-ohm, and 16-ohm output connections.

Will you please show me the proper hookup to the amplifier when using both speakers as mentioned? Earle R. Wickham, Bloomingdale, N. J.

A. Figure 1 shows a circuit which, when constructed, will function as you desire. No further explanation need be given.

FM and Ignition Noise

Q. My FM antenna picks up ignition noise from passing cars, presumably from those which do not have suppressors. In converting from monophonic to stereo-

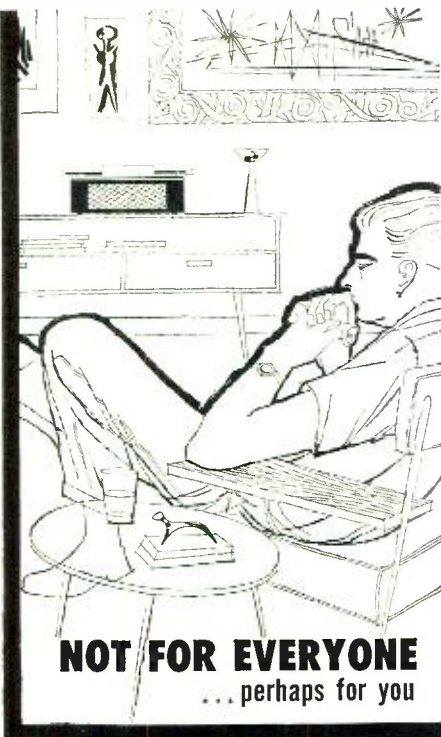
phonic sound I switched from a Pilot to an Eico FM tuner with no apparent change in the reception of the ignition interference.

My antenna is a non-directional folded dipole, mounted approximately 32 feet above my roof and about 45 feet above ground level. It is set back about 40 feet from the street. Lead-in wire is twisted and is about 45 feet long. The strength of the received signal seems to make little or no difference, because it seems that the intensity of the interference is about the same on all stations. Can you offer any suggestions as to what I can do about this problem? G. L. McCain, Belmont, Calif.

A. The first thing which comes to mind with regard to ignition noise is, "How much signal strength is available at your location?" If signals are below the limiter threshold, there is little you can do.

If, however, some of the noise is picked up by the lead-in, you might be able to do something after all. Replace your present lead-in with 300-ohm shielded line. It is similar in idea to two-conductor shielded

* 3420 Newark Ave., Brooklyn 3, N. Y.



NOT FOR EVERYONE
... perhaps for you



Tandberg 5

**3-SPEED, 4-TRACK
STEREO RECORDER
PLAYBACK**

The Tandberg 5 is not everyman's tape recorder. It is an instrument built to incredibly rigid standards of perfection, designed to provide the discriminating listener with a lifetime of listening pleasure. To the educated ear, the difference between Tandberg reproduction and conventional recorder playback is immediately apparent.

Yet, the difference is subtle. It is reflected in shadings and nuances that most recorders ignore. If your ear is finely attuned to musical perfection... if you relish the certainty that you own the finest... then the Tandberg 5 will give you more pleasure-per-dollar than any other tape recorder, anywhere.

See and hear the Tandberg 5 at your high fidelity dealer. The instrument illustrated here is the Tandberg Model 5-2. Complete with two TM-2 microphones for home stereophonic recordings, input-output cords, reels and handsome Transport luggage case, \$513.95. Other Tandberg models from \$249.50.

For full information, write Dept. A9.

Tandberg of America, Inc.
8 Third Avenue • Pelham, New York

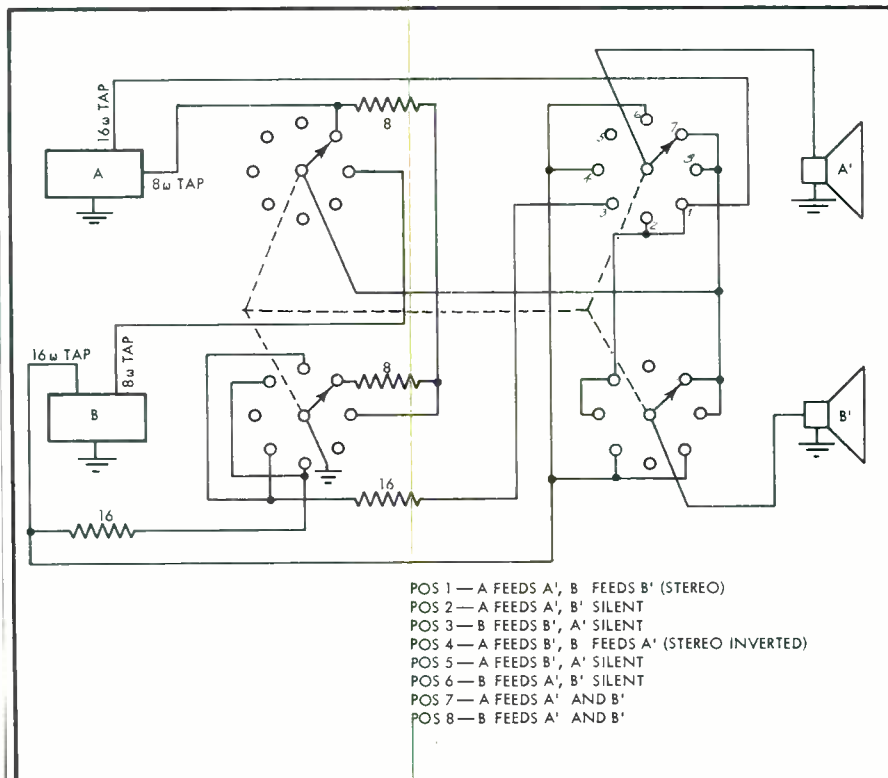


Fig. 1.

"Without reservation—we recommend the Garrard Changer with the Pickering Fluxvalve Cartridge for stereo records.

We believe more Fluxvalves are in Garrard Changers than in all other turntables and changers combined,"

says *Walter O. Stanton*

President, Pickering and Co. Inc.



James E. Fox

Walter O. Stanton

"We can readily understand the public confidence in Garrard Changers for Stereo,"

says Mr. James E. Fox, Service Manager, Pickering and Co. Inc.

"Our own laboratory tests as well as service records show that Garrard changers are virtually trouble-free and require no adjustment for perfect stereo reproduction with a Pickering cartridge. The design and precision mounting of the Garrard changer tone arm make it eminently compatible with the Fluxvalve principle. In fact, we have used the Garrard changer in the development of all Pickering stereophonic and monophonic cartridges for many years."



Stanton Stereo FLUXVALVE Model 371 Mounted in Garrard Shell



We thank Mr. Stanton and Mr. Fox for these personal comments which explain why so many discriminating high fidelity enthusiasts are completely satisfied owners of Garrard Changers with Pickering Stereo Cartridges. Today, more Garrard Changers are sold as components for stereo than all other turntables and changers combined.

Here are the reasons why Garrard Changers are endorsed for stereo not only by Pickering, but by all other manufacturers of fine stereo cartridges—Electro-Voice, Shure, General Electric, Fairchild, etc.

- Vibration-free turntable.
- Vertical and lateral rumble completely inaudible. Wow and flutter far below exacting "broadcast tolerance" standards.
- Exclusive Aluminum tone arm precision-mounted at engineering works for optimum tracking angle, perfect sound reproduction.
- Unrestricted choice of stereo cartridges—any of them will track at the manufacturer's lightest specified weight.
- Record handling gentler than the surest human hand.
- The important convenience of manual play plus completely automatic operation without compromise in performance.

These are the FACTS, no one can deny them with authority—and they are backed by the 36 years of experience that have created Garrard's unique reputation for unsurpassed quality.

For the best in Stereo...

Insist on a

Garrard
CHANGER
THE WORLD'S FINEST!

Send for free Garrard Comparator Guide.

Your Name _____

Address _____

City _____ State _____

Mail to Dept. GM-19 at address below.



B.I.C. ENDORSE QUALITY

There's a Garrard for every high fidelity system... all engineered and wired for Stereo and Monaural records.



RC99 Super Changer \$69.50



RC99 Deluxe Changer \$59.50



RC121/121 Interim Changer \$42.50



TPA/12 Stereo Tone Arm \$19.50



301 Transcription Turntable \$29.00



4MF Transcription Manual Player \$36.50

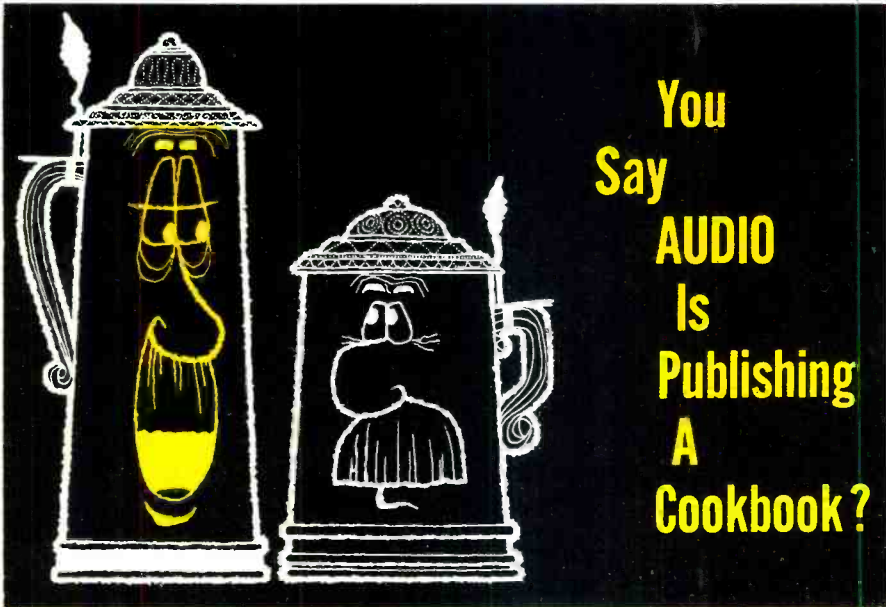


Model 7/73 Manual Player \$19.50

GARRARD SALES CORPORATION, Division of British Industries Corporation, FORT WASHINGTON, N. Y.

Canadian Inquiries to Chas. W. Pointon, Ltd., 6 Alcona Ave., Toronto

Territories other than U.S.A. and Canada to Garrard Engineering & Mfg. Co., Ltd., Swindon, Wilts., England



Yes, AUDIO is publishing a cookbook—not that we intend to extend the subject of gastronomy to include recipes in future pages of AUDIO.

You may ask...why?

And we would answer—Simply because we feel that people who read AUDIO, and enjoy the finest quality music reproduction also enjoy really good food on their tables.

Your next question may be...Is it a different kind of cookbook?

Of course our reply would be—Yes! Oh, it doesn't have a revolutionary format and it appears to look like any ordinary cookbook. But, the secret of its goodness is the recipes that fill its 148 pages... recipes responsible for the heart warming, flavorsome, homespun aromas experienced only in the kitchen of an Adirondack country home.

The name of the book is PLACID EATING, and it is chock full of palatable tempting recipes compiled by Climena M. Wikoff, owner of the Mirror Lake Inn...at (you guessed it) Lake Placid, New York.

Actually, the first edition (now out of print) was discovered by Mr. AUDIO (C. G. McProud) during his stay at Mrs. Wikoff's Mirror Lake Inn, where, in Mr. McProud's own words—"...every meal is so tasty that eating becomes a real joy, where each night's dessert excels the one from the night before, where one has to

push himself away from the table before upsetting the daily calorie count."

Here is a cookbook that will enable you to recreate in your own homes superb dishes experienced only at the Mirror Lake Inn—dishes like *Lake Trout Baked In Wine* and *Adirondack Apple Pie*, recipes for which are reproduced below—

LAKE TROUT BAKED IN WHITE WINE

Remove heads and tails from a 2-pound fish. Split open down back and rinse well. Remove backbone and rub inside with lemon, salt, pepper and thyme to taste. Knead 1 tablespoon of butter and anchovy paste the size of a large pea; placing mixture inside fish. Place fish in a greased baking pan and cover with $\frac{1}{2}$ cup of white wine. Bake 25 to 30 minutes in moderate oven, 350 degrees. Baste frequently. Garnish with parsley and lemon and serve with plain boiled potatoes.

ADIRONDACK APPLE PIE

1 c. sugar	3 tbsps. white corn syrup
2 tbsps. sifted flour	6 to 8 tart apples, thinly sliced
$\frac{1}{2}$ tsp. grated nutmeg	pastry
$\frac{1}{2}$ c. orange juice	
$\frac{1}{2}$ c. melted butter	

Mix together the sugar, flour, nutmeg, orange juice, corn syrup and melted butter. Add the sliced apples and mix thoroughly. Butter a pie pan heavily before putting in your pastry. Fill the pie shell with the apple mixture and make pastry strips for the top which should be dipped in melted butter before putting on the pie. Bake in 400 degree oven for 15 minutes; reduce heat to 250 degrees and bake 35 to 40 minutes longer.

This colorful book, plastic bound for easy handling, will contribute many wonderful adventures in food for everyone in the family. Order a copy today, the Lady-of-the-house will adore you for it. Incidentally...it makes a wonderful gift for anyone. PLACID EATING, 152 pages, Plastic Bound: \$3.95.



ORDER TODAY...\$3.95

line such as that used with low-impedance balanced lines. Do not use ordinary cable, since the capacitance will not be correct. The two leads of the line are connected to the input terminals of the FM set, and the shield is grounded to a radiator or water-pipe.

If you still have excessive noise pickup, you will then need to do one of three things: 1) Use an antenna having higher gain; 2) use an FM receiver having a lower limiter threshold; or 3) mount the antenna even higher than it now is. You may have to resort to a combination of all three possibilities.

Two Amplifiers and Two Speakers

Q. My problem, simply stated, is the following: I have two amplifiers and two speakers. I should like to build a switching unit enabling me to use amplifier 1 with speaker A, speaker B or both; also, No. 2 with either or both. If possible, I would like to be able to use amplifier No. 1 with one speaker and simultaneously, amplifier No. 2 with the other for my stereophonic sound system. The impedance of both speakers is 16 ohms. Both amplifiers are equipped with 4-, 8-, and 16-ohm outputs. Martin S. Lubell, Pittsburgh, Pa.

A. Figure 2 meets your requirements, with one addition. I provided a stereo normal, and a stereo-inverted position, so that the speakers may be reversed with regard to the amplifier to which they are connected. The diagram will make this arrangement clearer. Switch positions are clearly identified as to function.

The 70-Volt Line

Q. What are the advantages of a 70-volt system? In fact, what is a 70-volt system? I understand that extra long lines can be used but I believe a matching transformer is required at the speaker end of the line. Will this transformer degrade the performance of the system? What if the speaker end of the line uses a crossover network? What are the disadvantages of the system? Does the 70-volt line need heavy wires to carry the voltage? James C. Palestine, St. Louis, Mo.

A. A 70-volt line is primarily intended for public address work. It would have no application in the home unless the lines running to the speaker were very long. This

(Continued on page 95)

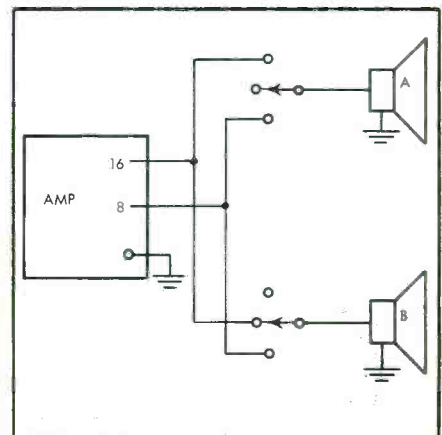


Fig. 2.

NEW SOUND EXCITEMENT FOR THE HI-FI STEREO AGE!

HEAVY DUTY
CAST ALUMINUM GIRDER
CONSTRUCTION

MAGNET ASSEMBLY
WEIGHT 61.5 OZ.

4, 8 AND 16 OHM
IMPEDANCES

TWIN VOICE COILS

DUAL CONES

NEW! LORENZ S-1288

Value-packed basic 12" loudspeaker with dual cones — for stereo or brilliant monaural. Twin voice coils provide 4, 8 and 16 ohm impedances on one speaker! Frequency response: 18 to 15,000 cps. Magnet assembly weight: 61.5 oz. Power rating: 30 watts peak. **\$44.50**

Never before, so many quality features in loudspeakers — yet priced for the modest budget! • Dual cones for breathtaking wire range performance! • Twin voice coils in 12" loudspeakers with flexible impedances of 4, 8 or 16 ohms, enabling you to select the impedance you require • Non-resonant cast aluminum girder constructed frames! • Fully tropicalized for finest operation in any climate • For stereo or monaural — singly or in matched pairs.

NEW! Lorenz S-1288 II

Consists of Lorenz S-1288 with twin tweeters on rigid metal bracket and high pass crossover. Dual cones and voice coils with 4, 8 or 16 ohm impedances. Frequency response: 18 to 18,000. Power rating: 35 watts peak. A system in itself! **\$67.50**

NEW! Lorenz S-888

Spacious sound with real economy! Outstanding 8" speaker with dual cones and high efficiency 8 ohm voice coil. Frequency response: 30 to 14,500 cps. Power rating: 18 watts peak. Magnet assembly weight, 28.5 oz. **\$21.50**

NEW! Lorenz S-388

Armored horn-type 2½" tweeter with plastic cone for 120-degree high frequency sound dispersion. New ferrite magnet hermetically sealed. Frequency response: 2,000 to 18,000 cps. Impedance: 5.5 ohms. Power rating: 2 watts peak. The perfect mate for Lorenz 12" or 8" speakers. **\$8.50**

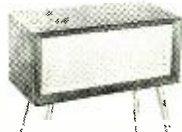
HP-1 High Pass Crossover

Crosses over at 2,000 cps at rate of 3 db per octave — feeds highs to tweeters, lows to woofer. Extends speaker system range to limit of audibility. For use with 2 or 3 way systems. **\$4.95**



NEW! OMEGA I

Completely finished on four sides for use horizontally or vertically. Inside, a full spectrum Lorenz 12" speaker, two tweeters and high pass crossover. • 18-18,000 cps. • 16 ohms. • 40 watts peak. • 27" x 14¾" x 11½". • 46 lbs. Unfinished Birch\$109.50 Assorted Finished Woods..... 119.50



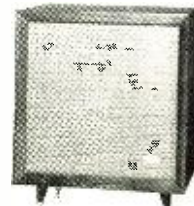
NEW! KAL AUQUETTE

Compact for bookshelf or table — or attach brass legs for console. Houses superb Lorenz 8" woofer, tweeter and crossover. • 35-17,000 cps. • 8 ohms. • 18 watts peak. • 11" x 23¾" x 10". • 16 lbs. Brown or Blond Leatherette.....\$49.50 Matching Brass Legs..... 5.95



NEW! AUQUETTE III

Big performance in small space! Use singly or pair for stereo. Completely finished on four sides for use horizontally or vertically. Features Lorenz 8" woofer with matching tweeter and crossover. • 30-17,500 cps. • 8 ohms • 18 watts peak. • 11" x 23¾" x 10" 20 lbs. Unfinished Birch\$57.50 Assorted Finished Woods 64.50 Matching Brass Legs 5.95

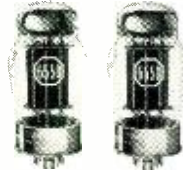
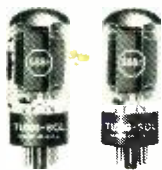


NEW! AUQUETTE SR.

Infinite baffle construction for "big system" performance. Complete with 4" legs. Houses famous Lorenz 8" woofer and tweeter with crossover. • 30-17,500 cps. • 8 ohms. • 20 watts peak. • 22¼" x 22¼" x 10½". • 37 lbs. Satin Mahogany\$69.50 Blond or Walnut..... 74.50

At High Fidelity Dealers Everywhere. FREE Catalog—Write Dept. A
Kingdom PRODUCTS, Ltd. 514 Broadway, New York 12, N. Y. • WORTH 6-0800
Exclusive U. S. Distributors for Lorenz High Fidelity Loudspeakers

**Tung-Sol audio tubes
dynamically balanced
and twin-packed
in matched pairs
by the manufacturer**



5881 For service in amplifiers of up to 50 watts.

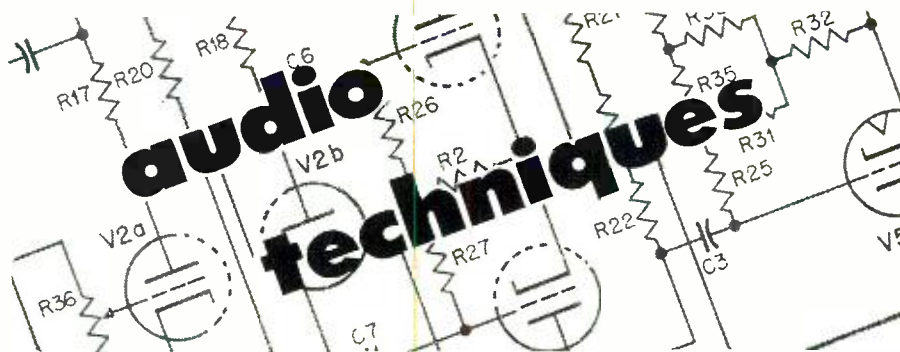
6550 For service in amplifiers and commercial audio equipment of up to 100 watts.

Now you can come as close to faultless sound reproduction as the design and circuitry of your hi-fi equipment will permit. Tung-Sol 5881 and 6550 beam-power amplifier tubes are dynamically balanced and factory-matched to very tight performance limits to help you achieve lowest distortion at all volume levels.

Use of Tung-Sol 5881 and 6550 tubes has long been associated with amplifiers of the very finest design. These tubes have always been produced to closest possible tolerances with cathode current ranges held to an absolute minimum.

Now, in twin-packed pairs, they assure the hi-fi enthusiast and the commercial sound engineer of replacement tubes that will provide new standards of performance—a feature of special importance with the newest amplifiers and loudspeakers, particularly binaural sound equipment. See your parts supplier.

Tung-Sol Electric Inc., Newark 4, New Jersey.



JOSEPH GIOVANELLI*

NOTE. Many of you have asked why this column has not appeared more frequently. The answer lies in the fact that I have not received sufficient material to make this column a more frequent feature.

For the benefit of new readers, I wish to mention that this column is devoted to the spreading of ideas which can help the experimenter. Many of you have been faced with problems and found solutions to them. It is more than likely that these problems and their solutions will be of general interest to many readers. This column offers the place wherein these ideas can be made available to those who can benefit from them. After all, it is only by sharing experience and information that banks of knowledge are built. It is, in fact, one of the important means by which civilization, as we know it, has been brought about.

This column is actually an extension of my other column, AUDIOCLINIC. In that column, a reader's personal problem with an improperly aligned tuner, for example, is translated into a problem of interest to many. In that column, I make an effort to solve the particular problem under discussion, whereas, in this one the reader submits problems and their solutions. By these two columns we have a means for relieving the experimenter of the need to break ground on his own which has been broken by others prior to his coming upon the problem. His mind is then free to move onto other experimenting in which he, in turn, may come up against a problem which he may solve. His problem may then very well be of interest to the rest of us, relieving us of the need to do the same work. This is the manner by which this bank of knowledge mentioned can build up.

The following is a typical solution to a problem. Mr. Cote was confronted with the need for considerable inductances so that he could test the performances of speakers and crossover networks. As you'll see, he made one inductance serve as many inductances.

Test Inductance for Crossover Networks

Crossover networks, the low impedance networks located between the loudspeaker voice coil and the amplifiers output-transformer secondary, are attenuation networks affected by the impedance of the loudspeaker. In turn, the impedance of the loudspeaker is affected by the type of cabinet or enclosure in which it is housed. Thus, the impedance of the same loudspeaker will be affected if it is mounted in an infinite

baffle, a reflex cabinet, a labyrinth, or a plain soapbox, varying with each enclosure.

This is one of the many intangibles which must be taken into consideration if optimum results are to be obtained. To cope with this problem, the following variable inductance may be of some use in dealing with homemade cabinets of no specific design, in a non-technical and practical manner.

Materials Needed.

- 3 lbs. of No 16 guage enamelled copper wire.
- Wood winding form.
- Multi-contact switch (Mallory 31117J).

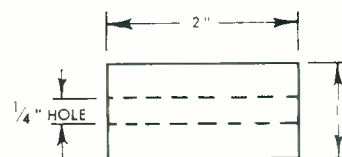


Fig. 1

Winding Form. A piece of broom handle 1 inch in diameter and 2 inches long will do nicely if it is accurately cut to size. A 1/4 inch hole is drilled in the center from one end to the other. (Fig. 1)

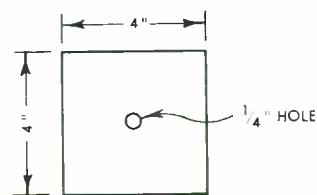


Fig. 2

Sides of Winding Form. Cut two pieces of 1/2-inch plywood 4 inches square (i.e., 4 inches on all sides) and drill a 1/4-inch hole at dead center of both pieces. (Fig. 2)

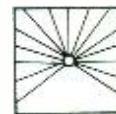


Fig. 3

Clamp these two pieces in a vise, and with a hacksaw cut five slits in each of three sides in a radiating pattern ending close to

(Continued on page 92)

* 3420 Newkirk Ave., Brooklyn 3, N. Y.

Easy-to-build

HEATHKIT

- style
- performance
- quality

costs you less!



MONAURAL-STEREO PREAMPLIFIER KIT (Two Channel Mixer)

MODEL SP-2 (stereo) \$56.95 Shpg. Wt. 15 lbs.
 MODEL SP-1 (monaural) \$37.95 Shpg. Wt. 13 lbs.
 MODEL C-SP-1 (converts SP-1 to SP-2) \$21.95 Shpg. Wt. 5 lbs.

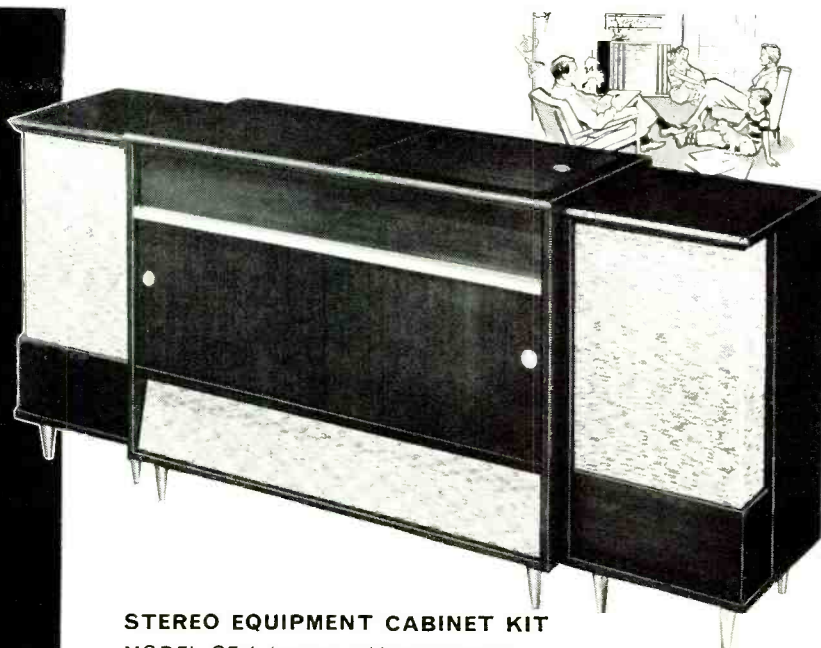
Special "building block" design allows you to purchase instrument in monaural version and add stereo or second channel later if desired. The SP-1 monaural preamplifier features six separate inputs with 4 input level controls. A function selector switch on the SP-2 provides two channel mixing. A 20' remote balance control is provided.



PROFESSIONAL STEREO-MONAURAL AM-FM TUNER KIT

MODEL PT-1 \$89.95

The 10-tube FM circuit features AFC (automatic frequency control) as well as AGC. An accurate tuning meter operates on both AM and FM while a 3-position switch selects meter functions without disturbing stereo or monaural listening. Individual flywheel tuning on both AM and FM. FM sensitivity is three microvolts for 30 db of quieting. The 3-tube FM front end is prewired and pre-aligned, and the entire AM circuit is on one printed circuit board for ease of construction. Shpg. Wt. 20 lbs.



STEREO EQUIPMENT CABINET KIT

MODEL SE-1 (center unit) \$149.95

Shpg. Wt. 162 lbs.

MODEL SC-1 (speaker enclosure) \$39.95 each

Shpg. Wt. 42 lbs.

Superbly designed cabinetry to house your complete stereo system. Delivered with pre-cut panels to fit Heathkit AM-FM tuner (PT-1), stereo preamplifier (SP-1 & 2) and record changer (RP-3). Blank panels also supplied to cut out for any other equipment you may now own. Adequate space also provided for tape deck, speakers, record storage and amplifiers. Speaker wings will hold Heathkit SS-2 or other speaker units of similar size. Available in unfinished birch or mahogany plywood.

World's largest manufacturer of electronic instruments in kit form

HEATH COMPANY
 Benton Harbor, 25, Michigan

a subsidiary of Daystrom, Inc.



HIGH FIDELITY RECORD CHANGER KIT

MODEL RP-3 \$64.95

Turntable quality with fully automatic features! A unique "turntable pause" allows record to fall gently into place while turntable is stopped. The tone arm engages the motionless record, and a friction clutch assures smooth start. Automatic speed selector plays mixed 33 $\frac{1}{3}$ and 45 RPM records regardless of sequence. Four speeds available: 16, 33 $\frac{1}{3}$, 45 and 78 RPM. Changer complete with GE-VR-II cartridge with diamond LP and sapphire 78 stylus, changer base, stylus pressure gauge and 45 RPM spindle. Shpg. Wt. 19 lbs.

"EXTRA PERFORMANCE" 55 WATT HI-FI AMPLIFIER KIT

A real work horse packed with top quality features, this hi-fi amplifier represents a remarkable value at less than a dollar per watt. Full audio output at maximum damping is a true 55 watts from 20 CPS to 20 kc with less than 2% total harmonic distortion throughout the entire range. Featuring famous "bas-bal" circuit, push-pull EL34 tubes and new modern styling. Shpg. Wt. 28 lbs.



MODEL W7-M \$54.95

NEW



NOTE THESE OUTSTANDING SPECIFICATIONS: Power Output: 14 watts, Hi-Fi; 12 watts, Professional; 16 watts, Utility. Power Response: ± 1 db from 20 cps to 20 kc at 14 watts output. Total Harmonic Distortion: less than 2%, 30 cps to 15 kc at 14 watts output. Intermodulation Distortion: less than 1% at 16 watts output using 60 cps and 6 kc signal mixed 4:1. Hum and Noise: mag. phono input, 47 db below 14 watts; tuner and crystal phono, 63 db below 14 watts.

14-WATT HI-FI ECONOMY AMPLIFIER KIT
MODEL EA-3 \$29⁹⁵

From HEATHKIT audio labs comes an exciting new kit... New Styling, New Features, Brilliant Performance! Designed to function as the "heart" of your hi-fi system, the EA-3 combines the pre-amplifier and amplifier into one compact package. Providing a full 14 watts of high fidelity power, more than adequate for operating the average system, the EA-3 provides all the controls necessary for precise blending of musical reproduction to your individual taste. Clearly marked controls give you finger-tip command of bass and treble "boost" and "cut" action, switch selection of three separate inputs, "on-off" and volume control. A hum balance control is also provided. The convenient neon pilot light on the front panel shows when instrument is on. Styled to blend harmoniously into any room surroundings, the handsome cover is of black vinyl coated steel with gold design and features the new "eyebrow" effect over the front panel to match the other new Heathkit hi-fi instruments. The panel is satin black with brush-gold trim strip, while the control knobs are black with gold inserts. Shpg. Wt. 15 lbs.

"MASTER CONTROL" PREAMPLIFIER KIT
MODEL WA-P2 \$19⁷⁵ (Not Illustrated):

All the controls you need to master a complete high fidelity system are incorporated in this versatile instrument. Features 5 switch-selected inputs each with level control. Provides tape recorder and cathode-follower outputs. Full frequency response is obtained within $\pm 1\frac{1}{2}$ db from 15 to 35,000 CPS and will do full justice to the finest available program sources. Equalization is provided for LP, RIAA, AES, and early 78 records. Shpg. Wt. 7 lbs.

MODEL TR-1A: Monophonic half-track record/playback with fast forward and rewind functions. Shpg. Wt. 24 lbs. **\$99⁹⁵**

MODEL TR-1AH: Half-track monophonic and stereo record/playback with fast forward and rewind functions. Shpg. Wt. 35 lbs. **\$149⁹⁵**

MODEL TR-1AQ: Quarter-track monophonic and stereo with record/playback fast forward and rewind functions. Shpg. Wt. 35 lbs. **\$149⁹⁵**



NOW! TWO NEW STEREO-MONO TAPE RECORDERS IN THE TR-1A SERIES

Offering complete versatility, the model TR-1A series tape recorders enable you to plan your hi-fi system to include the functions you want. Buy the new half-track (TR-1AH) or quarter-track (TR-1AQ) versions which record and playback stereo and monophonic programming, or the half-track monophonic record-playback version (TR-1A).

Precision parts hold flutter and wow to less than 0.35%. Four-pole, fan cooled motor. One control lever selects all tape handling functions. Each tape preamplifier features NARTB playback equalization, separate record and playback gain controls, cathode follower output, mike or line input, and two circuit boards for easy construction and high stability. Complete instructions guide assembly.



HIGH FIDELITY AM TUNER KIT
MODEL BC-1A \$26⁹⁵

Designed especially for high fidelity applications this AM tuner will give you reception close to FM. A special detector is incorporated and the IF circuits are "broadbanded" for low signal distortion. Sensitivity and selectivity are excellent and quiet performance is assured by a high signal-to-noise ratio. All tunable components are prealigned before shipment. Your "best buy" in an AM tuner. Shpg. Wt. 9 lbs.



MODEL FM-4
\$34⁹⁵
 (with cabinet)

HIGH FIDELITY FM TUNER KIT (FM-4)

The all new model FM-4 incorporates the latest advancement in circuit design. Features include better than 2.5 microvolt sensitivity for 20 db of quieting, automatic frequency control (afc) with defeat switch, flywheel tuning and prewired, prealigned and pretested tuning unit. Prealigned IF transformers and prewired tuning unit assure easy assembly with no further need of alignment after unit is completed. The five tube circuit features a generous power supply utilizing a silicon diode rectifier. Shpg. Wt. 8 lbs.

"UNIVERSAL" 12 WATT HIGH FIDELITY AMPLIFIER KIT
MODEL UA-1 \$21⁹⁵

Ideal for stereo or monaural applications, this 12-watt power package features less than 2% total harmonic distortion throughout the entire audio range (30 to 15,000 CPS) at full 12-watt output. Use with preamplifier models WA-P2 or SP-1 & 2. Taps for 4, 8 and 16 ohm speakers. Shpg. Wt. 13 lbs.



YOU'RE NEVER OUT OF DATE WITH HEATHKITS

Heathkit hi-fi systems are designed for maximum flexibility. Simple conversion from basic to complex systems or from monaural to stereo is easily accomplished by adding to already existing units. Heathkit engineering skill is your guarantee against obsolescence. Expand your hi-fi as your budget permits... and, if you like, spread the payments over easy monthly installments with the Heath Time Payment Plan.

CONTEMPORARY
Model CE-1B Birch
Model CE-1M Mahogany



- No Woodworking Experience Required For Construction.
- All Parts Precut & Pre drilled For Ease of Assembly.
- Maximum Overall Dimensions: 18" W. x 24" H. x 35½" D.



TRADITIONAL
Model CE-1T Mahogany

CHAIRSIDE ENCLOSURE KIT
MODEL CE-1 **\$43⁹⁵** each

Control your complete home hi-fi system right from your easy chair with this handsome chairside enclosure in either traditional or contemporary models. It is designed to house the Heathkit AM and FM tuners (BC-1A and FM-3A) and the WA-P2 preamplifier, along with the RP-3 or majority of record changers which will fit in the space provided. Well ventilated space is provided in the rear of the enclosure for any of the Heathkit amplifiers designed to operate with the WA-P2. The tilt-out shelf can be installed on either right or left side as desired during the construction, and the lift-top lid in front can also be reversed. All parts are pre-cut and pre drilled for easy assembly. The contemporary cabinet is available in either mahogany or birch, and the traditional cabinet is available in mahogany suitable for the finish of your choice. All hardware supplied. Shpg. Wt. 46 lbs.

**IT'S EASY . . . IT'S FUN
AND YOU SAVE UP TO ½
WITH DO-IT-YOURSELF HEATHKITS**

Putting together your own Heathkit can be one of the most exciting hobbies you ever enjoyed. Simple step-by-step instructions and large pictorial diagrams show you where every part goes. You can't possibly go wrong. No previous electronic or kit building experience is required. You'll learn a lot about your equipment as you build it, and, of course, you will experience the pride and satisfaction of having done it yourself.



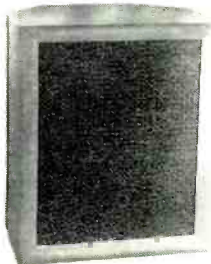
**DIAMOND STYLUS HI-FI
PICKUP CARTRIDGE**

MODEL MF-1 **\$26⁹⁵**

Replace your present pickup with the MF-1 and enjoy the fullest fidelity your library of LP's has to offer. Designed to Heath specifications to offer you one of the finest cartridges available today. Nominally flat response from 20 to 20,000 CPS. Shpg. Wt. 1 lb.

**"RANGE EXTENDING" HI-FI
SPEAKER SYSTEM KIT**

The SS-1B employs a 15" woofer and super tweeter to extend overall response of basic SS-2 speaker from 35 to 16,000 CPS ± 5 db. Crossover circuit is built in. Impedance is 16 ohms, power rating 35 watts. Constructed of ¾" veneer-surfaced plywood suitable for light or dark finish. Shpg. Wt. 80 lbs.



MODEL SS-1B
\$99⁹⁵



SEND FOR FREE CATALOG

Describing over 100 easy-to-build kits in hi-fi, test, marine and ham radio fields. Also contains complete specifications and schematics.

"BASIC RANGE" HI-FI SPEAKER SYSTEM KIT



MODEL SS-2 **\$39⁹⁵**

Legs: No. 91-26 Shpg. Wt. 3 lb. \$4.95

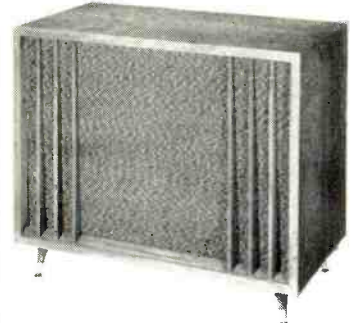
The modest cost of this basic speaker system makes it a spectacular buy for any hi-fi enthusiast. Uses an 8" mid-range woofer and a compression-type tweeter to cover the frequency range of 50 to 12,000

CPS. Crossover circuit is built in with balance control. Impedance is 16 ohms. Power rating 25 watts. Tweeter horn rotates so that the speaker may be used in either an upright or horizontal position. Cabinet is made of veneer-surfaced furniture-grade plywood suitable for light or dark finish. All wood parts are pre-cut and pre drilled for easy assembly. Shpg. Wt. 26 lbs.

LEGATO HI-FI SPEAKER SYSTEM KIT

MODEL HH-1 **\$299⁹⁵**


The startling realism of sound reproduction by the Legato is achieved through the use of two 15" Altec Lansing low frequency drivers and a specially designed exponential horn with high frequency driver. The special crossover network is built in. Covers 25 to 20,000 CPS within ± 5 db. Power rating 50 watts. Cabinet is constructed of ¾" veneer-surfaced plywood in either African mahogany or white birch suitable for the finish of your choice. All parts are pre-cut and pre drilled for easy assembly. Shpg. Wt. 195 lbs.



HEATH

COMPANY • BENTON HARBOR 25, MICH.

*pioneer in
"do-it-yourself."
electronics*

 a subsidiary of Daystrom, Inc.

Please send the Free Heathkit catalog.

Enclosed find \$.....
Please enclose postage for parcel post—express orders are shipped delivery charges collect. All prices F.O.B. Benton Harbor, Mich. A 20% deposit is required on all C.O.D. orders. Prices subject to change without notice.

name _____
address _____
city & state _____

QUANTITY	ITEM	MODEL NO.	PRICE

LETTERS

Doppler Effect Dissension

SIR:

With reference to Miss Rettinger's article "Loudspeaker distortion due to the Doppler effect," we wish to disagree.

To quote the author, "The Doppler effect . . . is characterized by a change in sound pitch due to the relative motion of the source and the observer." Using *Fig. 1*, a 16-inch speaker at 22 cps with a cone travel of 1 inch, we came up with a forward piston velocity of slightly over 1 mile per hour. The Doppler effect at this velocity can easily be checked by walking toward a sound source at a speed of 1 m.p.h.

Miss Rettinger's method of checking her results by an A-B test is, in our opinion, worthless. The individual difference between speaker A (full-range single-speaker system) and speaker B (three-way speaker system) is by far more than the supposed difference caused by the Doppler effect. The only way actually to test the theory by ear would be to feed a 40-cps sine wave and a 10,000-cps sine wave into the same speaker with a filter that could be switched in to cut out the low frequency. We have tried this and have found the difference to be unnoticeable.

L. D. DALESSANDRO and
LARRY S. ROGERS II,
1602-5 ATW Det.,
APO 125,
New York, N. Y.

Stereo Miking

SIR:

This is in partial reply to a letter from Mr. Morris in your August, 1959, issue. He notes the lack of information on stereo microphone placement or "miking." Miking and mixing are, as he suggests, the secret to all recording success. I agree with you that \$50,000 is very inexpensive indeed for a manual on the topic.

Mr. Morris may find the literature on monophonic miking useful. Over a number of years, I have collected information on this field. Below are listed the books, papers, and manuals I have found most helpful.

1. Bernhart, José, *Traité de Prise de Son*, Editions Eyrolles, Paris, 1949 (in French). This is the only definitive work I know of. Definite instructions are given for all sorts of miking situations. The point of view is that being recognized by an increasing number of audio engineers: the esthetic experience that is music depends on creating within the listener a more or less well-defined sequence of emotional states. Since the psychological set of the listener at home differs from that in the concert hall, there is no reason to suppose that physical fidelity is necessary or even desirable. The correct miking is that which delivers the proper packaged emotion to the customer. (Thanks to Ed Uecke of Capitol Records for the last phrase.)

2. Berndt-Bach, Inc., Hollywood, Calif., *How to Use Your Ciné-Voice*, Oct. 1954. This brochure is written from the point of view of motion picture technique, and many typical situations are illustrated.

(continued on page 98)

FIRST

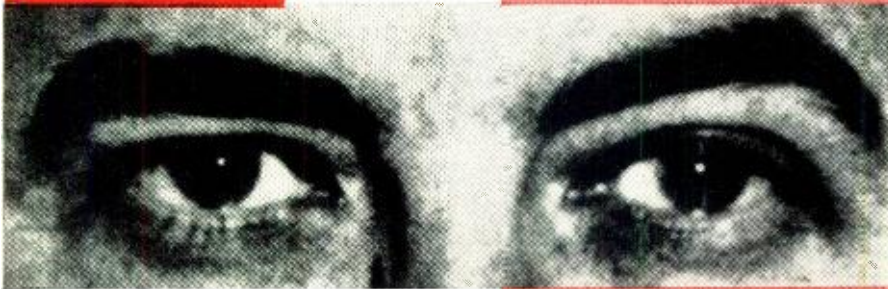
it was
industrial
applications...

THEN

exacting
military
systems...

...and **NOW**

it's the
**TV
MANUFACTURER**
who sees the solution
to his problems...



The frame grid is the closest approach to the ideal "Physicist's grid"—electrical characteristics but no physical dimensions. It results in: • higher transconductance per milliampere • tighter G_m and plate current tolerance • low transit time • low capacitances • lower microphonics • rugged construction

...in
Amperex
**FRAME
GRID
TUBES**

FOR TV TUNERS

6E58
4E58
6E85
2E85
6DJ8

FOR MILITARY REQUIREMENTS
AND

EXACTING INDUSTRIAL APPLICATIONS:

6688
6688A (MIL-E-1/1218)
6922
6922 (MIL-E-1/1168)
5847 (MIL-E-1/467)
5842 (MIL-E-1/468)

AVAILABLE FROM ALL
AMPEREX FRANCHISED DISTRIBUTORS

AMPEREX FRAME GRID

The grid-to-cathode spacing tolerance is determined by the carefully controlled diameter of grid support rods (centerless ground) and by frame crossbraces between these rods. Extremely fine grid wire eliminates the "island effect" usually encountered in conventional tubes with equally close grid-to-cathode spacing. Rigid support of fine wires reduces mechanical resonance and microphonics in the grid.

CONVENTIONAL GRID

Grid-to-cathode spacing tolerance depends on accuracy of grid dimension, obtained by stretching on a mandrel, and on tolerances of holes in top and bottom mica rod supports. Diameter of grid wire must be large enough to be self-supporting.

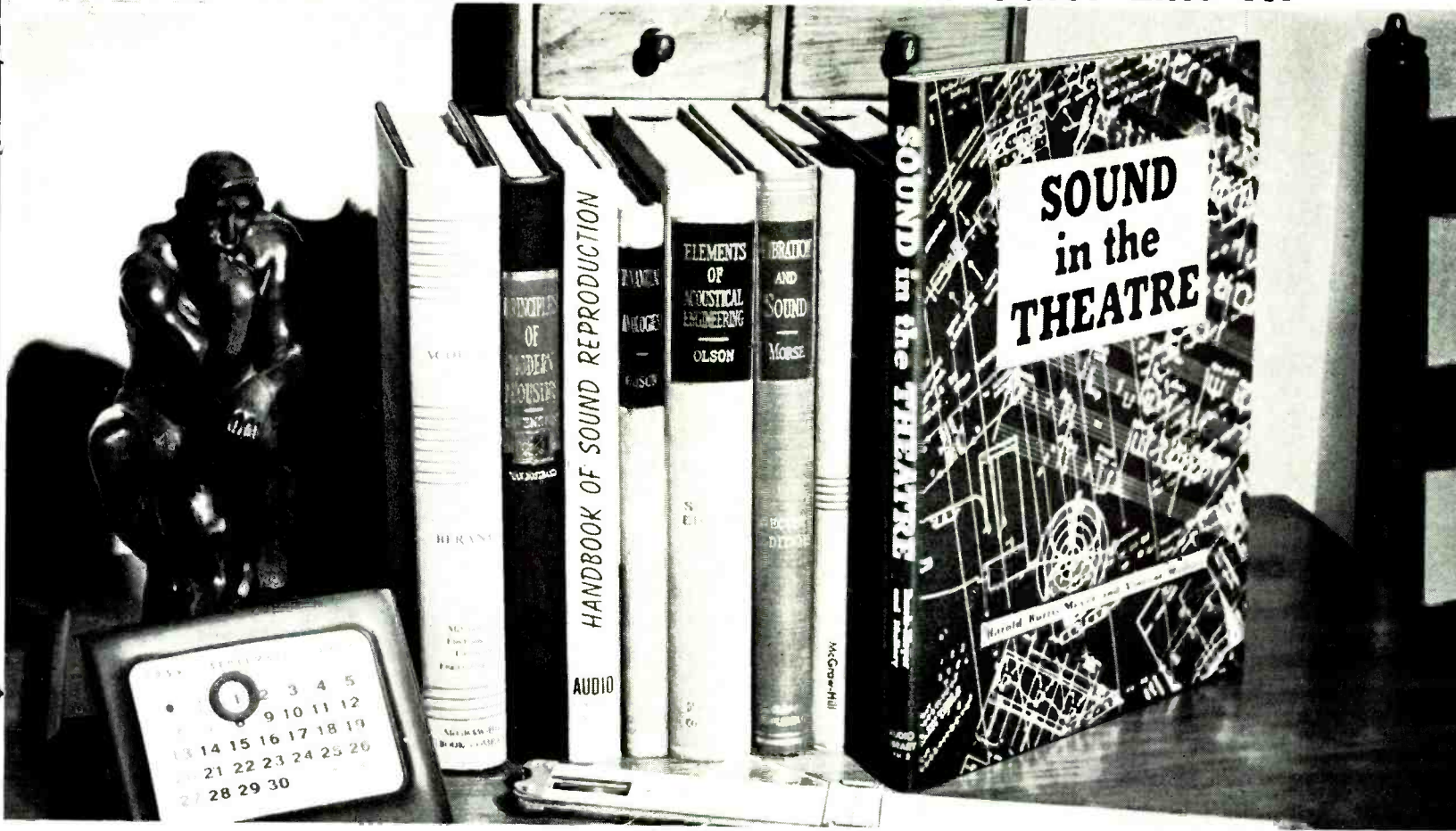
For additional data write to
Semiconductor and Special Tube Division
Amperex Electronic Corporation
230 Duffy Ave.,
Hicksville, Long Island, N. Y.
In Canada:
Rogers Electronic Tubes & Components,
116 Vanderhoof Avenue, Toronto 17, Ontario



ask **Amperex**

about applications assistance on frame
grid tubes for TV and FM tuners, and
on reliable premium quality (PQ) tubes
for industrial and military applications

The First Book of its Kind—No Other Like It!



The publishers of AUDIO invite you to purchase—at a prepublication saving—the completely new
SOUND in the THEATRE by Harold Burriss-Meyer and Vincent Mallory

THE BOOK

Nothing like SOUND in the THEATRE has ever been published. It is the first book to set forth in authoritative detail what you can do with sound by electronic control, and how to do it whenever the source (singer, musician, speaker, etc.) and the audience are present together. The book develops the requirements for electronic sound control from the necessities of the performance, the characteristics of the audience (hearing and psychoacoustics), and the way sound is modified by environment, hall, and scenery. Sound sources are considered for their susceptibility of control and need for it, and the many techniques for applying electronic sound control are described and illustrated in thirty-two specific problems. From these problems are de-

rived systems and equipment specifications. Complete procedures are given for: Planning, assembling, and testing sound control installations—Articulating sound control with other elements of production—Rehearsals and performances—Operation and maintenance of sound control equipment.

THE AUTHORS

During the past thirty years, the authors have developed the techniques of sound control in opera, open-air amphitheatres, theatres on Broadway, theatres on-the-road and off-Broadway, in concert halls and night clubs, in Hollywood and in the laboratory. Some of their techniques are used in broadcast and recording as well as in performances where an audience is present. From their laboratory have come notably successful applications of sound control to psychological warfare and psychological screening.

HAROLD BURRIS-MEYER has written *Scenery for the Theatre*, the standard text on the subject, and *Theatres and*

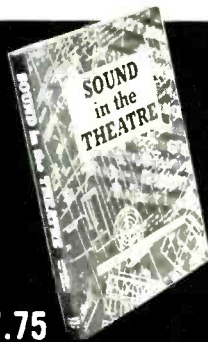
Auditoriums, both done with Edward C. Cole. He also wrote *Acoustics for the Architect* with Lewis S. Goodfriend. Presently an acoustical consultant to the Department of Defense, he is a fellow and past counsellor of the Acoustical Society of America; fellow of the Audio Engineering Society, Senior Member of the IRE, and member of the American Physical Society, The American Institute of Physics and the American Educational Theater Association.

VINCENT MALLORY is presently chief of the General Equipment Branch of the Missile Guidance Division in the Naval Ordnance. His background in acoustics dates back to his days as an engineering student at the University of Pittsburgh. He first employed sound control in the legitimate theatre in GRAND STREET FOLLIES of 1928 at the Booth Theatre. He has served as consultant in open-air sound control for the New York City Department of Parks. He has extensive experience in manufacturing having served as chief engineer with many fine companies. He is a fellow of the Acoustical Society of America and a member of the American Institute of Physics.

An invaluable reference—an indispensable guide for anyone working in the theatre—a complete technological thesaurus for the engineer, architect, designer, technician, student, and teacher concerned with the reinforcement of sound and speech.

TO BE PUBLISHED AT \$10.00

Prepublication price \$7.75



This prepublication saving certificate is worth \$2.25

RADIO Magazines, Inc., Dept. S99
 Post Office Box 629 Mineola, New York

I am enclosing my remittance for \$7.75, special prepublication price.

Send my copy of SOUND in the THEATRE postpaid.

(No C.O.D., all books sent postpaid in U.S.A. and possessions, Canada, and Mexico. Add 50c for Foreign orders.)

Name _____ Address _____

City _____ Zone _____ State _____

This offer expires October 15, 1959.

AUDIO ETC.

Edward Tatnall Canby

1. MUSICAL JAUNDICE

Following hard on the heels of last month's installment, this postscript is being written back home—I am returned to audio-land and the "normal" world (for me) of records, hi fi, stereo and all the rest. It was a good break, my expedition to the Sewanee Summer Music Center in Tennessee; it gave me a big, new appreciation of living music in the process of being put together for live performance. I listened to musical notes straight out of musical instruments—not out of loudspeakers, and I did it day and night. I ate and drank live music, slept with it, wallowed in it for a whole month. And now I'm musically vitamin-starved. Wouldn't have believed it.

There wasn't a quiet moment where I was, practically ever, from the early-bird footlings of the first morning clarinet, up betimes and against camp regulations to do a bit of extra practicing, straight through to the last cough of a wet French horn blowing itself out for the brief night's rest. (They are *very* wet instruments, especially in a humid climate. Your pour them on the floor, every few minutes.) There wasn't a minute, all day long, when I could settle down in my usual fashion, to contemplate in respectful silence the greatness of the audio art, or lose myself in the hi fi sounds of Palestrina from the West Coast and Gershwin from Vienna. Normally, I live the world over, via records. Here in Tennessee, the world shrank down to the size of one college dormitory filled with practicing musicians—and did they practice!

Bits and pieces of familiar music were constantly drifting about my ears, or buzzing like annoying, persistent mosquitoes. Upstairs, a clarinet would start on a phrase out of Brahms; down the corridor and in another key a sour fiddle would scrape painfully out-of-tune scales, carefully, one note at a time. Next door, my bassoon friend would blow a sudden explosion of grunts and wheezes, the bassoon's way of warming up, and start off on the bass part of something by Beethoven. . . .

I know too much music by now, alas. I could always recognize these bits and fragments, or if I didn't, I'd go crazy trying to figure out where I'd heard them before. Meanwhile somebody else would plough into next week's modern offering, perhaps a piece like the "Kleine Kammermusik" of Hindemith—*teetittletee, tittle tee, tittle tee*—and play that one tiny little phrase of music a hundred times, by count, without a single perceptible pause. Tantalizing tunes kept repeating themselves ad nauseum, divided and subdivided into smaller bits for concentration on trills, jumps, and other tricky passages, until I thought I'd go nuts waiting for something new. It was like the record that repeats grooves in the apartment upstairs, or the red traffic light that won't turn green. Go on, *play the next part*, I'd yell silently to myself, tearing out hairs

in my anguish; but they never did; you don't when you practice.

There were a few expert musicians among these all-day tootlers, mainly professionals on the faculty, who tossed off their bits with life-like realism and polish even if they never did get beyond a few notes at a time. I'd no sooner begin, thankfully, to enthuse over a really beautiful phrase from, say, the Mozart Clarinet Quintet, (down the hall) when the same phrase would float in again on the breeze; half an hour later it would still be playing, over and over. Then there was the Clarinet's breath control practice, which consisted of a single note begun extremely softly, growing to full volume and fading slowly away to nothing. Eerie! It sounded exactly like an electronic oscillator being turned up and down.

Worst of all, there were the predictable exercises, those dreadful, brassy, stupid progressive tunes that all teachers write for their special instruments, which start on a pattern and keep it going for minutes and minutes, moving laboriously upwards or downwards. When one of these begins, you feel you can't afford to take a breath until the horrid thing reaches its lengthy unwinding and stops. Truly hypnotic, like the sight of a rattlesnake coiled and ready to strike.

It was the beginners who really got me down, though—the hard-working, admirable students. I loved them, but not their instruments. When a student, off somewhere in the very audible distance, started work on one of those familiar bits of melody, painfully dribbled out half-speed and out of tune, I'd get ready to run for the nearest woods. Wrong note. *WRONG NOTE!* No—not that way! And as if responding telepathetically to my agony, the distant instrument would stop, think things over solemnly while I waited with baited breath, then proceed to play the same passage and the same wrong notes all over again. Oof! I almost went out of my mind, trying not to listen. I'm not much good at not listening.

* * *

There is, indeed, a hi fi moral to all of this. We who listen to good records are doubly spoiled with good music. True, the live concert is the immediate end-product of all the tortured practicing I heard—as the resplendent new amplifier is the product of the engineer's yearly sweating. The live musical audience hears only the best that the musicians can do and, like us, is spared the hideous sounds of preparation.

But the record listener is even more a victim of spoiling, for records are technically more perfect than concerts. A fluff, a wrong note, a minor slip—these are the spice of the live concert and the human evidence that music is human and humanity is frail, if endlessly determined. The very fact that nothing whatever can be done about it is a challenge of a special sort. You play it right the first time—or else. And if

you make a bloop, you go back to practicing again, with more determination than ever that the next time will be better, nearer to perfection.

Not so with records. Mistakes can be corrected and so they are made. Music can be re-performed, re-taped, patched together. And right here, needless to say, is the musician's greatest beef about the art of recording—it deprives him of the challenge of the perfect live performance, the musical hole-in-one, that is no longer necessary and therefore in effect quite impossible!

No doubt about it, musicians do make more mistakes in recording sessions than they do in live performances. They can't help it. But we, the spoiled listeners, never even get to hear them. We are doubly removed from the reality of the musician's experience. That's the way many musicians feel, anyhow, and I think maybe they're right.

Anyhow, I'm glad that I was able to suffer for awhile in the birth-pangs of some real, nascent music. It was worth it. I left Sewanee like the proverbial shipwrecked sailor, music, music everywhere and not a note to drink; I was starved for good playing, for *perfect* playing. I had listened to all the practicing I could possibly stand. I craved, shall we say, the surcease of hi fi.

Just what the doctor ordered for my species of chronic musical jaundice, with more records coming in every month than I can absorb in a year. Maybe I ought to do this again.

2. MIRACLE SURFACE

Oh me. Oh my. Back about ten years ago when the LP record first blossomed out in plastic and the static problem raised its ugly high-voltage snout for the first time in earnest, I got excited about ways and means to eliminate static. What really worked me into a tizzy was a blinding, brilliant idea that struck me one day as I was reading, I think, *Popular Science Monthly*. It was so good that I wrote a registered letter to myself, hired a Washington patent engineer—and got exactly nowhere. Now I can't even find the letter, but no matter; RCA has come out with Miracle Surface.

You see, I dabbled first with Static-Clean and the like, the liquids which allow static charges to leak away; I tried all the wet-wash and detergent systems then being promoted; I rushed out with a gleam in my eye to get an early model of the famous Static Brush, with radioactive polonium mounted in it—and I hit the national news-fronts in those heady atomic days when I suggested that the thing might be dangerous, perhaps. (It wasn't a bit; but then, who amongst us knew much about radioactive elements then.) Come to think of it, the gentleman of the press who picked me up on the static brush was none other than one John Conly, then a mainstay of *Pathfinder* magazine and since a hi fi and music stalwart.

Anyhow, all of these proceedings seemed to me then—and seem to me now—quite cart-before-the-horsish. It was obvious, to me at least, that the right way to solve the static problem was to *get hold of a record material that wouldn't develop static*. So simple in theory, but not so simple in the patenting.

The *Popular Science* article wasn't about records, of course. It merely described a newly developed and astonishing family of *electrically conducting* plastics. Don't remember the name, but I do recall that one of them was spoken of as having a conductivity equal to that of mercury, which still seems slightly unthinkable. But the blinding light hit me instantly—why not

* 780 Greenwich St., New York 14, N. Y.

In **STEREO**
STEREO

and Mono Hi-Fi... the experts say
your best buy is **EICO**

"The overall design of the HF-81 is conservative, honest and functional. It is a good value considered purely on its own merits, and a better one when its price is considered as well."

— Hirsch-Houck Labs (HIGH FIDELITY Magazine)

- Advanced engineering • Finest quality components
- "Beginner-Tested," easy step-by-step instructions
- LIFETIME service & calibration guarantee at nominal cost
- IN STOCK — compare, then take home any EICO equipment — right "off the shelf" — from 1500 neighborhood EICO dealers.



Stereo Amplifier-Preamplifier HF81

HF81 Stereo Amplifier-Preamplifier selects, amplifies, controls any stereo source & feeds it thru self-contained dual 14W amplifiers to a pair of speakers. Provides 28W monophonically. Ganged level controls, separate balance control, independent bass & treble controls for each channel. Identical Williamson-type, push-pull EL84 power amplifiers. "Excellent!" — SATURDAY REVIEW: HI-FI MUSIC AT HOME. "Outstanding quality... extremely versatile." — ELECTRONICS WORLD LAB-TESTED. Kit \$69.95. Wired \$109.95. Includes cover.

HF85 Stereo Preamplifier is a complete, master stereo preamplifier-control unit, self-powered for flexibility & to avoid power-supply problems. Distortion borders on unmeasurable even at high output levels. Level, bass, & treble controls independent for each channel or ganged for both channels. Inputs for phono, tape head, mike, AM, FM, & FM-multiplex. One each auxiliary A & B input in each channel. Switched-in loudness compensator. "Extreme flexibility... a bargain." — HI-FI REVIEW. Kit \$39.95. Wired \$64.95. Includes cover.

New HF87 70-Watt Stereo Power Amplifier: Dual 35W power amplifiers of the highest quality. Uses top-quality output transformers for undistorted response across the entire audio range at full power to provide utmost clarity on full orchestra & organ. 1M distortion 1% at 70W, harmonic distortion less than 1% from 20 to 20,000 cps within 1 db of 70W. Ultra-linear connected EL34 output stages & surgistor-protected silicon diode rectifier power supply. Selector switch chooses mono or stereo service; 4, 8, 16, and 32 ohm speaker taps, input level controls: basic sensitivity 0.38 volts. Without exaggeration, one of the very finest stereo amplifiers available regardless of price. Use with self-powered stereo preamplifier-control unit (HF85 recommended). Kit \$74.95. Wired \$114.95.

HF86 28W Stereo Power Amplifier Kit \$43.95. Wired \$74.95.

FM Tuner HFT90: Prewired, prealigned, temperature-compensated "front end" is drift-free. Prewired exclusive precision eye-ronic® traveling tuning indicator. Sensitivity: 1.5 uv for 20 db quieting; 2.5 uv for 30 db quieting, full limiting

from 25 uv. IF bandwidth 260 kc at 6 db points. Both cathode follower & FM-multiplex stereo outputs, prevent obsolescence. Very low distortion. "One of the best buys in high fidelity kits." — AUDIOCRAFT. Kit \$39.95*. Wired \$65.95*. Cover \$3.95. *Less cover, F.E.T. incl.

New AM Tuner HFT94. Matches HFT90. Selects "hi-fi" wide (20c — 5kc @ -3 db) or weak-station narrow (20c — 5kc @ -3 db) bandpass. Tuned RF stage for high selectivity & sensitivity; precision eye-ronic® tuning. Built-in ferrite loop, prealigned RF & IF coils. Sensitivity 3 uv @ 30% mod. for 1.0 V out, 20 db S/N. Very low noise & distortion. High-Q 10 kc whistle filter. Kit \$39.95. Wired \$69.95. Incl. Cover & F.E.T.

New AF-4 Stereo Amplifier provides clean 4W per channel or 8W total output. Inputs for ceramic/crystal stereo pick-ups. AM FM stereo, FM-multi stereo. 6-position stereo/mono selector. Clutch-concentric level & tone controls. Use with a pair of HFS-5 Speaker Systems for good quality, low-cost stereo. Kit \$38.95. Wired \$64.95.

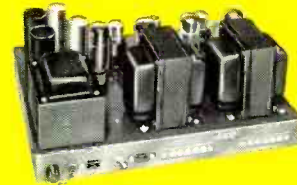
HF12 Mono Integrated Amplifier provides complete "front-end" facilities and true high fidelity performance. Inputs for phono, tape head, TV, tuner and crystal/ceramic cartridge. Preferred variable crossover, feedback type tone control circuit. Highly stable Williamson-type power amplifier circuit. Power output: 12W continuous, 25W peak. Kit \$34.95. Wired \$57.95. Includes cover.

New HFS3 3-Way Speaker System Semi-Kit complete with factory-built 3" veneered plywood (4 sides) cabinet. Bellows-suspension, full-inch excursion 12" woofer (22 cps res.), 8" mid-range speaker with high internal damping cone for smooth response. 3 1/2" cone tweeter, 2 1/4 cu. ft. ducted-port enclosure. System Q of 1/2 for smoothest frequency & best transient response. 32-14,000 cps clean, useful response. 16 ohms impedance. HWD: 26 1/2", 13 7/8", 14 3/8". Unfinished birch \$72.50. Walnut, mahogany or teak \$87.95.

New HFS5 2-Way Speaker System Semi-Kit complete with factory-built 3 1/2" veneered plywood (4 sides) cabinet. Bellows-suspension, 3/8" excursion,



Stereo Preamplifier HF85



**70W Stereo Power Amplifier HF87
28W Stereo Power Amplifier HF86**



**FM Tuner HFT90
AM Tuner HFT94**



Stereo Integrated Amplifier AF4



**12W Mono Integrated Amplifier HF12
Other Mono Integrated Amplifiers:
50, 30 & 20W (use 2 for stereo)**



**2-Way Bookshelf
Speaker System HFS1
3-Way Speaker System HFS3
2-Way Speaker System HFS5**

8" woofer (45 cps res.) & 3 1/2" cone tweeter, 1 1/2 cu. ft. ducted-port enclosure. System Q of 1/2 for smoothest frequency & best transient response. 45-14,000 cps clean, useful response. HWD: 24", 12 1/2", 10 1/2". Unfinished birch \$47.50. Walnut, mahogany or teak \$59.50. **HFS1 Bookshelf Speaker System** complete with factory-built cabinet. Jensen 8" woofer, matching Jensen compression-driver exponential horn tweeter. Smooth clean bass: crisp extended highs. 70-12,000 cps range. 8 ohms. HWD: 23" x 11" x 9". Price \$39.95.

LGS-1 Brass Tip Matching 14" Legs — \$3.95. **HFS2 Omni-Directional Speaker System** (not illus.) HWD: 36", 15 1/4", 11 1/2". "Eminently musical" HIGH FIDELITY. "Fine for stereo" MODERN HI-FI. Completely factory-built. Mahogany or walnut \$139.95. Blond \$144.95.

EICO, 33-00 Northern Blvd., L.I.C. 1, N. Y.

SHOW ME HOW TO SAVE 50% on 65 models of top quality:

- Hi-Fi Test Instruments
 - "Ham" Gear Free STEREO Hi-Fi Guide
- Send FREE catalog & name of neighborhood EICO dealer.

NAME _____ A-9
ADDRESS _____
CITY _____ ZONE _____ STATE _____



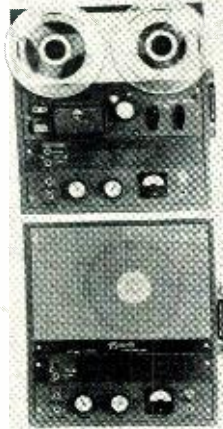
Over 1 MILLION EICO Instruments in use throughout the world.

Add 5% in the West.

Copyright 1959 by Electronic Instr. Co., Inc. 33-00 N. Blvd., L. I. C. 1, N. Y.

In New York hear "The EICO Stereo Hour," WBAI-FM, 99.5 mc, Mondays, Thursdays and Saturdays, 7:00 P.M.

22 WAYS TO ENJOY THE ROBERTS



HOW TAPE EQUIPMENT SERVES MANY AUDIO NEEDS

22 are discussed in new
Roberts booklet

Roberts Electronics Inc. has prepared this 20 page booklet to demonstrate the wide versatility and high quality reproduction of monaural and stereo tape equipment. Eight ways to record live or from broadcasts and to dub or copy from disks and tapes are discussed, including the correct way to tape stereo broadcasts.

Also included in this informative booklet are ten methods to play back through high level and low level external amplifier/speakers in both monaural and stereo. Suggestions are given for the use of tape equipment to "dub in" vocal or instrumental accompaniment by mixing and multiple recording.

The booklet treats with the general use and care of tape equipment and instructions for tape splicing, microphone placement and recording procedure. A complete index and bibliography are included.

Before you buy a tape recorder, you will want to read this valuable booklet, "22 Ways to Enjoy the Roberts." For your copy, just fill out and mail the coupon below.

ROBERTS ELECTRONICS INC.

1045 N. Sycamore, Los Angeles 38, Calif. Dept. D
Please send me a copy of "22 Ways to Enjoy the Roberts."

NAME _____

ADDRESS _____

CITY _____ ZONE _____ STATE _____

Enclose 10c (stamps, cash) for handling & postage

use this type of plastic for record making?

Better—why bother to make a pure, all-out new material with the "conductivity of mercury". I thought to myself at once that even a very slight electrical conductivity would suffice for our special purposes; maybe this mercury material, in some form or other, could be added to vinylite, in sufficient quantity to reduce the static but not enough to throw those delicately balanced physical qualities of vinyl plastic awry and gum up the presses.

(Ugh, said the careful amateur in me, they already add carbon black and that is a conductor; maybe my idea isn't so good.)

It wasn't amateurishness that stopped me cold, though, but simply the plain fact that I could not get hold of the material itself, nor offer any description of it to the govt. I tried. My obliging lawyer looked up all the patent literature and found nothing that seemed to smack of my idea at all. But, he said, I'd have to be specific about that conducting plastic. It, in itself, was probably well protected; mine was merely an idea for its use that hadn't been propounded before.

Well, we tried hard, but those plastic boys were clever. All I ever got was polite letters suggesting that samples were not available and that further information would be sent on at an appropriate moment; they'd put me on a list. I never heard a thing again, as you may easily guess. Every attempt I made to get more information led to the same block. So that was that.

Now roughly ten years later, RCA Victor has announced "Miracle Surface." It is a "new revolutionary anti-static ingredient 317X" . . . one of the greatest technical advances in recording of the decade (*sic*). "Miracle Surface records will not attract dust, will help to prevent surface noises and ensure faithful sound reproduction on all RCA Victor Living Stereo records." Doesn't mention mono but we'll suppose this to be a mere oversight.

"Miracle Surface records were developed after years of the most intensive and detailed research by RCA Victor engineers. It has long been a dream of the record industry to make record surfaces anti-static. A large part of consumer complaints about records have always concerned the problem of extra-musical noises and the accumulation of lint as the needle passes over the record grooves. Miracle Surface records eliminate these problems."

Well, I say congrats to RCA and my only wonder—just having received the advance press release—is whether the "compound" (the term RCA uses) is all the way through the record or a matter of surface treatment, suggested by the trade name. No illumination whatever, at this point, but this is much too big a thing to keep exclusive and, if it works as it should, we'll soon have all the other companies' ideas on the subject—either with comparable materials, licensed use of the same stuff, or with raucous objections.

If the new material does what it is supposed to and keeps on doing it for the life of the record, if playing quality and record life are unchanged in the physical sense, then RCA has something tremendous here.

Hey, RCA, how about tossing me a Christmas dividend? Like, say, a life membership in the RCA Victor Society of Great Music. I could use a few more records.

3. THE MANUAL CHANGER

The record changer makers have really been on the spot these last couple of years, what with stereo, new and smaller points on our styli, lighter stylus force—down to

almost nothing, relatively speaking—and in general the necessity for a home-type, general-purpose component that has all the finesse of a highly professional machine yet remains childproof, wife-proof, dog-proof and, (let's not forget)—changes records, every time.

Skeptics have always been able to claim that a changer is at best a hideous compromise, between lazy-man automation and the true requirements of the "modern" record. Even the very first changers, with their enormous bulk, their three-pound playing heads and their lovely habit of smashing a shellac disc every so often, were quite clearly a form of low-caste compromise. The highbrow record collectors of the thirties didn't mind saying so, even then. The high-type record collector disdained the early changer, whether it was a Capehart or a Garrard or what-have-you, and changed his 78's by hand, with his nose in the air and a very satisfied look upon his big face.

No change—or not much—as of today, in this basic attitude among the new hi-fi faithful. Changers are still for the birds—i.e. the non-intellectuals, the non-dedicated, the background music listeners, the lazy people, the button-pushers. The real gone hi-fi man changes his own, as always (handling the record ever-so-carefully by its edges, with a delicate swipe of a polishing cloth on the immaculate surface before he puts each one on the table) and most such people are particularly proud of the fact that their manual record playing equipment costs more than a comparable changer. It must be good!

Well, of course, speaking generally, it is. As I say, the changer people have been on a mean spot, trying to keep up their mechanical prestige, so to speak. But as almost always happens in such cases, adversity—not severe enough to put them out of business, there being plenty of low-brow lazy people still around—has sharpened their efforts towards improvement! Changers now try ever so manfully to be manual players too. Believe it or not, it is now a virtue for a changer to be a manual player!

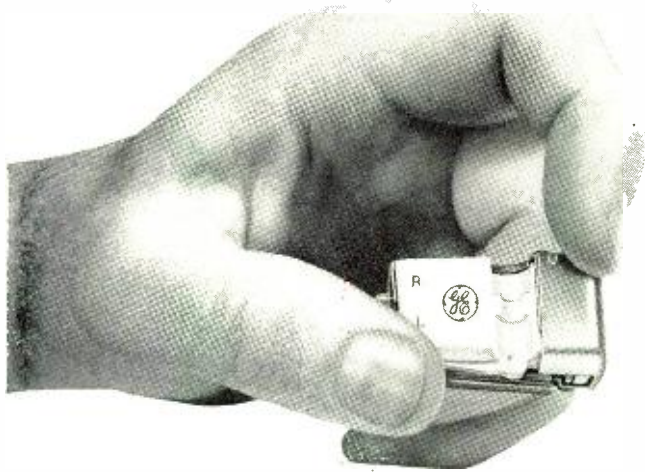
A true virtue, too. With the LP, manual playing is honestly only a shade more troublesome than the automatic sort. Automatic playing still has annoyances that offset its values only too frequently, and no point in going into them—we all have experienced them.

The main value of a changer, today, is in two mechanical operations neither of which involves changing. The biggest usefulness is the simplest, the automatic shut-off at the end of a record. There, in one device, you have the most striking, the most genuinely practical aspect of the present-day changer. When the record is done, the machine stops—there's none of that gentle, persistent, gradually increasing rurr, rurr, rurr, rurr, which indicates a record turning idly in its final groove—it always happens when you are on the phone or in the kitchen or outdoors or elsewhere; time and again you are likely to let the thing just run, quietly, for minutes, hours, even overnight. An automatic stop is the answer and no two ways about it.

The other vital function, as I see it, is the automatic start. Now this, of course, is not nearly as much of a straight convenience. It is usually much quicker and simpler just to put your stylus in the groove by hand and let'er rip. But few of us can do that little thing nowadays without at least one or two loud squawks of protest from the speaker. Pickups are too light, our hands too clumsy. The automatic start, involving the relatively slow process of put-

(Continued on page 62)

the all-new VR-22 stereo cartridge



VR-225 .5 mil diamond stylus. For professional-type tone arms, \$27.95.



VR-227 .7 mil diamond stylus. For record changer or turntable, \$24.95.

Now, outstanding in all four critical areas of stereo cartridge performance—**Compliance**—Tracks precisely, not a trace of stiffness. **Channel Separation**—Up to 30 db for maximum stereo effect. Nothing higher on the market! **Response**—Smooth and flat for superior sound from 20 to 20,000 cycles (VR-225), 20 to 17,000 cycles (VR-227). **Virtually hum-free**—triple shielded against stray currents. **This is our masterpiece. We urge you to hear it.**

GENERAL  ELECTRIC

Audio Components Section, Auburn, N. Y.

EDITOR'S REVIEW

TWO FOR THE SHOW

WHEN SEPTEMBER ROLLS AROUND and we begin to enjoy a respite from the summer heat, we usually tell ourselves that now we can get down to some serious work. Then we look at the schedule of hi-fi shows and realize it was all a dream—even though we do not attend all of them personally. Fact is, it would be impossible to attend every one throughout because they occur on the same days. One can't be in Milwaukee and Houston on the same three days, nor in Chicago and Dallas the following weekend.

The Chicago High Fidelity Show and Music Festival is always looked forward to as the beginning of the fall buying season—the place where all the new equipment will be shown to the public for the first time. AUDIO readers already know what most of the new gadgets are, since they have read the PRODUCT PREVIEW in the August issue and, unless they read this page first every month, they will have seen the continuation in this issue. But it is always more fun to see and feel the new amplifiers, changers, turntables, phono pickups, tape recorders, speakers, and so on, than it is to read about them—although the reading tells us the basic facts and sparks our interest in the particular items we will look for. *And listen to.*

That brings up another question—how does one judge an amplifier's quality unless he is familiar with the speaker? How do you judge a tuner unless you know the quality of the station to which you are listening and the quality of the particular record that may be playing? To do a reliable job of judging anything, one must have some standard of reference. For example, we like to carry a few records with us when we are asked to evaluate a loudspeaker or a pickup or even an amplifier—records with which we are thoroughly familiar. Even though it is generally recognized that most people do not have reliable aural memories, the usual serious audiophile is actually an experienced listener and if he uses the same records all the time his comparisons are likely to be reasonably reliable.

Fortunately, one or two records each year will become the "theme songs" of the hi-fi shows, and after a few days we get to hear them so often that we can arrive at an average of how they sound. Then we can make valid comparisons. And we have also added a new title or so to our own list of "familiar" records.

STANDARDS AND ADVERTISING

With the adoption by the Institute of High Fidelity Manufacturers of standards for measurement of tuners and amplifiers, it should become much easier for one to compare performance of these products by a

perusal of the specifications. The standards for measurements of tuners were published in these pages in the May and June issues, and those for amplifiers will be published in the October issue.

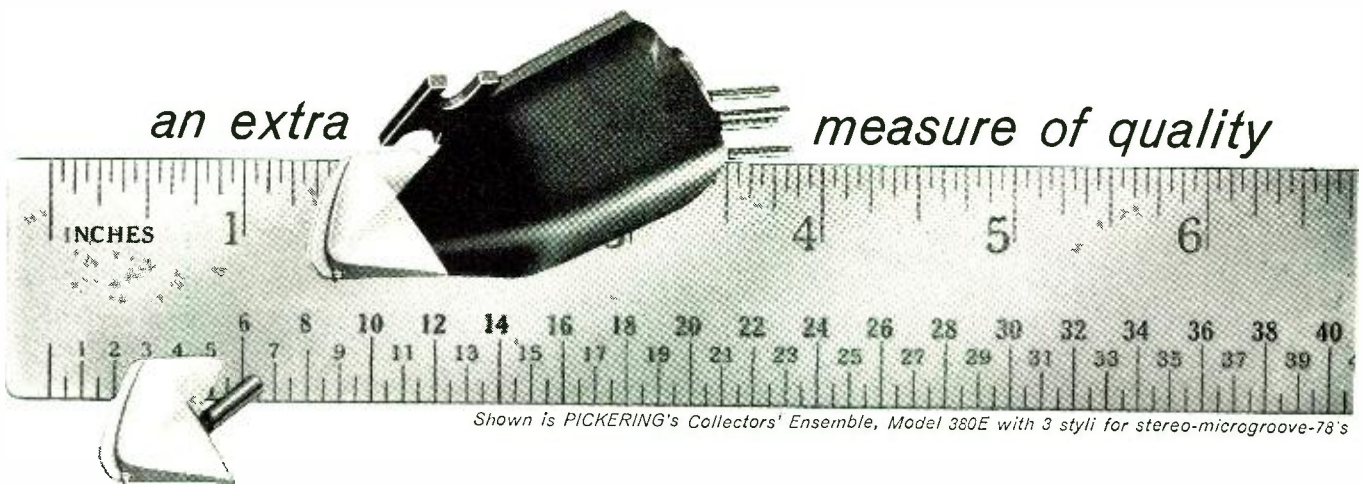
Since these standards have been adopted by the Institute, we assume that the published information about members' products will be in accordance with them, and we hope that each one will so indicate in his printed brochures and advertisements. And there is no reason why the products of those manufacturers who are not members should not also be measured and described in the same terms. Heretofore the information about products has not always been expressed in the same terms and it is something like comparing automobile speeds measured over a course whose length was established by surveyors using rubber tapes.

We believe standards are essential whenever any comparative description is presented. No AUDIO reader is ever actually fooled by an advertisement which offers a "magnificent 30-watt amplifier" when the tube list includes as power tubes a pair of 6V6's. Unfortunately, the general public doesn't have sufficient built-in protection to know the difference. On the other hand, the philosophy behind the component manufacturers is such that they wouldn't attempt such a fancy claim, and since their companies are generally comparatively small, it is probable that the chief engineer sat in while the advertising was being written. In many of the really big companies it appears that the specifications originated on Madison Avenue.

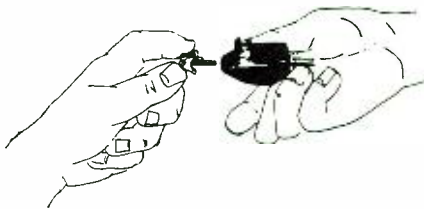
MORE FM NETWORKING

The New York area, already well supplied with good FM programming, engenders a feeling of complacency among those of us who like good music, and it is only when we wander far afield—like across the Hudson River—that we run across a dearth of the kind of music we prefer. New York state is fairly well covered with music—largely from the QXR Network—and there are a few such stations in New Jersey and Philadelphia. With occasional exceptions, however, when one goes south and west from Philadelphia the aural fare begins to have a strong tinge of "country music," and very few AM stations offer anything that runs over two minutes, so they can accommodate more commercials.

The QXR Network carries the good music programs of WQXR, New York—long the staple of many of the metropolitan area's listeners. WHINC-FM in New Haven joined the network in May of this year, and more recently WTAG-FM of Worcester, Massachusetts, has entered the fold. The people of those areas are fortunate.



Shown is PICKERING's Collectors' Ensemble, Model 380E with 3 styli for stereo-microgroove-78's



Only the Stanton Stereo FLUXVALVE features the safe, comfortable, easily replaceable stylus assembly.

**PICKERING — for more than a decade — the world's most experienced manufacturer of high fidelity pickups... supplier to the recording industry.*

FOR THOSE WHO CAN HEAR THE DIFFERENCE

Pickering

PICKERING & CO., INC., PLAINVIEW, NEW YORK

AUDIO • SEPTEMBER, 1959

The extra measure of quality in every PICKERING product **adds extra value...** **extra convenience...** to any high fidelity system! The beautifully simple sculptured lines... the low, sleek profile... the **new** look in quality stereophonic pickups—this is the shape of good things to come—this is the PICKERING **Collectors' Series**.

Without question, the 380 is the **finest**—with more features and more flexibility than any other stereo pickup in the world. For example— the 380 is fully encapsulated in **precious mu-metal** for absolutely hum-free performance.

Visit your dealer for a demonstration today, you will love the **live, eager** response to every nuance in the record groove... you will find yourself listening to a **bright, delightful quality**... second only to the original live performance. The only true way to judge a high fidelity component is to compare it with another... measure its performance with the most vital instrument of all... the ear. Those who can **hear** the difference... choose PICKERING*.

COLLECTORS' SERIES

Totally new and unique to high fidelity is the "Collectors' Ensemble"... a complete quality "pickup-package" for reproduction of all records—stereo—microgroove—78's.

Model 380E—Collectors' Ensemble, includes the Stanton Stereo FLUXVALVE with 3 "V-GUARD" styli for stereo, microgroove and 78 rpm records **\$60.00**

Model 380A—Includes Stanton Stereo FLUXVALVE with D3807A "V-GUARD" stylus for transcription arms **\$34.50**

Model 380C—Includes Stanton Stereo FLUXVALVE with D3807C "V-GUARD" stylus for auto-changer arms **\$29.85**

PRO-STANDARD SERIES

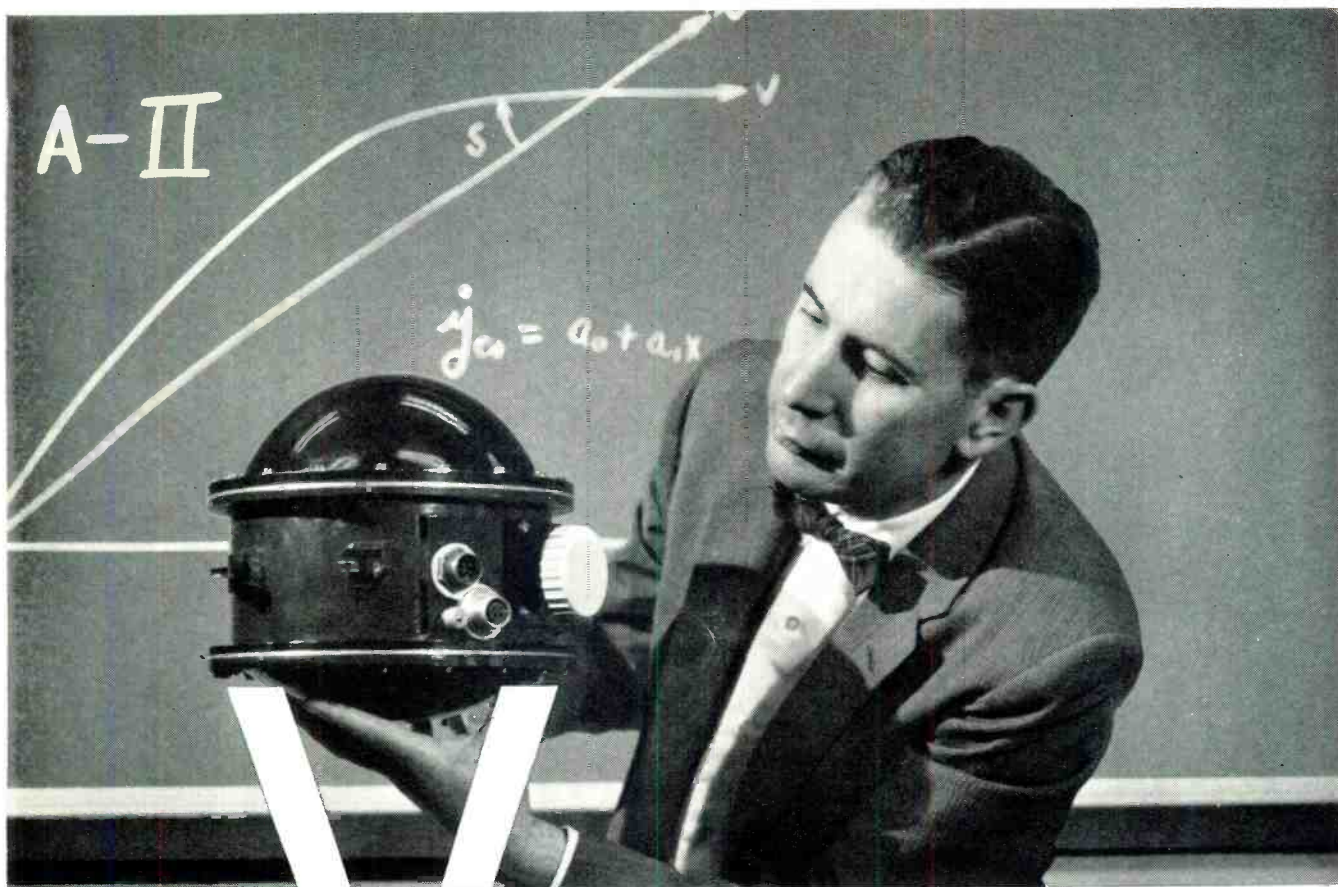
It may interest you to know that in one short year, PICKERING'S Pro-Standard Series has become an industry standard... the universal choice of professionals. Now, the new and revolutionary PAC[®] technique developed by PICKERING has effected economies in manufacture which permit a reduction in the price of the Pro-Standard Series.

Model 371A Mk II Stanton Stereo FLUXVALVE Pickup now **\$26.40**

Model 371C Mk II Stanton Stereo FLUXVALVE Pickup now **\$24.00**

Model 196 Mk II UNIPOISE Arm with integrated Stanton Stereo FLUXVALVE Pickup now **\$49.50**

*PICKERING AUTOMATED CRAFTSMANSHIP
FLUXVALVE, "V-GUARD", "T-GUARD", UNIPOISE, PAC[®]



Edwin Felch, project director in charge of developing the Titan guidance system, holds the "voice" of the ICBM.

V VOICE OF A GUIDED MISSILE

This is a missile-borne transmitter. It is the "voice" of a missile in flight . . . part of a new radio-inertial guidance system developed by Bell Telephone Laboratories for the Ballistic Missile Division of the Air Force.

This versatile system helped deliver the nose cone of a Thor-Able test missile precisely to its South Atlantic target area—5000 miles from Cape Canaveral, Florida. So accurately was the nose cone placed that a waiting group of ships and planes retrieved it in a matter of hours. It was the first nose cone ever to be recovered after so long a flight.

The command guidance system which made such accuracy possible combines precision tracking radar with a special Remington Rand Univac computer. Fed a steady stream of signals from the missile-borne transmitter, the ground-based equipment compares the missile's flight path with the preselected path. Corrective steering orders are computed and transmitted automatically to the missile. The ground

station monitors the progress of the flight continuously and obtains immediate evaluation of mission success. And since the principal control equipment is kept on the ground, expendable hardware in the missile itself is minimized.

This radio-inertial guidance system is a product of the Bell Laboratories-Western Electric development-production team. It is in production at Western Electric for the first operational squadrons of the Titan intercontinental ballistic missile.

Bell Labs scientists and engineers developed the world's most versatile telephone network and much of our nation's radar. They have constantly pioneered in missile systems. From their storehouse of knowledge and experience comes this new achievement in missile guidance.

BELL TELEPHONE LABORATORIES

*World center of communications research
and development*



Low-Noise AM Tuner Uses Triode Input

CHARLES H. CHANDLER* and ALLEN R. GREENLEAF

With this simple conversion of the r.f. stage of a simple superheterodyne AM receiver, the noise level is reduced enough to provide a good match for the FM tuner on stereophonic broadcasts.

AN UNUSUAL AM TUNER had its origin when one of the writers (the second one) desired to receive AM-FM stereo broadcasts from WQXR, New York. He was faced with a double problem: 1) low signal strength because of the shielding effect of the steel-frame building in which he lives, and apparently some peculiarity of geographical location; 2) interference from electric devices within the building. As a first step, he purchased an AM superheterodyne tuner kit with shielded loop, and assembled it. The shielded loop greatly reduced the interference, but the tuner produced a constant hiss that made it useless for enjoyable AM reception.

Several persons who had experience in the design and construction of radio receivers were consulted, and each made suggestions that were believed to offer a chance of helping. In accordance with some of these suggestions, the tuner's rather considerable bandwidth was narrowed, and several types of pentode r.f. amplifier tubes, and several pentodes of each type, were tried in the front end in the hope of finding one that was sufficiently quiet. A variable low-pass audio filter that had been used successfully in playing worn 78-rpm records was tried

* 1 Marlborough St., Boston 16, Mass.

at the tuner output, but did not reduce the hiss adequately until the upper audio range had been cut down to a frequency response materially below that obtainable from ordinary table-top radios. This was, of course, unacceptable. Finally the tuner was sent to a laboratory for check-up and any necessary alignment, but the laboratory reported that they were unable to improve it enough to meet the owner's requirements for quietness.

By this time it was clear that the problem was fundamental: the available signal was simply so weak that noise generated in the first tube of the tuner overrode it. Since it was impossible to obtain a stronger signal, the only way out was to reduce the noise.

Source of Noise

Now it is well known that triodes generate appreciably less noise than do pentodes, for reasons arising principally from the greater simplicity of the triode structure. For equally valid reasons, however, triode r.f. amplifiers have not been used in broadcast receivers since some time in the 30's. No modern references could be found in the technical literature to describe broadcast-band receiver circuits with triodes. Older arrangements, using various complicated

or critical neutralizing expedients, were not considered suitable. It was therefore necessary to design a triode front end according to modern concepts; this resulted in the circuit to be described.

Electronics engineer Chandler having supplied a schematic of an AM tuner with triode input, enough parts were obtained for the job, and the tuner was built from scratch (and debugged) by duffer Greenleaf. As the product of a ten-thumber, the tuner is inelegant in appearance, but it is quiet in operation.

A tuned-radio-frequency circuit was first essayed, with encouraging results. However, there appeared to be no reason why the triode could not be substituted, with at least equal success, for the pentode r.f. amplifier which, when used, precedes the mixer stage of a superheterodyne circuit. Such a tuner was accordingly constructed on the salvaged chassis of a Philco Model E-678 receiver, and has proved extremely satisfactory. The E-678 was a complete a.c./d.c./battery receiver, with an r.f. stage as the front end. The 3-gang tuning capacitor, ferrite-core antenna, oscillator coil, r.f. transformer, and i.f. transformers were retained for use in the new tuner; the five 7-contact tube sockets were rewired for regular 6.3-volt tubes.

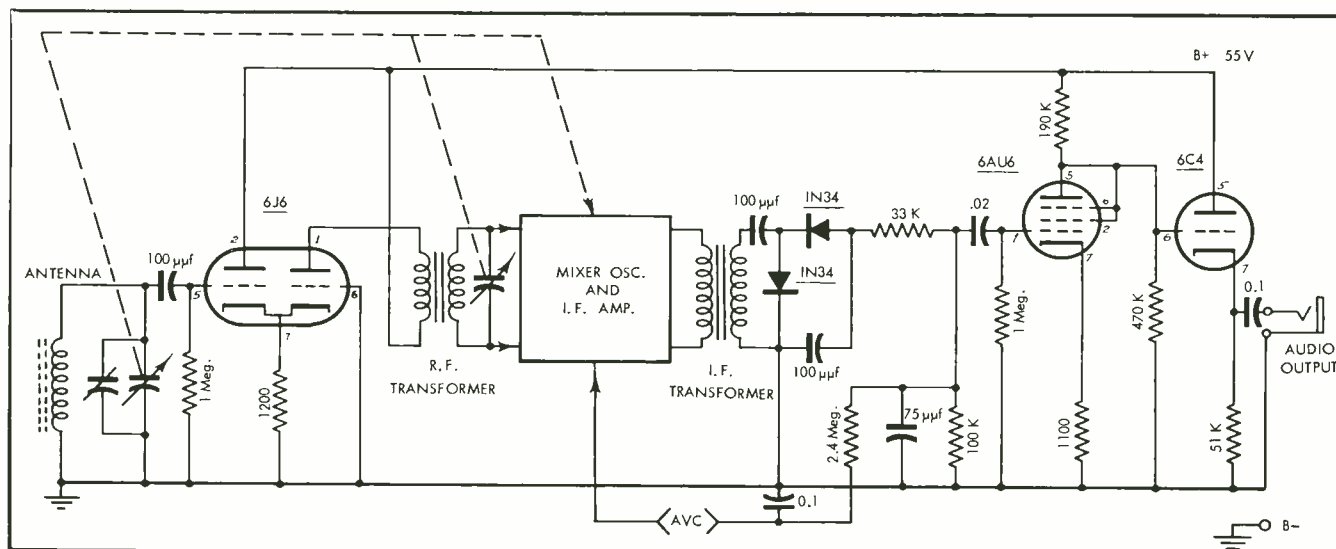


Fig. 1. Schematic diagram of tuner, showing novel r.f. amplifier stage.

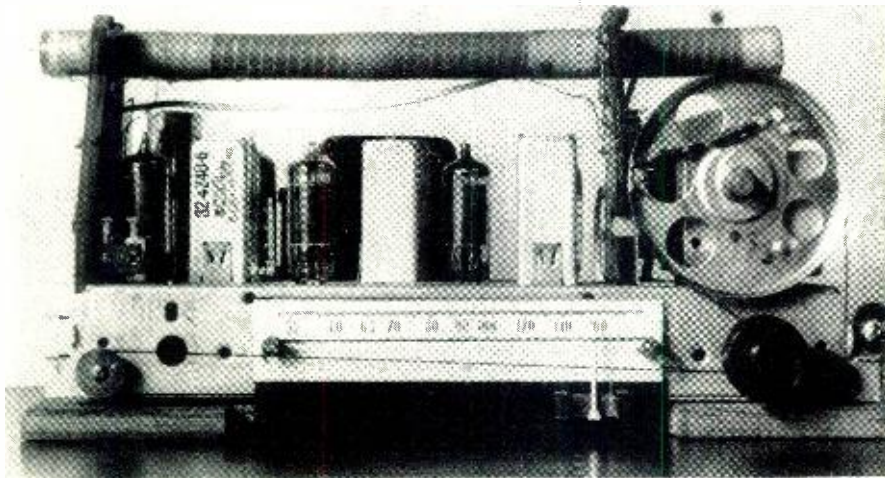


Fig. 2. Photograph of tuner (front view).

Circuit Details

Let us now consider the circuit design details. In order to avoid stability problems, a grounded-grid stage was used as an r.f. amplifier. In this configuration, the grid shields the input from the output, so that no neutralization is required at the frequencies involved. However, a cathode circuit, which is the input of a grounded-grid amplifier, presents a very low impedance to a signal source. This would constitute a severe load on any preceding tuned circuit unless a low-impedance tap were provided on the antenna loop, as is done in transistor radios. While an impedance match could be obtained in this way, the delivered signal voltage would then be quite low—an intolerable situation in view of the extremely weak signal available. An input cathode follower was therefore provided to drive the grounded-grid stage directly. No a.v.c. voltage is applied to this stage, since remote-cutoff triodes are not available; however, this is not a

serious drawback because the tuner is designed for weak-signal application.

As may be seen in Fig. 1, a 6J6 was used for the combination cathode follower and r.f. amplifier. The second stage is a perfectly orthodox 6BE6 converter, followed by a similarly conventional i.f. stage using a 6BA6; a.v.c. is applied to both of these stages. The output is fed to a high-quality diode detector of the peak-to-peak type, a circuit that is gaining increasing favor in AM tuners because of its low distortion. Although the audio voltage was low, its signal-to-noise ratio was satisfactory. To bring volume to a convenient level, a stage of audio amplification was provided by a triode-connected 6AU6, followed by a 6C4 as a cathode follower. Two 6C4's, a 12AU7, or a 6CG7 could, of course, have been used for these functions. Decoupling is entirely conventional; across-socket shielding was found unnecessary. A separate power supply (with transformer) is used; the highest voltage present (on the plates of the 6J6, 6BE6, and 6C4

tubes) is 55, a figure suggesting "starved amplifier" techniques. Higher voltage applied to the first stage increased hiss somewhat.

The schematic shows the essentials, and is believed to be self-explanatory. As noted above, the r.f. and oscillator tuned circuits were those that came with the salvaged chassis, and operated satisfactorily. However, any standard make of ferrite-core loop (the larger the better) may be used as antenna coil; standard replacement-type coils can likewise be used for the r.f., i.f., and oscillator elements. Application of all tuned circuits is precisely the same as in a superheterodyne of conventional design.

Standard alignment procedures were used. After alignment, a linear dial scale from one of the writers' archives was reproduced photographically to a size that made exact scale readings occur at the two tracking points. Although the scale which was photographed had not been designed for this tuner, the procedure cited resulted in calibration more accurate than that of most commercial broadcast receivers. Figure 2, shows this dial clearly on the complete tuner chassis.

The "front end" portion of the tuner is shown in a below-chassis view in Fig. 3. The leads from the ferrite-core antenna enter at the upper left; the r.f. coupling capacitor and grid return resistor are seen to converge at pin 5 of the 6J6 near top center. The common cathode resistor partially obscures the 6J6 socket.

The other tube socket at right center is that of the converter stage. The cocoon-like object just below center is the oscillator coil, with the oscillator padder near left center.

The 6J6 tube was a war surplus item that was stated to be especially "quietized"—probably against microphonics for the most part. (Actually, an ordinary 6J6 was equally satisfactory.) All resistors associated with the 6J6 stage were of the deposited-carbon type. Unquestionably the principal factor in the improvement was the substitution of the triode for the pentode, but low-noise components were felt desirable in order to preserve the full benefit.

Over-all performance of the novel AM tuner is entirely satisfactory, and the AM signal matches in quality the FM signal from the same station as well as AM and FM signals can be expected to match.

It is suggested that anyone who is now afflicted with an AM tuner in which front-end hiss precludes hi-fi results might well see if it is of conventional design, with a pentode as r.f. amplifier. If so, it is almost certain that great improvement can be made simply substituting the triode front end of the tuner shown in the accompanying diagram. The same would be true of the AM section of an AM-FM "stereo" tuner. $\text{\textcircled{A}}$

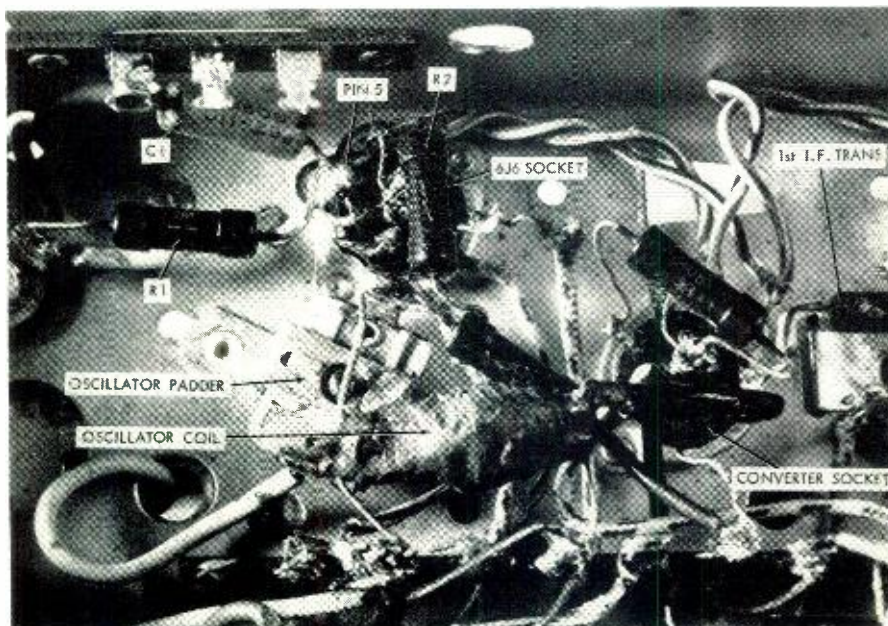


Fig. 3. Portion of underside of tuner, showing wiring of r.f. and mixer stages.



All for Once, Once for All

EDWIN F. WIRSING*

When Forest Lawn Memorial-Park decided to present a special Good Friday-Easter program, the audio men moved in and things began to pop.

HERE IS A 195-foot wide by 45-foot high oil rendering of the Crucifixion of Jesus Christ in a specially-built Hall, and Forest Lawn Memorial-Park, near Los Angeles, decided to feature it in a special Good Friday program with a sixty-piece orchestra, forty-piece chorus and narration. Some 1200 people attended by special invitation, and portions of the proceedings were carried live on radio.

The hallowed halls began to rock when first, the Columbia Broadcasting System was convinced that the occasion offered a splendid opportunity for using its Los Angeles AM and FM facilities to broadcast the program in stereo; second, it was decided as an independent operation to record the event in stereo.

* *Box 2066-D, Pasadena, Calif.*

And everything was to happen at one time, while a live performance took place.

The Glendale Symphony Orchestra, comprised of hand-picked recording, broadcasting, and motion picture musicians presented the music; another hand-picked group of vocalists assembled as the Glendale Chorale; and Amerigo Marino, the Glendale Symphony's Conductor, wrote a special composition for chorus and orchestra based on the massive Crucifixion painting by Jan Styka.

But the real drama was in the prodigious task of getting a stereo broadcast out of this live performance with narration. Add to this the fact that stereo recordings were to be made simultaneously, and one can understand why fourteen microphones, thousands of feet

of cable, and carloads of technicians swarmed over the event like it was an election-year political convention.

To say the least, a most cooperative Maestro Marino was confronted with more than a conductor's share of problems. According to him, "We thought we had everything under control, then during dress rehearsal when the picture was unveiled for purposes of timing, the sound started bouncing off the huge shellacked canvas like rifle shots." The imposing oil painting is normally concealed behind a tremendous curtain, and when drawn the acoustics of the room change completely. So, it was during this revelation at dress rehearsal that the audio engineers stopped everything and indulged in microphone and level adjusting.

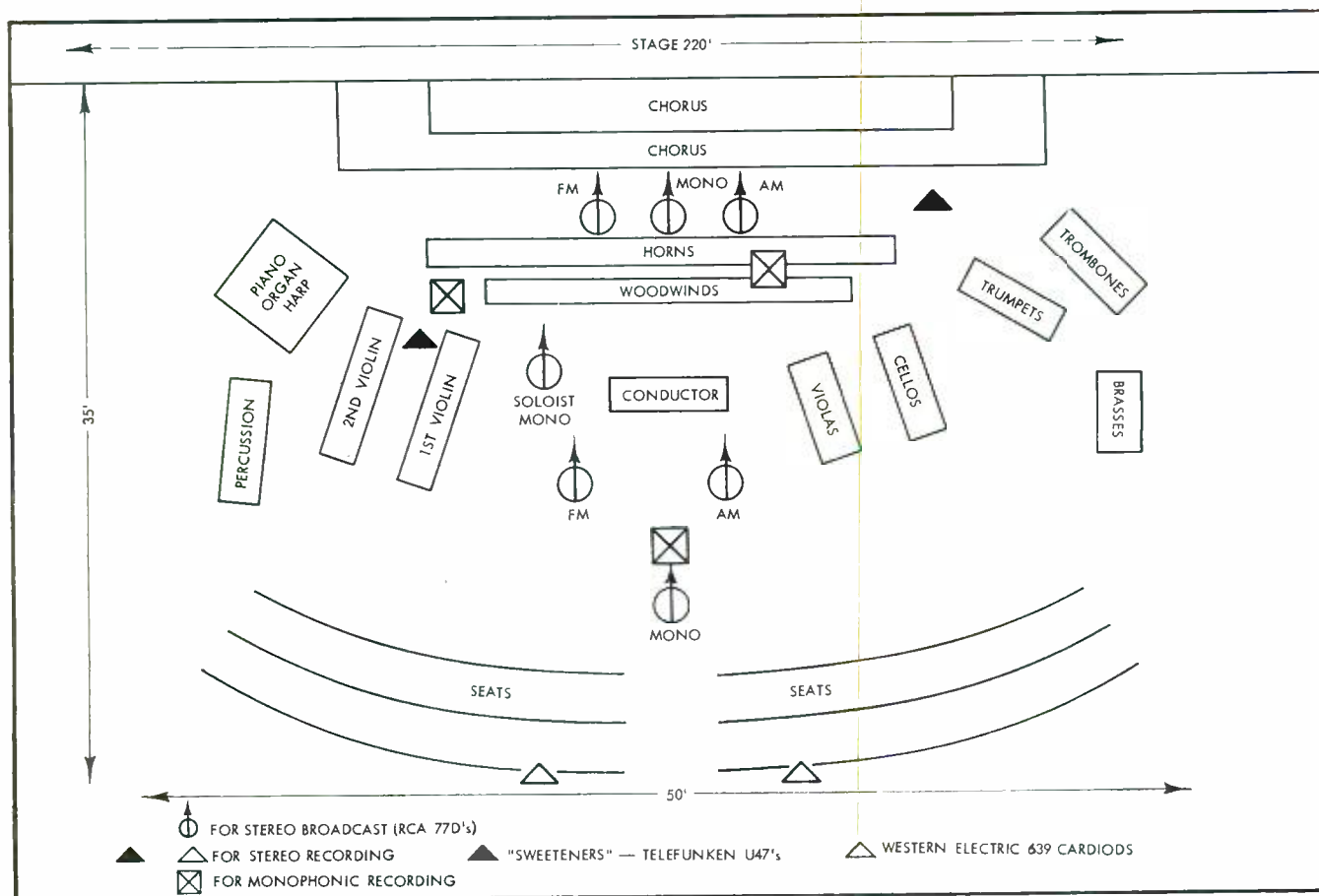


Fig. 1. Diagram showing arrangement of orchestra and chorus, together with the microphone placement used for broadcast and for stereo and mono recording.

The Problem

But let's start from the beginning and reconstruct some of the challenges confronting the sound crews:

The Hall of the Crucifixion at Forest Lawn was built specifically to house the painting; hence the unique dimensions include about 220 feet of width, a hundred feet to the ceiling, and a scant 75 of depth. Adding to the problem, the floor is scooped out like a shell with a low point in the center. Approximately 1200 seats arch from side to side of the hall in 12 rows. Only on one other occasion had there ever been live music presented in the hall and that was during dedication of the painting in 1951; and at that time no attempt was made either to broadcast or professionally record the event. Consequently, there was no "past performance" to go by. So, it was "once through for all and all for once."

When the CBS radio men first looked at the physical facilities, they were for being assigned elsewhere that night, but one bright spot opened up: The Hall of the Crucifixion has a very well situated and yet secluded master control room from which lighting, sound, and curtain are manipulated. The room is located opposite the stage about half-way up and offers ample room for the necessary personnel and audio equipment, which included a portable isolation booth for

the "on-the-air" announcements which the attending audience could not hear. (The control room itself was too chaotic with noise to take a chance without the booth.)

Producer and director of the stereo broadcast over KNX AM and FM was Sterling Tracy. Bob Chadwick, also of the staff, rode the board as technical director. Both must be credited with a terrific job of organization and planning which was reflected in the broadcast itself. No small part of the kudos must be awarded the conductor, Amerigo "Rickie" Marino, who is a proficient radio and motion picture studio artist, as well as a fine interpretive classical conductor. Rickie admittedly has worked under a lot of tough acoustical conditions but, "never anything like this!"

It was obvious from the outset that the orchestra had to be on risers which would compensate for the dip in the center of the auditorium floor. Hence, special platforms were constructed for the orchestra and the chorus. Half of the orchestra, and all of the chorus, was above the conductor; as Marino stated, "I could hear *real* well, but it was the audience and the microphones we were worried about."

We asked how critical the placement of the sections of the orchestra was, to which Marino replied, "It didn't make

any difference where we put the percussion, bass section, and horns, you could hear them rumble through the entire hall during a triple pianissimo. We had to umbrella the strings and woodwinds or nothing would have carried but trumpets on down."

What about the chorus?

"This, too, presented a problem," Marino continued. "They had to be close to me because there was very little light in the Hall, but the closer they were to the orchestra the more difficult the separation became, no matter how many mikes we used. The elevated position helped since we had some of the mikes 'way up in the air, facing the chorus, *over* the orchestra."

In other words, the entire standard position and manner of performing had to be altered from conventional concepts to compensate for the acoustics of the hall.

Microphone Placement

Once the rehearsal got under way, there were countless adjustments at the request of the engineers, and had a less skilled ensemble than the Glendale Symphony been involved, the performance might have suffered due to lack of rehearsal time specifically for the music. Everything seemed to be dominated by the high, long hall and the fourteen

temperamental microphones.

In all fairness to CBS, it might be explained that only seven of the fourteen were used for the stereo broadcast; four others were employed by Milt Philipson, audio engineer, who was producing the stereo tapes of the event. Philipson's problems were quite different from those of the radio men, as will be noted from the diagram of mike placement, *Fig. 1*. In making the tapes the main concern was stereo only and consequently, the inordinate way in which the production was staged both from the standpoint of the hall as well as the needs of the radio boys, was not the best for stereo recording. The radio microphones had to achieve stereo with AM and FM, in addition to furnishing each channel with satisfactory sound to comply with the F.C.C. requirements of separate and independent signals. The radio microphones were never more than eight feet apart at any position, while Philipson's mikes were set up to cover *inside* as well as over-all sound.

There were three additional microphones used by Forest Lawn which had the performance recorded monophonically just as a matter of history, but they too, it might be added, had problems because the orchestra was split in such an unusual way that it required delicate mixing of three mike signals to achieve a decent monophonic signal.

On top of this was the non-perfunctory problem of having the narrator, Wendell Noble, positioned on the stage about fifty feet away from the conductor, who gave all the cues to the performers. An-

other problem was the "off-stage" announcer who filled-in for the radio audience; his portion was fed to radio but eliminated from the tapes—another reason why he had to be isolated.

Of the seven mikes used by CBS, two were used for AM and two for FM; the fifth and sixth were in a direct line at center, one behind the conductor and one in front of the chorus; these were used to fill in to each channel as needed. The seventh radio microphone was exclusively for the soprano soloist, Miss Marie Gibson, and mixed to each channel.

The actual program included the following selections played for the half-hour preceding the broadcast: a Bach *Air from the Suite No. 3 in D Major*. The mammoth hall provided an impressive setting for the mood of the music; although the Hall of the Crucifixion is not a religious edifice, it creates that feeling. Next was Mozart's *Lacrymosa*, from the *Requiem*. The forty members of the Glendale Chorale did most clearly and definitely execute their part and the over-all balance of chorus and orchestra achieved by Marino was commendable.

Finlandia by Sibelius was next, and it was no mean task keeping the staccato trumpet passages from completely dominating the performance. The final selection of the pre-broadcast portion included Mascagni's *Intermezzo* and the *Inneggiano il Signor* from *Cavalleria Rusticana*. Featured again was the Chorale with Miss Gibson, whose voice carried extremely well in the resounding chamber.

Then the broadcast, which was introduced with the typical tuning up of the orchestra (in stereo), supposedly to give all the listeners at home a chance to make necessary adjustments. It did seem a bit superfluous, however, since the station had promotional spots running endlessly all day telling people to get their sets placed correctly. The tuning up bit took the edge off the opening selection for the stereophonic effect.

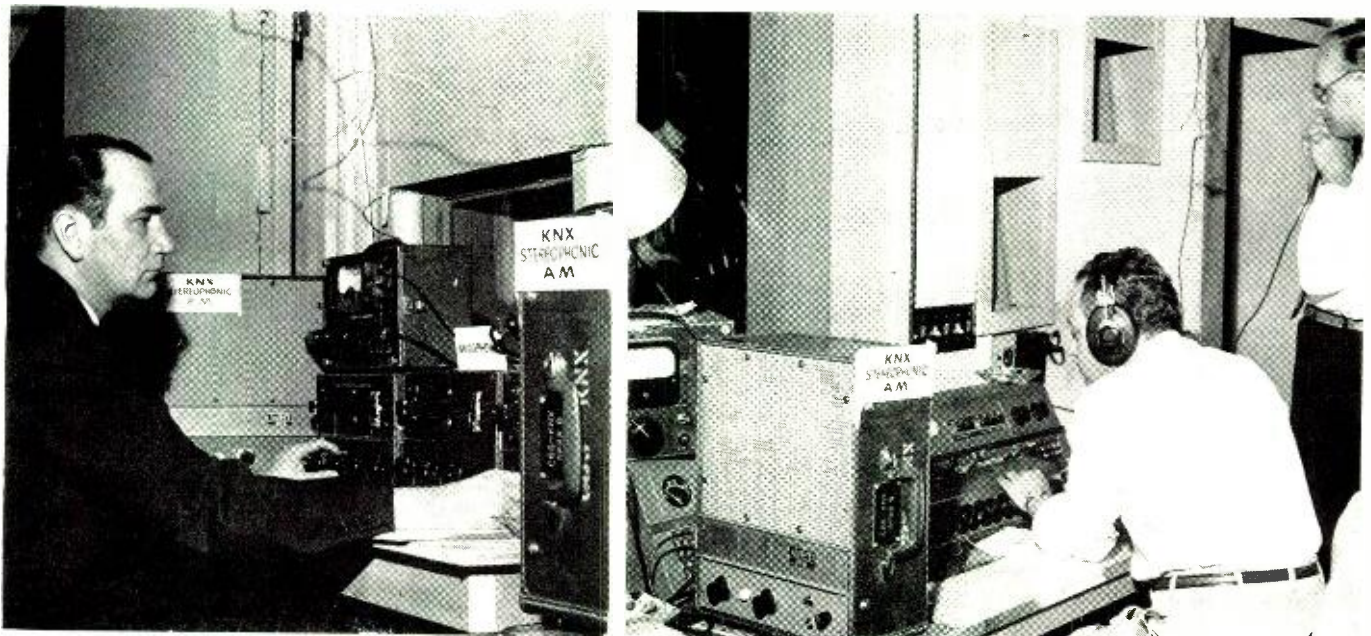
First came the *Russian Easter Overture* by Rimsky-Korsakoff. The stereo effect was most virile. *I Will Not Leave You Comfortless*, by Titecomb, was performed a cappella by the Chorale; and in stereo it was fine; the two mikes in front of the group provided perfect coverage.

Handel's *I Know That My Redeemer Liveth*, featuring Miss Gibson, who now, during the broadcast, was less audible to the audience since the house PA system was leveled down to eliminate possible feedback during the broadcast. Next the *Hallelujah* from *The Messiah* and the chorus seemed to give it everything, leaving little, we fear, for the Sunday Church services the individuals might have been committed to for the following Easter Sunday.

The climax of the program was the presentation of the huge painting, with the special music by Marino. Although the original composition was reminiscent of some motion pictures, it did provide compelling support and it was quite apparent that the composer studied the acoustics before he started writing. The

(Continued on page 95)

Left, Bob Chadwick, radio technical director, Monophonic mixer in the center handled soloist mike as well as two "cover" mikes; AM and FM channels each used two mikes, eight feet apart. Right, Milt Philipson at the control panel for stereo recording, a part of Forest Lawn's facility; tape machines, microphones, and all radio equipment had to be brought in. Philipson had to use 'phones because radio monitors to the left provided cues for other technicians. Man at right, W. V. Stark of Forest Lawn, was on phone to the auditorium with information about lighting effects.



Contributory Infringement of Patents

ALBERT WOODRUFF GRAY*

An infringement can occur when information or material is provided with the intent that it shall be used in such a manner as to negate the value of a patent to its owner. Thus if you aid someone in infringing a patent, you may be just as guilty as if you infringed it yourself.

GIVING OF AID OR ASSISTANCE in the infringement of a patent brings the giver under the ban in the Biblical Apocrypha, "He that toucheth pitch shall be defiled therewith."

Vacuum tubes of a special type used in patented radio receiving sets were sold in the open market. Purchased by the manufacturers of the supplemental equipment for receivers, these tubes were packaged for export by these manufacturers separately but in the cartons containing the other equipment.

Owners of the combination patents of these receiving sets protested to the courts that the substitution of the tubes contributed to the infringement of their receiver patents. No wrong was done, said the court in that instance, until the tubes were inserted in the sockets. The patent monopoly, it was asserted, did not cover the sale of the separate elements, however capable they might be of contributing to the patented invention.

"Only when such association is made," concluded the court, "is there a direct infringement of the monopoly and not even then if it is done outside the territory for which the monopoly is granted. This is the basis for the doctrine of contributory infringement which permits the elements of a patented combination to be sold in this country with the intent that the purchaser shall make and use the invention abroad.

"Hence, sales made in European countries of goods unprotected in such countries by patent, were no infringement, irrespective of the patent protection accorded in the United States."¹

Later however, in this case, it was discovered that these tubes, packed as they were separate from the supplemental equipment, had been inserted and tested in the factory before export.

"The testing was a commercial use of the complicated combination of the patents, just as it is to be used by the ultimate purchasers, even though the re-

ceiving waves and musical tone were generated in a laboratory rather than at a testing transmitting station.

"It is enough that it was necessary to assemble the tubes and the receiver and to use them as a combination of the patent in suit. The tests were made to see if they were marketable—commercially, and hence an infringing use."²

Phonograph Records

In its disposition of this controversy over the wrongful use of these vacuum tubes the court but echoed the law asserted long before by the United States Supreme Court. Under the Berliner patents for a "sound producing apparatus," phonographs and records were manufactured by the Victor Talking Machine Co. By another manufacturer at that time were made disc records adapted for use in the "sound producing apparatus" of the owner of these patents. Of the interference with combination patents that court said.

"A combination is a composition of elements, some of which may be old and others new, or all old, or all new. It is however the combination that is the invention and is as much a unit in contemplation of law as a single or noncomposite instrument.

"Whoever uses it without permission is an infringer of it. Whoever contributes to such use is an infringer of it. It can make no difference as to the infringement or non-infringement of the combination that one of its elements or all of its elements are unpatented.

"For instance, in the case at bar the issue would be exactly the same even if the record disc were a patented article which this company had a right to use or to which the owner of the patent had no rights independent of his right to its use in the combination."³

For many years this law of contributory infringement had been entirely the

decisions of the courts. With the enactment of the present patent law in 1952 this court-made law became a part of that statute. By this present statute it is now provided,

"Whoever actively induces infringement of a patent shall be liable as an infringer. Whoever sells a component of a patented machine, manufacture, combination, or composition, or a material or apparatus for use in practicing a patented process, constituting a material part of the invention, knowing the same to be especially made or especially adapted for use in the infringement of such patent, and not a staple article or commodity of commerce suitable for noninfringing use, shall be liable as a contributory infringer."⁴

Characterization of this section of the statute in the House Report, was in part, "The doctrine of contributory infringement has been part of our law for about 80 years. It has been applied to enjoin those who sought to cause infringement by supplying someone else with the means and directions for infringing a patent.

"One who makes a special device constituting the heart of a patented machine and supplies it to others with directions, specific or implied, to complete the machine, is obviously appropriating the benefit of the patented invention. It is for this reason that the doctrine of contributory infringement, which prevents appropriating another man's patented invention has been characterized as 'an expression both of law and morals.'

"Considerable doubt and confusion as to the scope of contributory infringement has resulted from a number of decisions of the courts in recent years. The purpose of this section is to codify in statutory form principles of contributory infringement and at the same time eliminate the doubt and confusion."

This statement of the purpose of the present patent law provision, was supplemented by the following:

(Continued on page 93)

⁴ 35 U.S.C.A., Sec. 271.

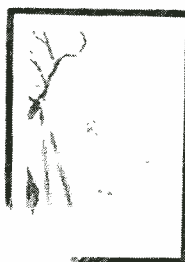
² Radio Corporation of America v. Andrea, 90 Fed. 2d 612, June 7, 1937.

³ Leeds & Catlin v. Victor Talking Machine Co., 213 U. S. 325, April 19, 1909.

* 112-20 72nd Drive, Forest Hills, N. Y.

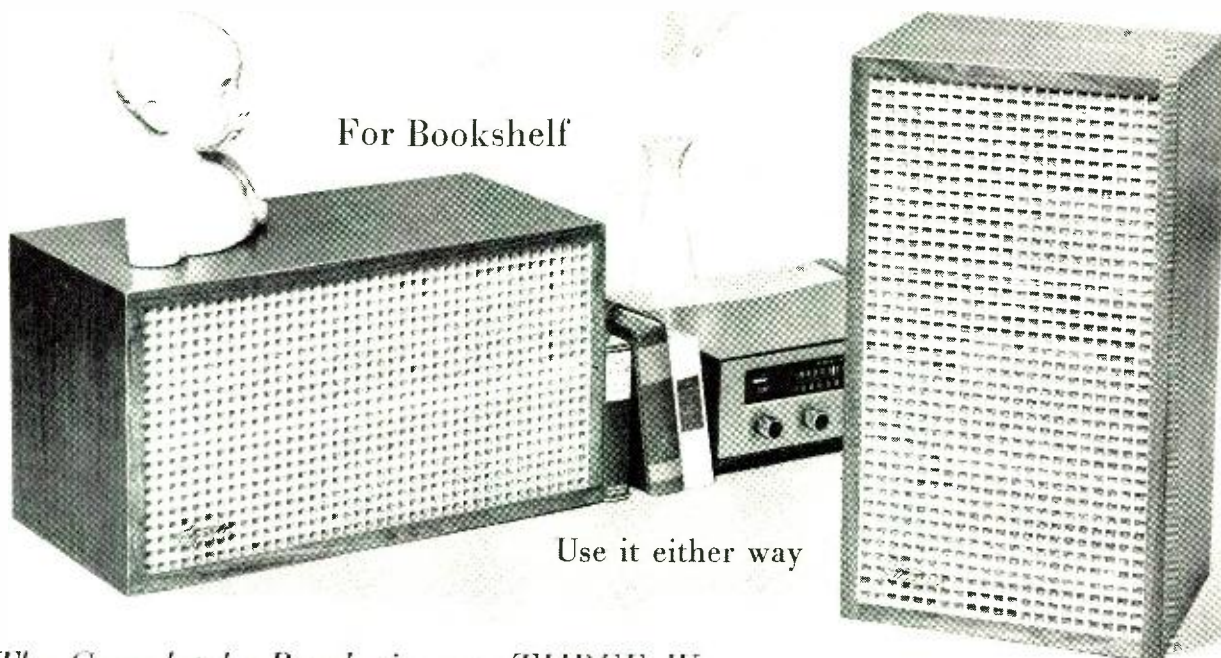
¹ Radio Corporation of America v. Andrea, 79 Fed. 2d 626, November 12, 1935.

92% MORE EFFICIENT!



For Floor

For Bookshelf



Use it either way

The Completely Revolutionary THREE-Way

FISHER XP-1

Free-Piston Speaker System

The search has ended—and in blazing success! For years we have sought to make available a basic speaker system that would do justice to the electrical quality of FISHER components *and at the same time* meet the decorative and space requirements of the average home. Compactness-plus-quality was the goal. Speaker efficiency was the problem. *The breakthrough came with the development of a special magnet assembly that is 92% more efficient.* In practical terms, the XP-1 combines in one compact assembly the best features of high compliance with those of high efficiency. The magnetic lines of force driving the woofer are totally captured in the air gap, where they belong, and where they can be put to work toward unexcelled bass and transient response. Want proof? Hold a metal object near the magnet of any conventional speaker; it will be drawn out of your hand. Then hold the same object near the FISHER XP-1 magnet; nothing happens! Because there are no stray, wasted magnetic fields in the XP-1. Designed for bookshelf or floor installation. *In Mahogany, Walnut, Cherry or Blonde, \$129.50*
In Unfinished Birch, Ready for Staining, \$124.50

POWER REQUIREMENTS: Can be used with any amplifier, 10 watts to 60 watts. **SPEAKERS:** One 12" woofer, one 5" mid-range and one super-tweeter. **FREQUENCY RESPONSE:** 30 cps to well beyond the range of audibility. **IMPEDANCE:** 8 ohms. **SIZE:** 13 1/4" x 24" x 11 3/4" deep.

WRITE TODAY FOR THE COMPLETE XP-1 STORY!

FISHER RADIO CORPORATION • 21-29 44th DRIVE • LONG ISLAND CITY I, N. Y.

Export: Morhan Exporting Corp., 458 Broadway, New York 13, N. Y.



What About Stereo Multiplexing and Matrixing?

NORMAN H. CROWHURST*

Here is a fair and impartial analysis of some of the methods proposed for stereo broadcasting. The author describes each, and comes up with some conclusions as to the probabilities of acceptance of any one of the systems within a reasonable time.

MAYBE THIS IS RUSHING IN where "angels fear to tread", but it seems to me as if some angels have been stepping a little out of bounds. As a man whose background is almost entirely in audio, I thought problems in matrixing and FM were best handled by the radio men. But I have encountered so many contradictions about the audio end of this that I decided to take an interest. This is what I found.

The Problems

First the technical aspects need clarifying. There are really two separate parts to the problem: the transmission and the audio. From the transmission viewpoint, the question is how we standardize subcarriers so we have two channels for stereo, and then, can we use one or more additional subcarriers on the same transmission for some other purpose?

Subcarriers can vary in allocation of the total modulation "percentage" and in location of the subcarrier's frequency, above the audio. All this is related to the

possible separation between associated channels on the same FM carrier, service range, signal-to-noise ratio, and possibly the ease in obtaining satisfactorily low distortion.

On the audio end is the question of how stereo program is distributed between the two available channels allocated to it, the main modulation and one subcarrier. As far as the transmission problems are concerned, there is no *basic* connection.

The transmission channels do not care whether they are transmitting left and right, or $L+R$ and $L-R$, or some other combination. There may be some argument about whether full fidelity (whatever that may mean) is required of the subcarrier channel, or whether a narrow band will do, but there is no essential connection with what the two channels are used for.

So statements that "matrixing robs the main channel more than straight left and right," or that one or the other way of impressing the audio has inherently higher noise level, are just bunk. What does affect the system noise level, frequency range, distortion, and so on, is

the distribution of available *transmission* energy, whichever way the audio utilizes it.

Those are the only purely technical considerations. Then there are some economic ones—or maybe these should be called political! At present FM-multiplexed subcarriers are being used for background music *private* services. As an economic fact, these services have enabled several FM stations to continue in business. These are not likely to be prepared to relinquish this income, unless stereo—or whatever else shows up—offers a more lucrative possibility.

Naturally, some high fidelity enthusiasts are appalled at the absorption of some of the "high fidelity" FM medium for such mundane (if not outrightly immoral) purposes. But we have to be practical. People who run FM stations must eat too. So there is an issue here as to whether it is possible to have a high-fidelity subcarrier as well as full-fidelity main carrier modulation *and* a low-fidelity subcarrier.

On this question one can get differing answers ranging from some who do not believe even a single subcarrier of any kind can be used without "robbing" the main channel in some way, to people who affirm that as many as three or four subcarriers are quite possible, without any diminution of quality.

As far as I have been able to ascertain, no figures exist on performance with *two* subcarriers, although some experimental transmissions have been made, and even tape recordings taken of them. More than two subcarriers have yet to be tried. The possibility is postulated solely on figuring. Performance details with only one subcarrier are far from technically complete in most instances.

To complicate the "political" aspect, arguments appear about what the second subcarrier is to be used for, and about the question of privacy or piracy. Multiplex Services assured me they are not worried about the home user picking up a private service for non-commercial lis-

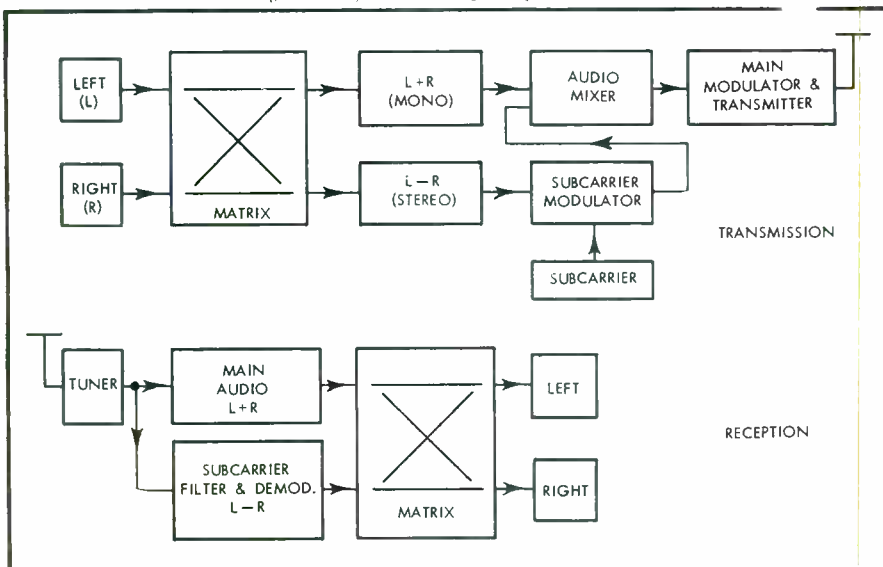


Fig. 1. Basic arrangement of the Crosby system.

AUDIO EMPIRE

ANNOUNCES
TWO NEW STEREOPHONIC
HIGH FIDELITY COMPONENTS —
THE FIRST TO ACHIEVE

STEREO/BALANCE

MOST ESSENTIAL REQUIREMENT
TO FULL-DIMENSIONAL STEREO PERFORMANCE



NEW empire 98 STEREO/BALANCE TRANSCRIPTION ARM

Stereo/balance through dynamic balance—the outstanding achievement of the new Empire 98 Transcription Arm. The geometry of the arm's design aligns the center of mass at the pivot point, so that the arm is in balance in all planes. The stylus exerts no greater pressure on either wall of the groove if the table is tilted at any angle—even upside down.

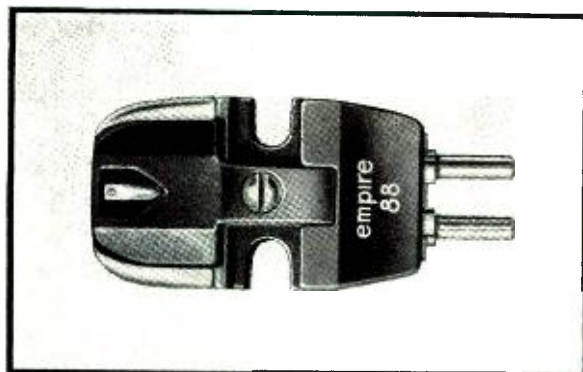
Further, this balance is not disturbed with any required change in stylus pressure, because changing stylus pressure with the Empire 98 does not shift the center of mass as it does in arms where stylus pressure depends upon the position of the counterweight.

The counterweight is only used to 'zero-out' the cartridge. Stylus pressure is actually dialed with a calibrated knob. This knob adjusts the tension of a temperature compensated linear torsion spring which applies a torque force as close to the theoretical center of mass as is mechanically possible. This knob is calibrated in grams with an accuracy of 0.1 grams.

The natural resonance of the Empire 98 is below the threshold of audibility (approximately 10 to 13 cycles). Precision ball-bearing races provide friction-free compliance in both vertical and lateral movements. The cartridge shell accepts all standard cartridges, is interchangeable, and is fitted with gold-plated, non-oxidizing electrical contacts. Every detail of the Empire 98 substantiates the careful planning that went into its design, and gives ample evidence of its quality in action.

EMPIRE 98 12" transcription arm \$34.50; EMPIRE 98P 16" transcription arm \$38.50

NEW empire 88 STEREO/BALANCE CARTRIDGE



The most impressive—the most dramatic feature of the new Empire 88 is the quality of its performance. It is difficult to equate and describe smoothness of response, clean, articulate reproduction, dimensional fullness and balance—yet, these are the sensations immediately evident with the first demonstration of this remarkable cartridge.

The Empire 88 employs the much-acclaimed moving magnet principle, incorporated in a new, improved design. Frequency response extends from 20 to 20,000 cycles, ± 2 db. The outputs of the two channels are perfectly balanced within ± 1 db. Yet, interchannel isolation over the entire stereo frequency range is better than 20 db. Hum-free operation is assured by the use of modern precautionary techniques: 4-pole balanced 'hum-bucking' construction, mu-metal magnetic shielding and 4-terminal output.

Aside from the noticeably superior performance of the Empire 88 over other cartridges playing the same monophonic or stereo records, there is virtually no groove wear. This is a result of the exclusive Empire 88 stylus lever design which achieves high compliance (5×10^{-9} cm/dyne vertically and laterally) and dynamic mass (less than 0.7×10^{-11} grams) diminishing to zero at high frequencies.

EMPIRE 88 with diamond stylus \$24.50; EMPIRE 88S with sapphire stylus \$18.50

See and hear these quality stereophonic components at your high fidelity dealer today, or write for details:

Audio Empire-precision products of Dyna-Empire, Inc., 1075 Stewart Avenue, Garden City, N. Y.
Dept. A-9

in Canada: Active Radio & TV Ltd., Toronto 2, Ont.

audio/empire

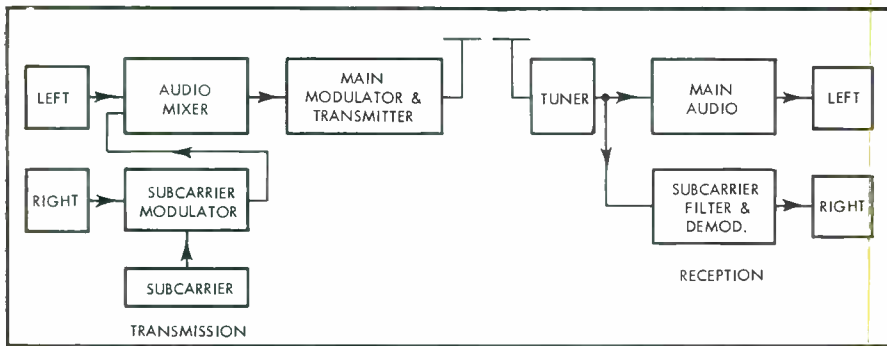


Fig. 2. Basic arrangement of the system according to the original Halstead proposal.

tening in his own living room. Their objection is that availability of multiplex adapters for home use means restaurants can easily buy and use the same sets to "steal" the program.

The answer to this is that you can also buy devices for pickup of telephone conversations, but this does not imply legalizing of wire tapping, infringement of privacy, or an official "nod" to blackmail by means of it. Criminal infringement, using legally marketed equipment, must still be cared for by proper police action and legal process.

Apparently realizing this is a weak case, some are arguing that there are more "legitimate" uses for subcarriers, such as for expanding educational facilities. Now, we are all in favor of anything that will help out the appalling shortage of classroom space and faculty time in the nation's colleges and schools. Probably nothing in this country is more vital at this time.

What surprises—and disgusts—me, is to hear a proponent of one system accusing the proponent of another of being opposed to such usage, when each of the systems involved in the argument is equally applicable (or inapplicable) to it.

In view of these attitudes, it takes quite an effort with a mud-scraper to get at the underlying facts. Let's take a quick look at the current proposals in the field.

The Crosby System

This system has been explained ade-

quately before. The essential feature of the system is the use of matrixing in the audio. The main modulation carries left plus right, the subcarrier left minus right. Matrixing is necessary on reception to get true stereo, which means an FM transmission using this system will not be strictly compatible with existing AM/FM transmissions. (Fig. 1)

The original Crosby recommendation was for a subcarrier of 50 ke/s modulated between 25 and 75 ke/s (25 ke/s deviation) and occupying half of the available main carrier modulation, which would be 37.5 ke/s. For the unmodulated subcarrier, this is a modulation index of 0.75, varying between 1.5 and 0.5 for the maximum swing of the subcarrier frequency.

This can in turn be broken up into sidebands of sidebands, most of which is hypothesized on the basis of "100 per cent" modulation over the range of audio frequencies, modulation index, or deviation ratio being referred to 100 per cent modulation at the highest accepted audio frequency. But if the modulation index is 5 (the figure for "straight", unmultiplied FM) at 15,000 cps, 100 per cent modulation at 1000 cps will represent a modulation index of 15 times this, or 75. This requires about 100 significant sidebands to transmit 100 per cent modulation at 1000 cps, extending about 100 ke/s on each side of the carrier.

But practical program modulation is not as simple as this. One does not get 100 per cent modulation of any one frequency, but a peak excursion correspond-

ing to 100 per cent when the instantaneous peaks of the component audio happen to add up in one direction.

All this has to be done twice over in multiplex: once in modulating the subcarrier, and again in applying the composite audio modulation to the main carrier. Then it all has to be transferred through the various stages from the audio modulator to the antenna without further distortion, which imposes more rigorous requirements than previously necessary for FM transmission.

Crosby reports his system capable of quite low distortion figures, while others reporting on WBAI (New York City) experimental transmissions using the Crosby system find much higher distortion figures. There is the reason for the difference—system capability, *vs.* actual equipment performance. *And this is not unique to the Crosby system.* It has to be faced, in precisely similar fashion, by all of them.

While the Crosby system is intentionally a wide deviation system, there are no absolute figures in it. It is quite as possible (or impossible) to put in another subcarrier, regardless of whether or not sum-and-difference matrixing, which is Crosby's *basic feature and claim*, is used. Distortion, frequency response and dynamic range on the subcarrier are not affected by whether the signal it carries is a matrixed one or not.

The Halstead System

By this designation I refer to the earlier proposal put forward by William S. Halstead. This was to use "straight" multiplexing without any matrixing: left channel on the main modulation with right on the subcarrier. To squeeze in two subcarriers (in reasonable "comfort"), the proposal was to restrict the right channel audio to a maximum frequency of 8000 cps, on the theory (which was supposed to be backed by experimental evidence) that frequencies above this do not contribute to stereo, so it's enough if they come from the left only. (Fig. 2).

The argument for the system was that it did not interfere with the private service operation and that it is compatible with the present AM/FM stereo, by transmitting the right channel on both the subcarrier and AM.

The argument against it was that it is not compatible, in the sense that FM receivers without adapters only receive the left, rather than a mixed or monophonic program. Also very few high fidelity people will accept the hypothesis about not needing anything above 8000 cps on the right.

Everybody in the business has done some changing of position, and now Halstead is going along with what we will call, for the sake of distinction,

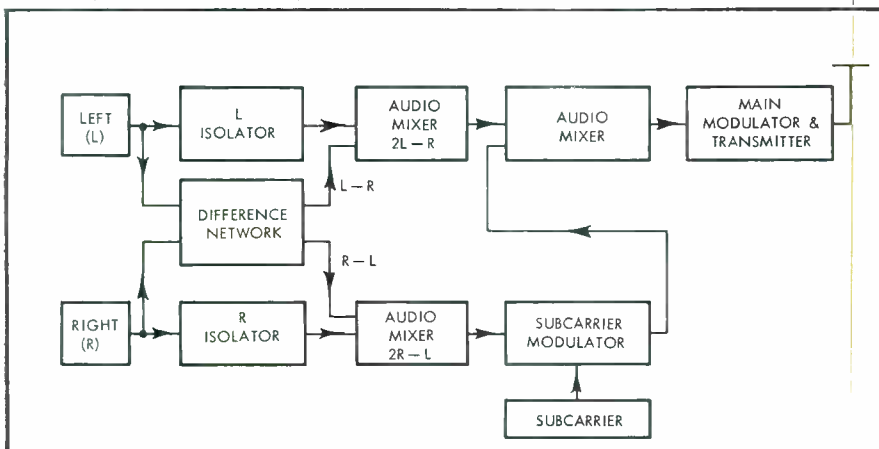
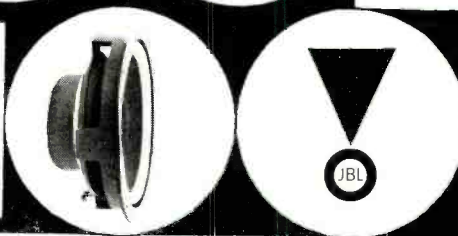
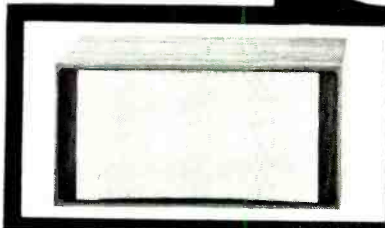
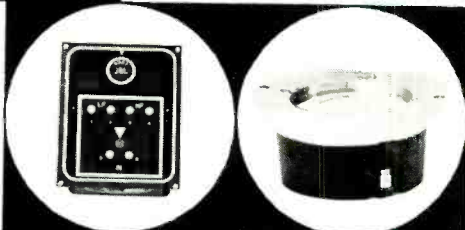
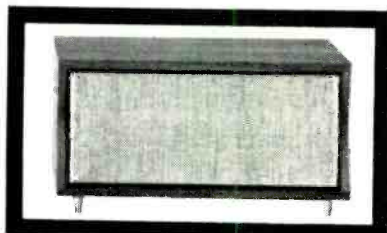


Fig. 3. The revised Halstead arrangement represented in the Burden system.

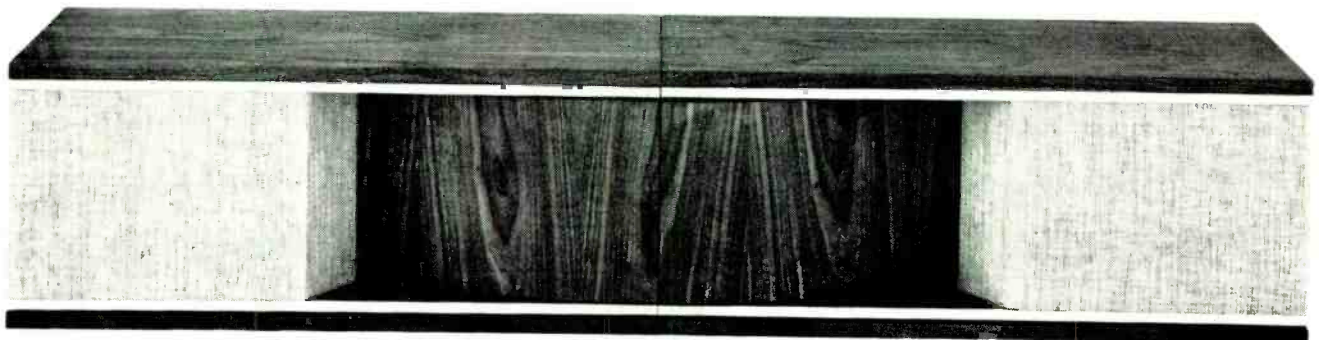
NEW TRANSDUCERS

for infinite baffle installation



Introduction of the new JBL Linear-Efficiency Loudspeakers has been met with overwhelming demand. It is apparent that many audio enthusiasts have been impatiently waiting for a truly precision-made driver engineered for sealed enclosure and wall installation. The super 8" LE8 is a full range loudspeaker which gives response from 30 to 15,000 c.p.s. that is smooth, clean, and accurate far beyond that delivered by any other speaker of this size ever made. Partly responsible is a silver impedance compensating ring in the magnetic circuit that controls power drawn by the voice coil at high frequencies. The LE8 makes an ideal replacement speaker because enclosure dimensions are not critical, and acoustical requirements can be readily met. An enclosed volume of only two cubic feet, or more, is recommended. The two-way Linear-Efficiency System Kit, JBL Model S5, shown in the smaller illustrations, includes JBL Model LE10 Low Frequency Driver with free air cone resonance of 15 c.p.s.; JBL Model LX3 Dividing Network for crossover at 1,000 c.p.s.; JBL Model LE30 High Frequency Driver, a completely new 5½ octave direct radiator. These three units form an integrated, perfectly matched, electro-acoustical system. They must be used together. All LE drivers have a new type mounting flange that permits mounting *from the front*, as well as the rear, of the baffle. Handsome new enclosures for LE units are the Dale, Madison, and Minigon. Write for free technical bulletins describing these extraordinary new transducers.

JAMES B. LANSING SOUND, INC.
3249 Casitas Ave.
Los Angeles 39, Calif.



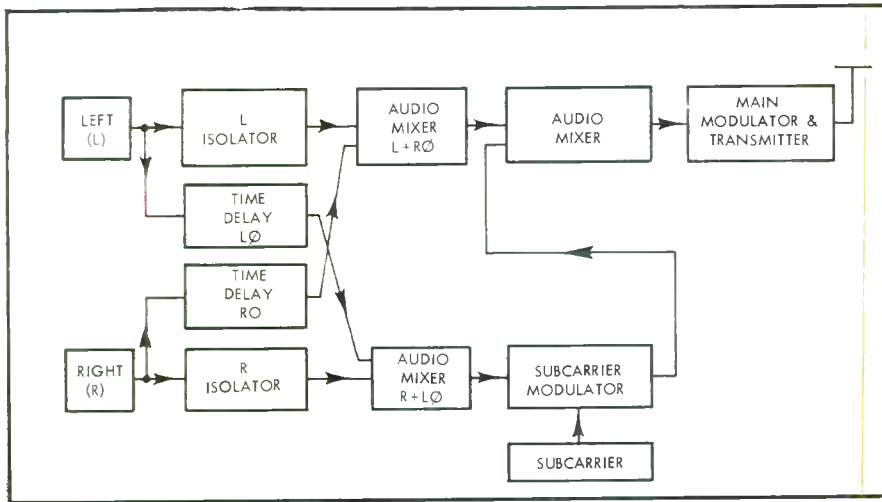


Fig. 4. The Bell system, as it would be applied to "straight" multiplex; actually the experimental transmission used TV and AM-FM channels, separately, so it has not been applied to multiplex as yet.

The Burden System

Developed by Richard W. Burden, this originally aimed at overcoming the objections to the Halstead system. To do this, it employs an alternative to matrixing. One might call it double matrixing. To the left audio is added $L - R$, to produce $2L - R$ for the main channel. The same component is subtracted from (or $R - L$ added to) the right audio, to produce $2R - L$ for the subcarrier. (Fig. 3)

This means both channels (with the intent of covering the AM/FM situation) carry left and right in different proportions and phase. When reproduced over stereo speakers, the $L - R$ from one speaker is expected to cancel acoustically with the $R - L$ from the other, leaving just L and R to be heard.

A further suggestion for the system is to apply a further matrixing network to the receiver adapter to retrieve the true L and R electrically, which certainly makes better sense.

The Bell System

By this designation I refer to the system that has been demonstrated by RCA/NBC with the Perry Como show. It uses a different means to achieve an objective similar to that of the Burden system, allowing both channels to carry full program content, yet produce stereo when both are used together.

It is not proposed for multiplex, but since its compatibility problems are similar, but a method different from Burden's is used to overcome them, it is included here.

In this case the Haas precedence effect is used. The right audio is time delayed by a fraction of a second, attenuated slightly, and added to the left channel and vice versa. Thus both channels carry left and right in equal strength, but with time differences (Fig. 4). Because of these time differences, which are not enough to be noticeable on the individual channels, the correct sounds are associ-

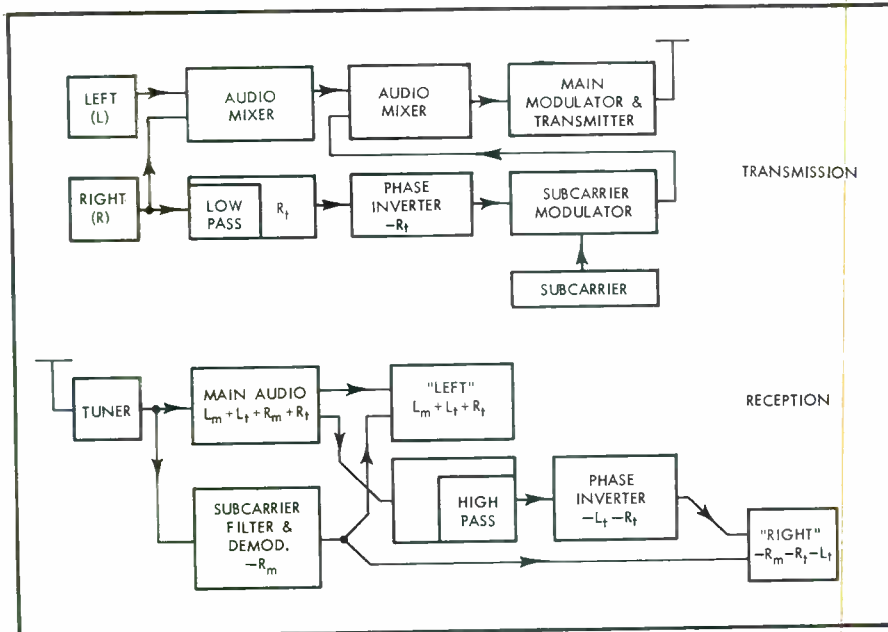


Fig. 5. Basic arrangement of the Calbest system, which is the only one postulated on a narrow band subcarrier.

ated with the loudspeakers that emit them first.

The Calbest System

The four systems so far described are each basically different ways of handling the audio fed into the transmitter. Originally Crosby favored a wide-band subcarrier and Halstead a narrow-band one, but these were not really essential to either's method. Actually, it would seem logical that Halstead's original system would benefit more from use of wide band, while a matrixed arrangement could better be adapted to a narrow channel for the difference signal.

But the Calbest system is predicated on use of a narrow band subcarrier. They argue (again on the basis of "tests") that frequencies above 3500 cps are not necessary to stereo. So they propose to carry all frequencies above this on the main modulation and to restrict the subcarrier to frequencies below this.

To achieve this without making one of the stereo channels highly deficient in reproduction, they reinsert the highs at the receiver from the main channel. To explain this let's designate frequencies below 3500 cps by the subscript m and those above by the subscript t . On the main channel they transmit the complete program $L_m + R_m + L_t + R_t$. This is the full mixed program, and in this respect is the same as the Crosby. It is the subcarrier content that is different. On the subcarrier they put just R_m . (Fig. 5)

The receiver juggles and re juggles this material so the left speaker presents $L_m + \frac{1}{2}(L_t + R_t)$ while the right one presents $R_m + \frac{1}{2}(L_t + R_t)$.

Disregarding, for the moment, the questionable validity of the 3500 cps assumption, this system is compatible with the present AM/FM transmissions, and does do the other things claimed. The question is whether Calbest's "findings" about the need for stereo difference above 3500 cps are final. We do not dispute their tests, but has everything been taken into account? If we grant, for argument's sake, that present stereo does not benefit from maintaining separate channels above 3500 cps, is it safe to presume that improved techniques will not later reverse this decision? I believe they probably will do so.

Reconciling Claims

There is no need to assume, as some seem to, that one man tells the truth, while his opponent must necessarily be lying. The unfortunate facts are that so little work has been done to coordinate tests, and that there are so many variables in both multiplex and stereo.

Programs can be recorded by a wide variety of microphone techniques. Many of the tests claim to have tried a wide

(Continued on page 61)

LISTEN!

TO THE LATEST REPORTS ON PILOT STEREO!

We are not permitted to name names or quote quotes. But a leading consumer testing organization millions know and trust has given Pilot stereo amplifiers and pre-amps extremely gratifying ratings in a very recent report. While you can't read the report here, you can listen to it — literally — by simply visiting your favorite sound room and testing one or more of the Pilot stereo components in question.



Pilot 210, Stereo Preamp. Unique 3-position power switch with optional automatic shutoff for equipment after last record has played. Quadri-Volume control, permits synchronized attenuation of both channels. DC filament supply for all tubes reduces hum to an absolute minimum. Feedback tone control circuits for low distortion. 12 inputs, 6 per channel, for all associated equipment. Two outputs—audio and tape. Low-impedance tape recording output for long cables. Separate bass and treble controls. Response: ± 1 db, 20 to 20,000 cps. Harmonic Distortion: 0.2% at 1 volt output. Hum & Noise: 80 db below 1 volt. Obtains power from Pilot 260 Amplifier. 5½" high x 14¾" wide x 11" deep. Wgt: 12 lbs.

Complete with enclosure. **\$89.50**



Pilot 260, 80 Watt Stereo Amplifier. Individual bias and balance controls provided to adjust operating point and accurately balance output tubes of each channel. Dual convenience outlets to connect associated equipment. Power output—80 watts, 40 watts per channel, music power for 1% harmonic distortion. 70 watts, 35 watts per channel, music power, for ½% harmonic distortion. Frequency response: 20 to 20,000 cycles per second. Sensitivity .8 volt for full power output. Hum level 90 db below full power. Input impedance 470,000 ohms. Output impedance 8 or 16 ohms per channel. 9 tubes. 15¾" wide x 6¾" high x 7¾" deep. Wgt: 35 lbs. Complete with brass-finished protective cover. **\$139.50**

PILOT

Founded 1919

For brochure describing Pilot's entire 40th Anniversary Series of Stereophonic Components, write to **Pilot Radio Corporation**, 37-04 36th St., Long Island City 1, N. Y.

The Tape Guide

Incorporating Tape into the Audio System

HERMAN BURSTEIN*

Practical hints on the methods of installing a tape recording machine into a typical home system that may assist the tape user in deriving the greatest satisfaction from it. Making the connections at the right places can easily save countless headaches in the use of a recorder and is more likely to improve the results obtained.

UNLIKE THE OTHER signal sources—phono, radio, and TV—the tape machine is generally employed not only to feed signals to the audio system but also to receive signals from the system for the purpose of recording them. Both in playback and recording there are various ways of connecting the tape machine to the rest of the system, and one must take into account the relative advantages and disadvantages of these alternatives.

Recording from the Audio System

Seldom is the tape machine connected directly to the signal source—such as, for example the tuner—when recording from a high fidelity system. In order to be able to record readily from the tuner, TV, or phono—without changing cable connections—the tape machine is ordi-

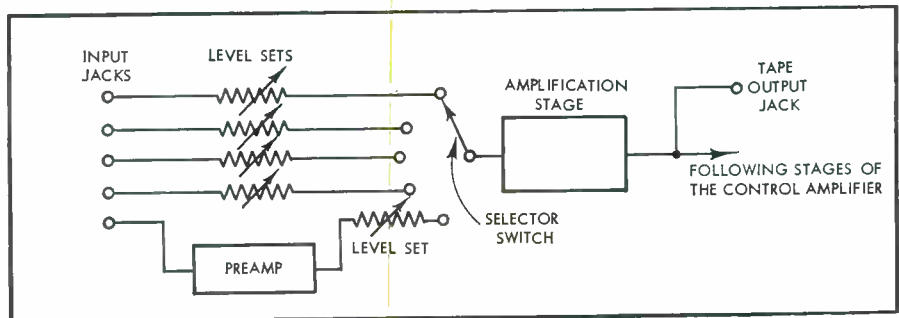


Fig. 2. Method employed in some control amplifiers for feeding incoming signals to a tape recorder.

narily fed from a point following the selector switch of the amplifier, as was shown last month in *Figs. 15 and 16*, reproduced here as *Figs. 1 and 2*. In the case of the magnetic phono cartridge, it is usually impossible to connect directly to the signal source because very few tape recorders contain the equalization and amplification facilities necessary for

directly accommodating a magnetic pick-up. On the other hand, it may be feasible to feed the signal from a piezoelectric or capacitive cartridge directly into a tape recorder.

For simplicity, connection is frequently made at the output of the power amplifier, that is, to the speaker leads, as shown in *Fig. 3*. Alligator clips offer a ready means of making this connection; the clips, which are soldered to a shielded cable, are fastened to the bared speaker leads; the other end of the shielded cable goes to a phone jack that feeds the signal to the tape recorder's high level input jack. One can purchase a ready-made cable with the alligator clips and phone jack soldered in place.

Connection to the speaker leads is most frequently employed with a commercial radio or radio-phonograph console that does not provide a tape output

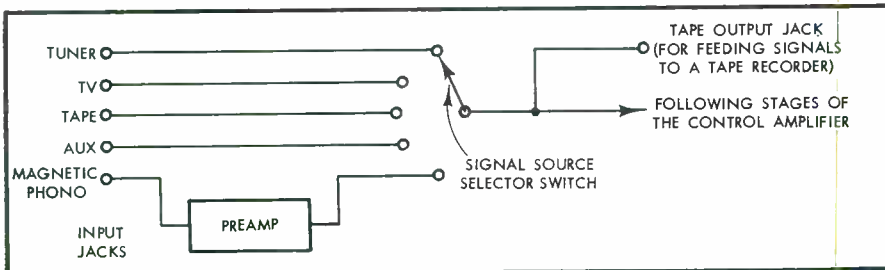


Fig. 1. Method employed in some control amplifiers for feeding incoming signals directly to a tape recorder.

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

AMPEX 960

STEREOPHONIC

RECORDER/REPRODUCER

Plays Both 2- & 4-Track Tape



RECORDS STEREO
OR MONOPHONIC

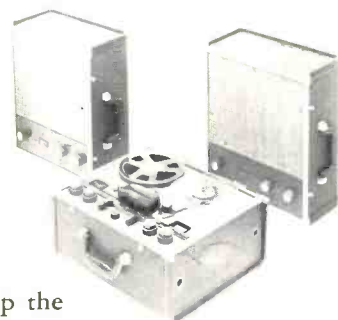
Stereo Portable PLUS!

Guiding the Ampex engineers who created the 960 was a dual objective—that of building a machine which was not only a superb example of engineering skill, but one which would also offer its user a range of capabilities far exceeding that of any other recorder made today. The result was not merely an improved stereo recorder, but *an entirely new concept* in home entertainment.

The STEREO 960 fits into family life in literally dozens of ways, contributing many tangible benefits in musical, educational and recreational fun. You'll use it to keep up the family correspondence by sending "letters in sound", to tape stereo programs off the air, to preserve your best monaural and stereo discs on tape, and to acquire new musical and language skills. You'll have endless fun exploring the 960's many fascinating recording capabilities, including sound-on-sound, echo chamber effects, and other advanced techniques.

ABOVE--960 PORTABLE STEREO
RECORDER/REPRODUCER

BELOW--MODEL 2560 PORTABLE
STEREO SYSTEM CONSISTING OF
960 AND PAIR OF 2010
AMPLIFIER-SPEAKERS



AMPEX STEREO

SIGNATURE OF PERFECTION IN SOUND

RECORDER/REPRODUCER SPECIFICATIONS

The true values of a recorder are best assessed through careful evaluation of its performance specifications and operating features. It is worthwhile noting here that these specifications are based not on theoretical design parameters but on actual performance tests. They are specifications which the recorder not only meets or exceeds today, but which years from now will still hold true. The Ampex Model 960 Stereophonic Recorder/Reproducer is capable of essentially distortionless frequency response from 30 to 20,000 cycles per second at the operating speed of 7½ inches per second, and from 30 to 15,000 cycles per second at 3¾ inches per second. Its precision-engineered timing accuracy is such that it offers perfection of pitch held to tolerances of less than one-third of a half-tone. Playing times, using standard (.002"), long play (.0015"), and extra-long play (.001") tapes are as follows:

	(a) 4-Track Stereo Tapes	(b) 2-Track Stereo Tapes	(c) Monaural Tapes, half-track
1200 foot reel	3¾ ips - 2 hrs. 8 min. 7½ ips - 1 hr 4 min.	3¾ ips - 1 hr. 4 min. 7½ ips - 32 minutes	3¾ ips - 2 hrs. 8 min. 7½ ips - 1 hr 4 min.
1800 foot reel	3¾ ips - 3 hrs. 12 min. 7½ ips - 1 hr 36 min.	3¾ ips - 1 hr. 36 min. 7½ ips - 48 minutes	3¾ ips - 3 hrs. 12 min. 7½ ips - 1 hr 36 min.
2400 foot reel	3¾ ips - 4 hrs. 16 min. 7½ ips - 2 hrs. 8 min.	3¾ ips - 2 hrs. 8 min. 7½ ips - 1 hr. 4 min.	3¾ ips - 4 hrs. 16 min. 7½ ips - 2 hrs. 8 min.

RECORD INPUTS: High impedance line inputs (radio/TV/phono/auxiliary) 0.3V rms for program level; high impedance microphone inputs

PLAYBACK OUTPUTS: Approximately 0.5V rms from cathode follower when playing program level tapes

PLAYBACK FREQUENCY RESPONSE: 30-20,000 cps at 7½ ips; 30-15,000 cps at 3¾ ips
Within ±2 db 50-15,000 cps at 7½ ips, 55 db dynamic range
Within ±2 db 50-10,000 cps at 3¾ ips, 50 db dynamic range

FLUTTER AND WOW: Under 0.2% rms at 7½ ips; under 0.25% rms at 3¾ ips

HEADS: Manufactured to the same standards of precision that exist in Ampex broadcast and recording studio equipment. Surfaces are lapped to an optical flatness so precise that they reflect specified wavelengths of light, resulting in uniform performance characteristics and greatly minimizing the effects of head wear. Azimuth alignment of stereo head gaps in the same stack is held within 20 seconds of arc, equivalent to less than 10 millionths of an inch—a degree of precision achieved through use of a unique process involving micro-accurate optical measurements within a controlled environment. Head gap width is 90 millionths of an inch ±5 millionths of an inch.

KEY TO THE EXCITING FUN FEATURES OF THE 960-- THE AMPEX STEREO-GRAPH

Here's the simplest, quickest answer to almost every question about how to perform the operations illustrated at right and numerous other recording functions. The Ampex Stereo-Graph shows you, quickly and clearly, the proper dial settings to make for more than a dozen of the most popular uses for the 960 . . . including sound-on-sound, language and music instruction,

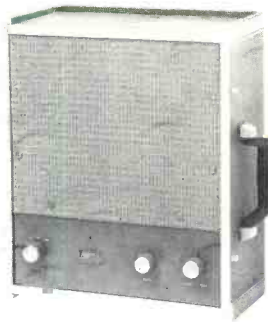


and other special effects. A convenient tape footage/playing time indicator is included on the reverse side.

MODEL 2010 MATCHING AMPLIFIER-SPEAKER

The Ampex Model 2010's ten-watt (20 watts peak) amplifier section provides operating characteristics (unequalized) flat within ±0.1 db, with total harmonic distortion less than 0.5 of 1%, throughout the maximum range of human hearing ability, at rated output. Noise and hum are 80 db below rated output, and input sensitivity is 0.18V to develop rated power.

The specially designed 8" speaker provides smooth, peak-free response throughout a remarkably wide audio range. Such superior design features as its massive die-cast frame and edgewise-wound ribbon coil contribute effectively to higher levels of performance than ever before achieved with a speaker this size.



MODEL 960 DIMENSIONS: Portable cases 9" x 15" x 17½". Unmounted recorder 13" x 15" x 6½" depth below top plate, 1½" above. Recorder weight 36 lbs., speaker amplifier 31 lbs.

AMPEX AUDIO, INC. • SUNNYVALE, CALIFORNIA



Relax and enjoy the show—let your Ampex do the narration! With the commentary on tape, your color slide shows are more professional, more complete and more fun!

Your favorite LP's and Stereo Discs are at their exciting best while they're new and unscratched. That's when to tape them on your Ampex, and preserve their original quality for keeps!



When you tape it "off the air" your only cost is for blank tape. Yet your musical repertoire can soon equal that of all the stations you hear!



There's a real future in family fun like this—with your Ampex you can live such happy moments over and over again, with a quality so lifelike you're almost literally carried back.



In the Ampex "Speech Testing Game", you pit your wits against the trigger-quick memory of the Ampex recorder/reproducer. You can't win, but it's fun trying.



Letter-writing is no longer a problem, with an Ampex in the house . . . now it's a family project. And even more fun than sending letters in sound is receiving them!



For "letters in sound", the 3" tape reel holds as much as a 10-page letter, mails first class anywhere in the United States for 8c.



A command performance, exclusively for you! Whether you prefer jazz, pops, or classical, the privacy of headphones listening is a unique pleasure. You don't disturb the rest of the family, and they don't disturb you!



The Ampex, in private rehearsal, can be a wonderful confidence-builder for people who normally develop rubber knees when faced with the prospect of speaking before a group.



Learning to speak a new language is made immeasurably easier on the Ampex; you can record your own phrases side-by-side with those of the instructor, and play them back for comparison at any time.



When you strike up the band in stereo, you don't need professional musicians to make a professional recording. Advanced techniques are amazingly easy on the Ampex.



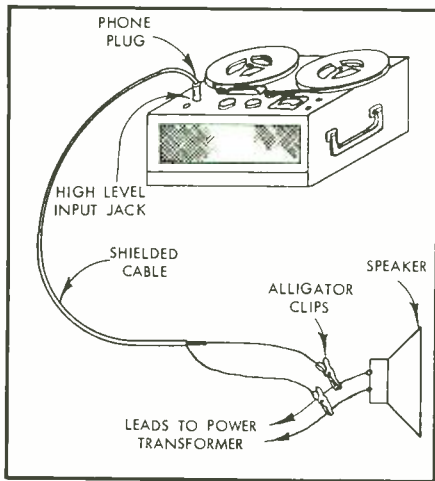


Fig. 3. A means of feeding an audio signal to the tape recorder.

jack (for feeding a tape recorder). This is the easiest course for the neophyte because it does not require him to go "inside" the set. But there are several disadvantages. The most serious, perhaps, is that the signal is picked up *after* the volume control of the set. If one has correctly adjusted the gain control of the tape recorder for proper recording level—high enough for adequate signal-to-noise ratio, low enough for imperceptible distortion—the adjustment is upset when one varies the setting of the volume control of the commercial set. If, for example, one turns down the volume when answering the telephone, one has also reduced the recording level.

Another disadvantage—how serious depends upon the quality of the commercial set—is that the signal is apt to be of lower quality after the output transformer of the power amplifier section than at earlier stages. If the output transformer is of the \$2 or \$3 variety so commonly found even in fairly high-priced commercial consoles, the signal here is apt to contain significantly more distortion and significantly worse frequency response, particularly at the bass end, than at other points in the amplifier.

Accordingly, it is preferable to pick up the signal at a voltage-amplifying stage, which requires going inside the unit. However, the connections are fairly simple. The easiest thing, ordinarily, is to connect a shielded cable across the unit's volume control, as shown in Fig. 4. Note that the connection is to the high ("hot") and low (ground) terminals of the control and not to the arm. Hence the signal fed to the tape recorder is independent of the volume control setting of the commercial set.

Connecting to the volume control raises a problem which generally does not occur when connecting to the speaker leads, namely serious attenuation of treble response. The cable, depending upon its length, may add as much as

several hundred micromicrofarads of capacitance to the circuit of the commercial unit, which may be enough to cause a substantial loss of high frequencies. A partial or complete solution is to use a minimum length of cable from the set to the tape recorder, under three feet if possible; and to use cable having low capacitance per foot (about 25 μf per foot is readily obtainable).

As a further expedient, if necessary, it may be feasible to make a simple change in the amplifier stage prior to the volume control that will reduce the effect of cable capacitance. This presumes that the stage in question is simply a voltage amplifier and has no bass, treble, or other forms of tone control associated with it. The procedure, illustrated in Fig. 5, consists merely of connecting a feedback resistor from the plate to the grid of the tube. Feedback reduces the output impedance of the tube and makes the frequency response at its output less subject to the effects of capacitance (of the cable) added to the circuit. On the other hand, the gain of the tube is also reduced, but usually there is gain to spare. The value of the

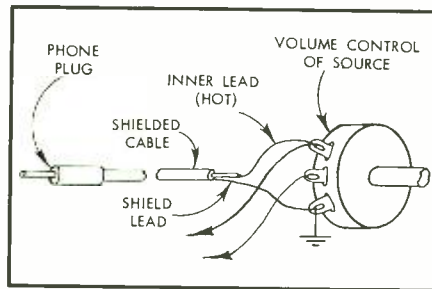


Fig. 4. Another means of feeding the audio signal to the tape recorder.

feedback resistor should be experimentally determined; it will probably lie between about 220k ohms and 1 megohm.

Recording from a High Fidelity System

Virtually all modern high fidelity control amplifiers or integrated amplifiers provide a tape-output jack for feeding the audio signal to a tape recorder. However, the circuit location of the tape-output jack varies from one amplifier to another. The circuit location may be perfectly satisfactory in certain instances and less satisfactory in others.

As illustrated in Fig. 1, a number of control amplifiers feed the incoming signal directly to the tape recorder; that is, the signal goes immediately to the selector switch, and the arm of the switch goes to the tape-output jack. This method has one possible drawback, namely that the capacitance of the cable leading to the tape recorder will attenuate the treble response of the signal source, namely the radio tuner or the TV. Nowadays most radio tuners have a low-impedance output (ordinarily a cathode follower), so that a good many feet of

cable can be employed without significantly affecting treble response. Some of the older tuners, however, have an output direct from the detector, and here the cable is apt to produce significant high-frequency loss. Moreover, few if any TV sets have a low output impedance, so that the cable is likely in this instance to take a toll of treble response. On the other hand, in many TV sets, in order to compensate for inadequate high-frequency response of their inexpensive speakers or for other reasons, the treble de-emphasis network is less than the required 75 microseconds; that is, high-frequency response is excessive at stages prior to the speaker. Hence the effect of the cable leading to the tape recorder may well be to bring frequency response closer to correct balance rather than to unduly subdue the high end.

Should the cable produce undesired treble loss when the signal source is an FM tuner or TV set, the de-emphasis network can be modified to compensate, as illustrated in Fig. 6. It is assumed here that the de-emphasis network consists of a 1000- μf capacitor and 75k-ohm resistor, and that the cable to the tape recorder adds 200 μf of capacitance. The 200 μf of cable capacitance is in effect in parallel with the 1000- μf capacitor, making a total of 1200 μf . In order for the time constant of the network to remain at 75 microseconds, the resistor should be 62.5k ohms. The nearest standard value, 62k ohms, will suffice.

The problem of cable capacitance are usually avoided when the tape-output jack is located as in Fig. 2. Here the jack comes after a low-impedance stage (usually a cathode follower), which permits a long run of cable without adverse effect upon high-frequency response. However, on occasion one will find an amplifier, usually an older unit, where the stage preceding the tape-output jack is of medium or high impedance. In this case one must be careful of cable length.

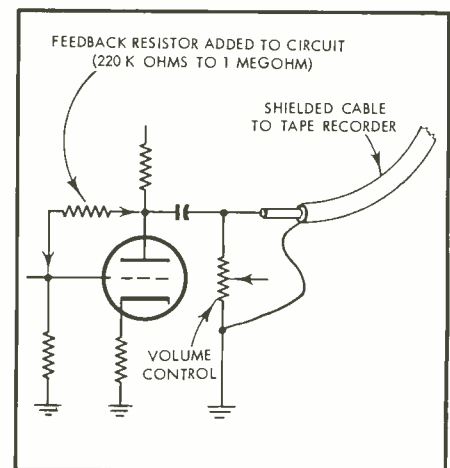


Fig. 5. Reducing the effect of cable capacitance upon high frequency response by adding a feedback resistor.

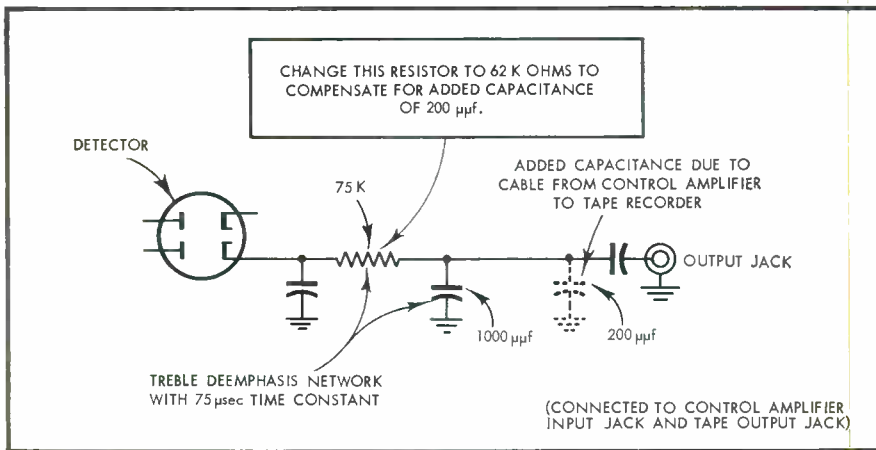


Fig. 6. Changing the deemphasis network in a FM tuner to compensate for capacitance added by a cable.

As suggested in the preceding section, one might make this stage more tolerant of cable length by inserting a feedback resistor of about 220k ohms to 1 megohm between the plate and grid; this involves some loss of gain, which generally can be accepted. In fact, in certain instances the loss of gain may be beneficial be-

grated amplifiers, the tape-output jack is located prior to the tone controls and other frequency-shaping circuits such as the loudness control, rumble filter, scratch filter, and presence control. The logic is that one will thereby obtain a "flat" recording. To illustrate, assume one is making a tape recording while

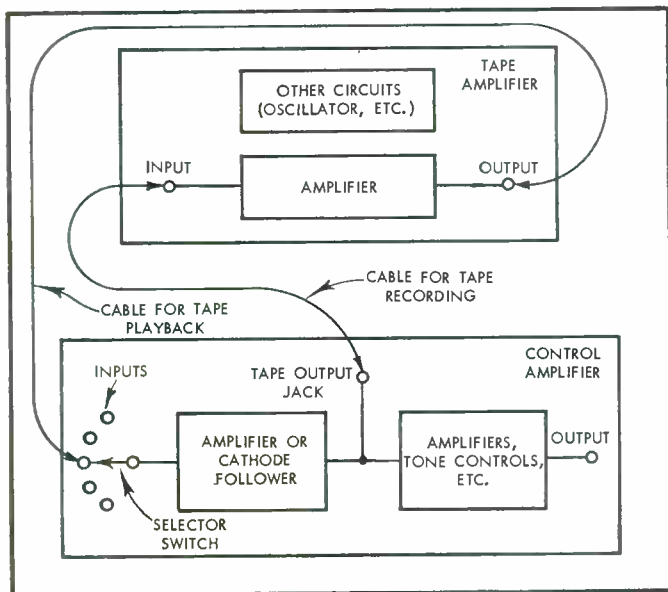


Fig. 7. How a feedback loop may occur.

cause it reduces the danger of overloading the stage in question and running into noticeable distortion.

Location of Tape-Output Jack with Respect to Tone Controls

In most control amplifiers or inte-

listening to the audio system at very low level (perhaps late at night). Then the loudness control or bass control or both will usually be set to produce a good deal of bass boost, compensating for the seeming drop-out of bass at low listening levels. For the same reason, the treble

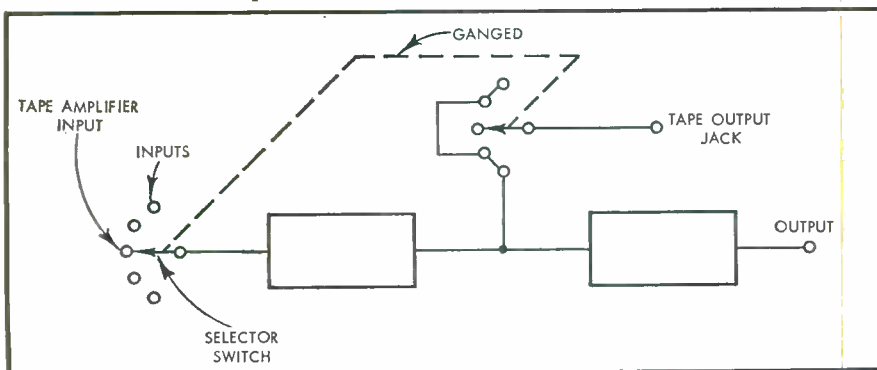


Fig. 8. Method employed in some control amplifiers to prevent feedback loop.

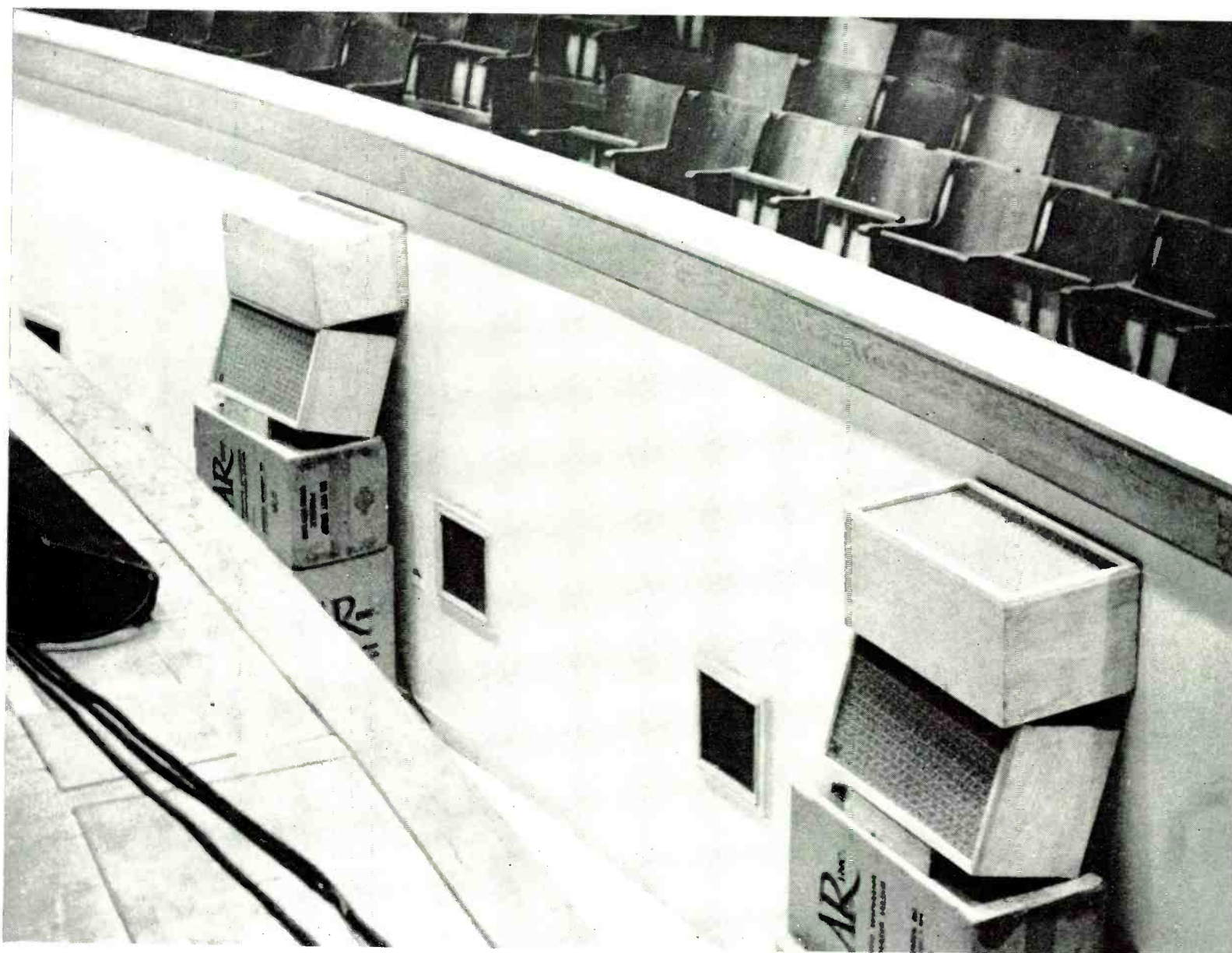
may also be accentuated. However, one does not ordinarily wish this bass and treble boost to reach the tape, for they will cause unnatural accentuation at medium and high levels of reproduction. Moreover, the augmented bass and treble may produce serious distortion on the tape. By having the tape-output jack precede the tone-shaping circuits, one obtains an electrically flat tape recording.

On the other hand, there is good reason why one might wish to have the tape output jack come after the tone-shaping circuits so that the frequency response of the signal can be altered before it reaches the tape. It is well known that disc recording companies often add a great deal of treble boost to the recorded material in order to impart an artificial brilliance. When recording a tape at speeds of 7.5 ips or less, a very large amount of treble boost is incorporated in the tape amplifier in order to preserve high-frequency response; this boost brings one close to the point at which the tape is overloaded. If the material being recorded on tape comes from a disc that unduly emphasizes the highs, overloading is quite likely to take place. Therefore it would be very desirable to cut the treble before the program material reaches the tape. Not only is overloading avoided, but the tonal balance of the tape recording is now more nearly flat to the ear. Flat acoustic response is obviously more important than flat electrical response, namely mere preservation of the signal frequencies in their original relative amplitudes without regard to balance.

AM reception offers another example of why it might be desirable to shape the frequency response of the signal before putting it on tape. Typically, AM reception is deficient in the high end (more often the fault of the tuner than of the broadcast station). A certain amount of treble boost will often improve matters, particularly if the signal is a strong one so that treble boost does not bring up static and sounds from interfering stations to an appreciable degree. If the treble-augmented signal is put on tape, then the tape bears a closer approach to flat acoustic response than the signal originally delivered by the AM tuner.

In the above case it may be countered that one could just as well supply the treble boost when playing back the tape rather than in recording. This is true, but the results would be less satisfactory. The more signal one can record on the tape—within the limits set by the susceptibility of the tape to overloading—the higher will be the signal-to-noise ratio in playback. Application of treble boost prior to recording augments the signal on the tape. On the other hand, use of treble boost in playback brings up the noise on the tape (hiss and modulation noise) and the noise of the tape-

orchestra pit in beersheba



When the Martha Graham dance group toured Israel, six AR-2 loudspeakers, with tape reproducing equipment, were taken along to provide musical accompaniment under circumstances where it was impractical to use live musicians.

Above are four AR-2's mounted in the orchestra pit of Cinema Karen in Beersheba (two more were placed backstage). These speakers were selected for the job because of their musical quality; the natural sound of the live instruments, rather than pseudo-hi-fi exaggerations, was desired.

AR *acoustic suspension* speaker systems—the AR-1, AR-2, and AR-3—are designed primarily for use in the home, but are also employed extensively by professional laboratories and studios. They are priced from \$89 to \$231.

Literature is available on request.

ACOUSTIC RESEARCH, INC. 24 Thorndike Street Cambridge 41, Mass.

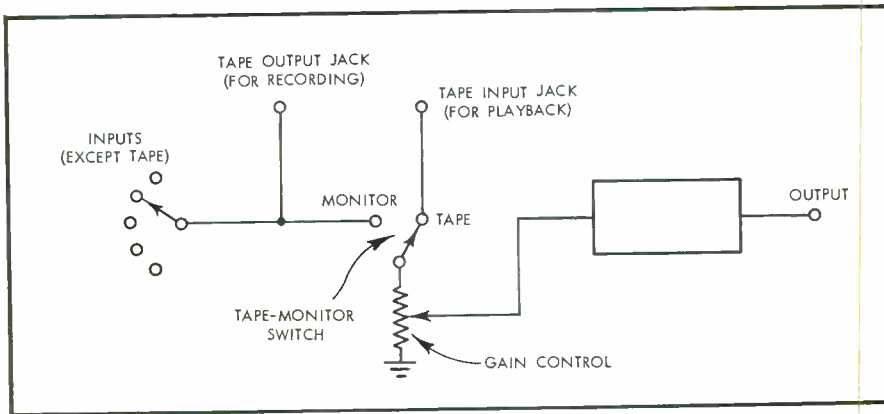


Fig. 9. Tape-monitor switch arrangement for accepting the playback signal from a tape machine.

playback amplifier, thereby deteriorating the signal-to-noise ratio.

It should further be noted that the program material may contain too much or too little bass. Too much bass may overload the tape; bass may be in the form of audio signals or rumble frequencies. If there is too little bass, one endangers the signal-to-noise ratio by waiting for playback to introduce the bass boost required for flat acoustic response.

All told, an optimum combination of high signal-to-noise ratio and low distortion is achieved by making the necessary tonal corrections, if any, before the tape is recorded rather than in playback. Accordingly, placement of the tape-output jack after the tone-shaping circuits can be a valuable feature. Of course this means that when recording a tape one has to consider what goes on the tape rather than the prevailing requirements for pleasant listening. To illustrate, if the audio system is operating at low level and one is making a tape at the same time, one may have to forego loudness compensation.

Whereas the usual practice in monophonic control amplifiers has been to

place the tape-output jack at an early stage, prior to the tone controls, a substantial number of stereo amplifiers place the jack at a late stage. This has certain advantages in addition to enabling one to control the frequency response of what goes on the tape. Location at a late stage usually means that one is recording what one hears. To illustrate, if the left and right signals are combined (as when playing a mono disc with a stereo cartridge), then the combined signals are recorded on the tape. If the balance control has been brought into play in order to correct for differences in level between the channels on a stereo disc, then the signals recorded on the tape have also been brought into balance. If only channel A is being played, then only channel A is recorded on the tape. And so forth.

Playback into the Audio System

In many control amplifiers or integrated amplifiers, the only means for accepting the playback signal from a tape machine is through a high-level input jack—usually marked TAPE AMPLIFIER or AUXILIARY—which puts the tape signal through the same route as the signal

from a tuner or TV set. If one is using a two-head machine, there is the possibility of a feedback loop, as illustrated in Fig. 7, which can produce a formidable howl or squeal due to oscillation. This can occur if the tape machine is in the record mode and at the same time one happens to set the selector switch of the control amplifier to admit the signal from the recorder. What might happen, depending upon the tape machine, is as follows:

In some tape recorders the output cable always remains connected to the tape amplifier circuit, whether the machine is in the record or playback mode. This amplifier circuit, it will be remembered from earlier discussion, is used both in record and playback, except for changes in the equalization employed. Accordingly a signal enters the input jack of the tape machine, is amplified by the tape amplifier, is fed by the output cable to the input of the control amplifier, goes to the tape-output jack of the control amplifier, again enters the input jack of the tape recorder, is further amplified, etc. This is an oscillatory process that produces the howl or squeal referred to.

To avoid this possibility, a number of tape recorders disconnect the output cable from the circuit when they are in the record mode. For the same reason, a few control amplifiers have adopted the expedient of Fig. 8. The tape-output jack of the control amplifier is disconnected from the circuit when the selector switch is turned to the tape amplifier position.

Another and more popular expedient employed in control amplifiers is that of Fig. 9. Here the tape-input jack is connected to the circuit by a special switch at a point following the tape-output jack. The arrangement of Fig. 9 is commonly referred to as a tape-monitor switch. Its primary purpose is in connection with tape recorders having separate record and playback heads. It permits one to switch quickly between the incoming signal that is being recorded and the playback signal off the tape, so that one may immediately check whether the tape recording is a reasonable facsimile of the original signal. At the same time, the tape-monitor switch serves the purpose of breaking up a feedback loop that might otherwise occur.

Figure 10 illustrates a different monitoring arrangement intended for use with tape recorders having separate record and playback heads. When the plug of the playback cable from the tape machine is inserted into the tape input jack of the control amplifier, it breaks the path of other signals entering the control amplifier. In order to hear the original signal, say from a tuner, one must depend upon an "A-B" switch

(Continued on page 64)

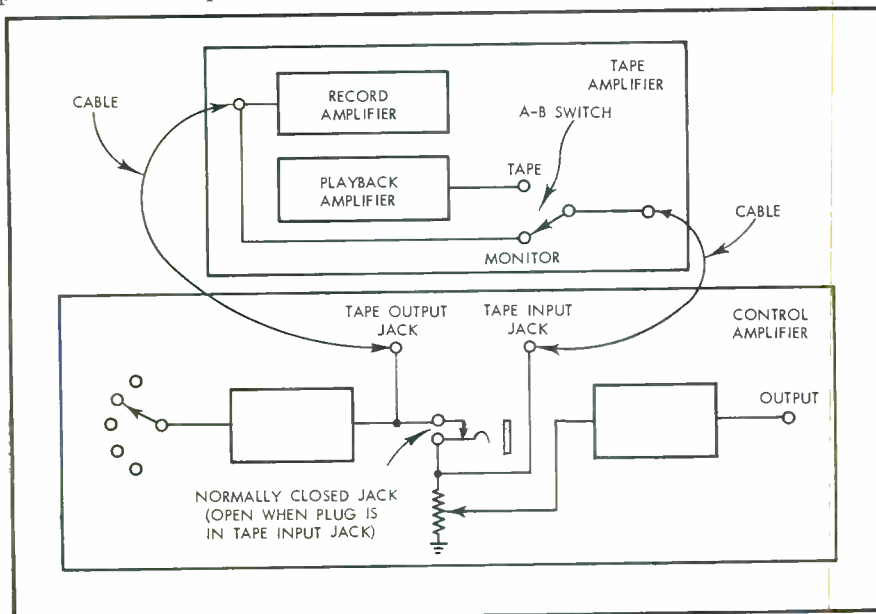


Fig. 10. Another tape monitoring arrangement.

THE NEW TURNTABLE THAT RECORDS!

*The
Push-Button
Miracle
for stereophonic and
monophonic
high fidelity sound!*

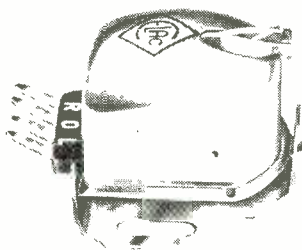


MIRACORD XS-200

The pushbutton miracle of high fidelity sound—with *every* practical and proven feature for the perfect reproduction of stereophonic or monophonic records.

- it's a heavyweight, professional-type turntable—and a fully-automatic changer!
- a special switch adapts Miracord to stereophonic or monophonic reproduction, with finest quality output on either system!
- vibration eliminated by special mounts!
- 5 push-buttons permit you to start, stop, pause, repeat or filter, without touching tone arm!
- Magic Wand spindles eliminate pusher platforms and stabilizing arms!
- intermixes 10" and 12" in any sequence; plays all 4 speeds, has a 4-pole motor. Plug-in head!
- shuts off automatically, returns tone arm to rest position!
- and many other outstanding features, not found in any other record changer or record player!

—yet it costs only \$67⁵⁰



STEREOTWIN 210/D a thrilling new standard in a stereo cartridge!

Acclaimed by engineers and audiophiles, STEREOTWIN 210/D is the finest cartridge for the stereo age. "Moving-magnet" principle gives new high in quality performance. Hum is eliminated by Mu-Metal casing. Stylus replacement is instant. Phenomenal separation: 22 db at 1000 cps. EXCLUSIVE ADJUSTMENT puts stylus in proper position both vertically and horizontally for record changers or manual tone arms. Truly an audio engineer's cartridge at an audiophile's price!

NOW \$34⁵⁰

FAR AHEAD > THE FINEST BY FAR Available at selected dealers.

For Free catalogue, please write Dept. A



AUDIOGERSH CORP.

514 Broadway, New York 12, N. Y.

WORTH 6-0800



A Ten-Watt All-Triode Amplifier

ROBERT M. VOSS* and ROBERT ELLIS

Build this simple low-powered amplifier using a pair of relatively new dual-triodes in the output stage and see how good a small amplifier can sound—with efficient speaker systems.

In the early days of electronics the only type of tube used for amplification was the triode. The reason for this was simple; the tetrode and pentode had not yet been developed. With the discovery that higher gain could be achieved by the use of a screen grid, designers jumped on the bandwagon, and the tetrode and later the pentode were thought to render the single-grid tube obsolete.

When the emphasis on faithful sound reproduction came into vogue, audio designers were forced to do some further investigation, for listening tests (as well as refined electronic measurements) revealed some facts which had not previously been noticed. For unknown reasons (some of them still uncertain) some triode amplifiers with low power ratings sounded cleaner than equivalent pentode circuits with more than double the triode audio output.

As high-fidelity grew up, audio fans became convinced of the superiority of

* 697 West End Ave., New York 25, N. Y.

one or the other class of tube, and circuits were developed which proved the virtues of either triodes or tetrodes. The Williamson amplifier, which probably gave high-fidelity its biggest boost, showed that a well-designed low-power triode amplifier could reproduce cleaner sound than any of the high-power circuits used at that time.

Triode advocates, however, had a short lived victory, for, in 1953, David Hafler and Herbert I. Keroes showed that an Ultra-Linear connection of the output tubes would more than double the undistorted power output of the triode Williamson. This revived popularity in the Williamson circuit, as well as giving a great deal of publicity to the (then young) third school of output-stage thinking. Partly as a result of the publicity given to the ultra-linear Williamson, this type of connection is now very popular with amplifier designers.

However occasional circuits are still developed which are particularly suited to triode output tubes. This amplifier is

one of them. 6BX7's are relatively unknown to audiophiles; as far as we know no commercially built amplifier and only one published circuit uses them. In *Radio-Electronics*, February 1957, Norman V. Becker described an amplifier which delivered eight watts at less than 1/2 per cent total harmonic distortion from two 6BX7's and a \$2.95 output transformer. Although Mr. Becker pointed out the great potentialities of the 6BX7 as an audio tube, it has not received the attention it merits.

One of the most notable virtues of the amplifier described here is its efficiency. Remember the power supply of the Williamson? It delivered 450 volts at 120 ma to the output stage. This is more than 50 watts, but the audio output was only rated at 12 watts. Our amplifier, Fig. 1, delivers 10 watts with a d.c. input of 25 watts; it is almost twice as efficient! An additional feature of the output stage, which uses two 6BX7's in push-pull (actually, four 1/2 6BX7's in push-pull parallel is more accurate) is its low driving requirement; the grids require only half the signal that the Williamson output stage did.

The early stages of the circuit, Fig. 2, bear a close resemblance to the corresponding part of the Mullard 520 amplifier. The change here is the use of a triode voltage amplifier instead of the original pentode. A triode furnishes enough gain so that, with 20 db of feedback, the amplifier requires only 0.5 volt for full output. We did not use an input level control because such controls frequently become noisy even if they are never touched after being initially set. If you want to decrease the sensitivity of the amplifier make up a voltage divider to fit your needs, making sure that the total grid resistance seen by the 6AV6 does not exceed 0.5 megohm.

The plate of the voltage amplifier is connected directly to the first grid of the cathode-coupled phase splitter, thus providing the necessary d.c. potential for the grid. We chose this type of phase splitter mainly because of the fact that the output impedances from its two sides are equal, therefore eliminating problems of unequal high-frequency phase shift that we have encountered with the other-



Fig. 1. External appearance of the authors' amplifier. Follow this layout for simplest wiring.

ALTEC LITTLE-GIANT BOOKCASE SPEAKER SYSTEMS...low as

\$79⁵⁰

Highest efficiency of any comparable system tested— $2\frac{1}{2}$ to $3\frac{1}{2}$ watts nominal for average room listening—peak ratings as high as 20 watts • Test against any other speaker system selling for up to \$50 more for frequency response—presence—efficiency • Price them. You'll buy ALTEC for the highest sound value.



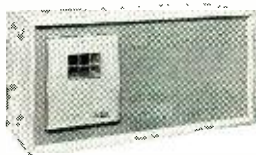
ALTEC 835A MONTEREY JR.

Quality of reproduction equals or exceeds systems costing up to twice as much. Finished on all four sides for use in horizontal or vertical positions.

Employs ALTEC's famous controlled-linear-excursion bass speaker that always repeats exactly what it hears. Direct-radiating cone tweeter.

Specifications:

Guaranteed frequency range: 20-18,000 cps • power rating: 15 watts • impedance: 16 ohms • finish: walnut, blond, mahogany • dimensions: $11\frac{1}{4}$ " H, 23" W, $11\frac{1}{4}$ " D • approximate shipping weight: 45 lbs • price: \$79.50



ALTEC 700B MELODIST

The most performance in the smallest package. ALTEC's Melodist is made to order for small apartments, or as a second speaker in stereo sound systems. Contains ALTEC's engineered bass speaker, plus the same high-frequency speaker used in more expensive ALTEC systems.

Specifications:

Guaranteed frequency range: 70-22,000 cps • power rating: 20 watts • impedance: 8 ohms • finish: blond, mahogany • dimensions: H- $11\frac{1}{4}$ ", W- $23\frac{3}{4}$ ", D- $10\frac{1}{8}$ " • approximate shipping weight: 24 lbs • price: \$126.00



ALTEC 834A MONTEREY

This is the ultimate in compact speaker systems. The Monterey uses two controlled-linear-excursion bass speakers, and ALTEC's

3000B high-frequency sectoral horn. At 40 cycles this outstanding system has, for the same power input, more than five times the audio output of any other small speaker system tested.

Specifications:

Guaranteed frequency range: 40-22,000 cps • power rating: 20 watts • impedance: 8 ohms • finish: walnut, blond, mahogany • dimensions: 14" H, 26" W, $14\frac{1}{2}$ " D • approximate shipping weight: 45 lbs • price: \$174.00

COMPLETE ALTEC SYSTEMS FOR MONO OR STEREO



ALTEC 355A 20-WATT
AMPLIFIER-PREAMPLIFIER

ALTEC S40 MASTER
STEREO CONTROL
\$12.00



For a monophonic system use ALTEC's 355A amplifier-preamplifier with ALTEC's 306A AM-FM or 307 FM tuner, and any one of ALTEC's compact speaker systems. Now, or in the future, you can have an ALTEC stereo system by simply adding another 355A, a matching speaker system, and the inexpensive S40 master stereo control.

ALTEC's advanced engineering and manufacturing methods guarantee big-speaker sound in small packages. That's why any one of ALTEC's three compact systems is an excellent choice as a second speaker if you want to convert your present mono system to stereo.

355A Specifications: frequency range: 20-22,000 cycles • power output: 20 watts • load impedance: 4, 8, and 16 ohms • seven separate inputs • tape recorder output • four position loudness control • three position scratch filter • three position rumble filter • dynamically balanced output • four separate volume controls • separate power switch • separate bass and treble controls • four position record compensation • fully shielded input section • eyeletted printed circuit • compact construction • ease of installation • price: \$111.00 (Walnut, blond, or mahogany cabinet: \$19.50)



Write for free catalogue:

ALTEC LANSING CORPORATION, Dept. 9 A
1515 S. Manchester Avenue, Anaheim, Calif.
161 Sixth Avenue, New York 13, N. Y.

A Subsidiary of Ling Electronics, Inc.

12-71

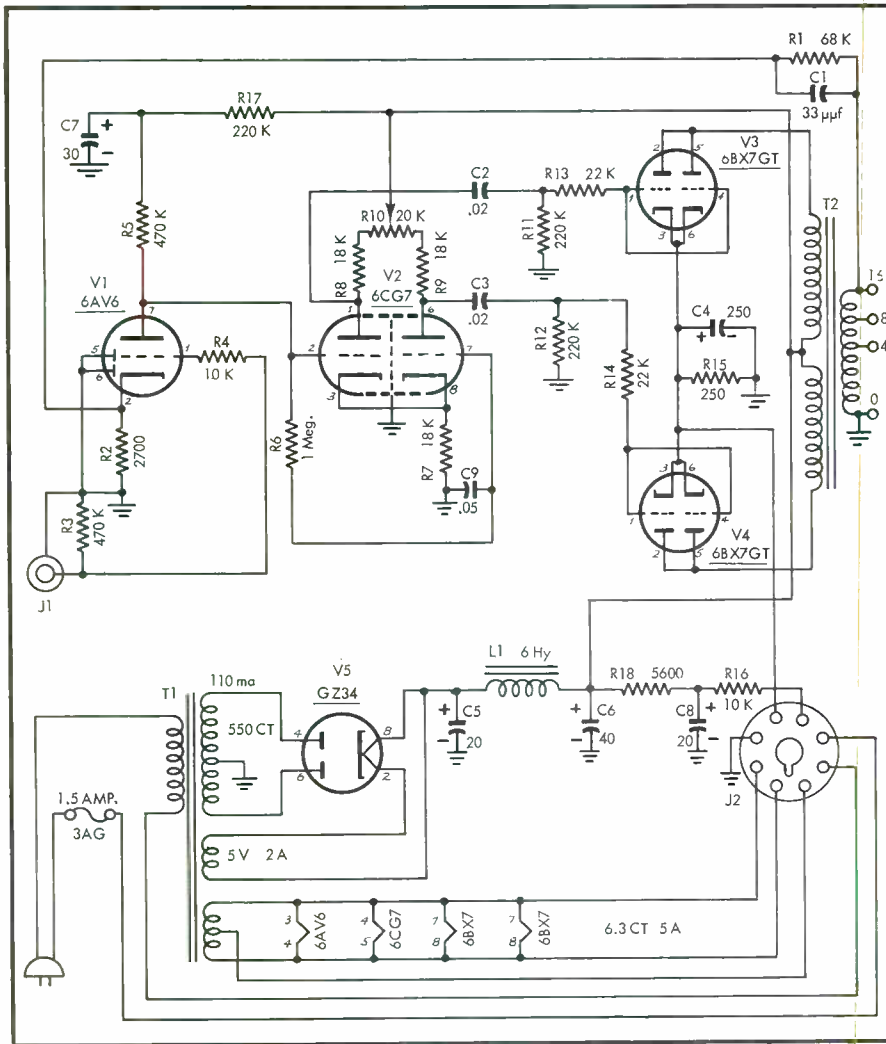


Fig. 2. Schematic of the simple 10-watt amplifier.

wise ideal split-load circuit. The balance control bears special mention. When construction is complete, connect the amplifier to a suitable load, set the control near mid-position, and feed a 1000-cps sine wave into the input. Measure the output and adjust for 3 or 4 volts across the 16-ohm winding. Then adjust the balance control for equal a.c. voltages at the plates of the output tubes. Adjusting for equal grid voltages is useless; it assumes that the output tubes have identical

transconductance, which is rarely the case even for so called matched pairs. True push-pull operation requires that the output transformer receive equal signals from both sides of the circuit.

Since a d.c. balance control is not incorporated in the output stage, it would be wise to select the closest matched (total current drawn by both sections) of several 6BX7's. We used a choke in the power supply, so that hum will be kept below audibility even with sub-

stantially mismatched tubes. Two steps were taken to further guard against hum. First, we used a ground bus to prevent ground loops from forming in the chassis. The bus is connected to the chassis only at the input jack. The filter capacitor must be mounted on an insulating wafer and grounded to the bus. Secondly, separate prongs on the preamp socket are connected to the transformer heater winding center tap and the cathodes of the output tubes. When no auxiliary equipment is being powered from the amplifier, plug a shorting plug (jumpers from pins 6 to 7, and 4 to 8) into the socket. As well as completing the primary circuit of the power transformer, this puts a bias of about 23 volts on the heaters. If a preamp is used, pin 4 can be used as a polarizing source to connect to the slider of a filament hum balance control. Aside from these extra connections, the socket is wired to accept any standard preamp, such as EICO, Heathkit, or Dynakit. It provides 6.3 volts at 1 amp, and 250 volts at 5 ma.

We cannot emphasize too strongly that an amplifier is no better than its output transformer. We selected an Aerosound TO-250 mainly because it will deliver 10 undistorted watts from 20 to 20,000 cycles. Negative feedback can do a great deal to improve frequency response characteristics and lower internal resistance, hum, and noise, but it cannot increase power output. As a matter of fact it can decrease useful power output by accentuating undesirable overload characteristics. If you economize by using a less expensive output transformer, don't expect to get as much power at the frequency extremes. This is an honest 10-watt amplifier; try measuring some of the commercial 10-watters around 20 cps and see how many of them will deliver rated power in that vicinity.

Figure 3 shows the frequency response of the amplifier. The smooth, extended high-frequency range is apparent in high-frequency transients. The undistorted power output is shown in Fig. 4.

(Continued on page 90)

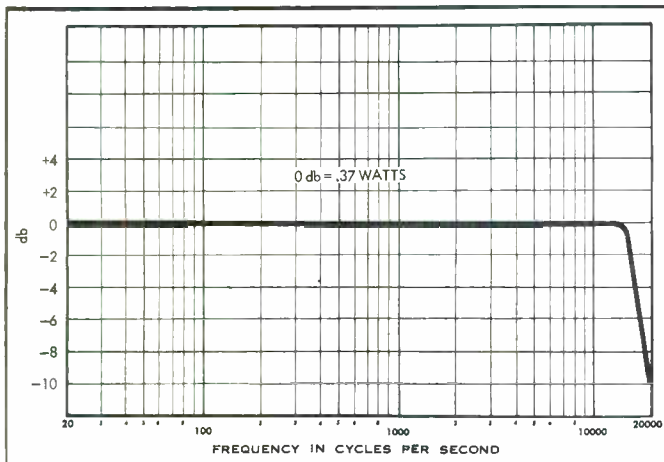


Fig. 3. Frequency response of the amplifier.

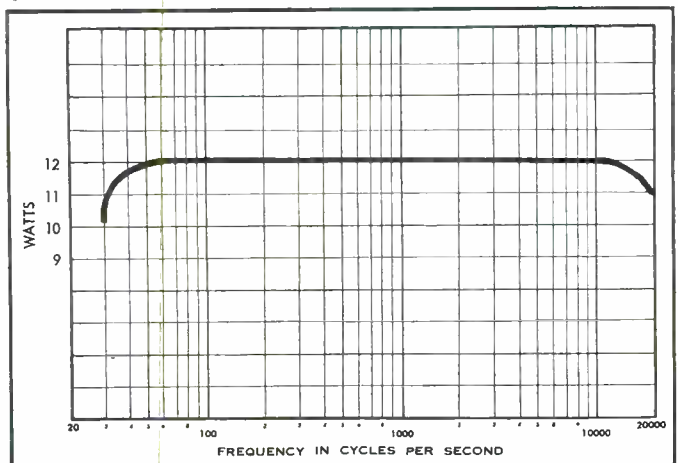
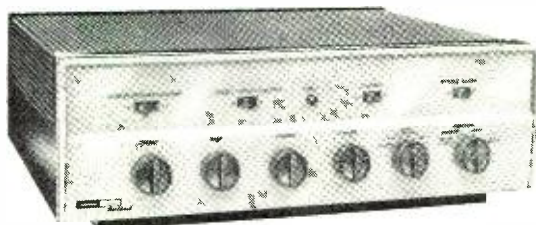
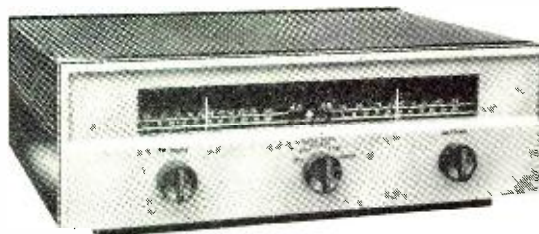


Fig. 4. Curve of power output vs. frequency.

THE BALLAD



THE SONNET



THE BALLAD, Model A230: Dual 15 watt amplifiers and dual preamplifiers in a magnificently styled instrument. *Friction-Clutch Tone Controls:* Bass and treble controls adjust separately for each channel. Once adjusted, the controls lock automatically to provide convenience of ganged operation. *Exclusive Third Channel Speaker Selector:* Remarkable new development permits addition and operation of a third channel speaker in local or remote stereo systems. Also permits simultaneous operation of virtually *any* combination of speakers — stereo and monaural — in local and remote installations. *Illuminated Push-Button On/Off Switch:* Wonderfully convenient device permits amplifier to be turned on and off without upsetting careful setting of controls. *Speaker Phasing Switch:* Corrects for improperly recorded program material. *Subsonic Filter:* Eliminates phonograph rumble.

The Ballad, Model A230 \$109.95
Optional Enclosure, Model AC23 7.95

THE SONNET, Model T230: Stereo AM/FM tuner. The ideal stereo companion for the A230 amplifier. *Separate, and Highly Sensitive AM/FM Sections:* Permit superb reception of AM/FM stereo broadcasts through this one instrument. *Multiplex Input:* Conveniently located multiplex jack accommodates multiplex adapter for receiving Crosby compatible multiplex (FM stereo) broadcasts. *High-Q Ferrite Loopstick:* Provides high AM pick-up sensitivity. *Automatic Frequency Control:* Locks each station into its proper position every time. Improves manual tuning by a factor of 10 to 1. *New Low Noise Front End and Wideband Transitionally Coupled IF Stages:* Result in increased sensitivity and low harmonic and intermodulation distortion. The T230 features a brilliantly contoured new escutcheon and a superbly styled new enclosure.

The Sonnet, Model T230 \$119.95
(Complete with Enclosure)
(Prices slightly higher in the West)

Harman-Kardon Packs More Solid,
Useful Engineering Features Into
The New Model A230 Stereo Amplifier
And The New Model T230 AM/FM Stereo
Tuner Than You Will Find In Most
Higher Priced Tuners and Amplifiers

harman kardon

Westbury, N. Y.

A "Panphonic" Stereo Control Amplifier

GEORGE MANNING LEWIS*

A phono preamp of unusual design is combined with an expander-compressor circuit to compensate for unequal loss of dynamic range of stereo discs as the grooves wear.

DESPITE THE INCREASED REALISM of stereophonic recording and reproduction in home music systems, many critical listeners are experiencing disappointment with stereo discs because of the inequalities in the dynamic range of the two "channels" that develops, during repeated use, from the disparate erosion of the two separate sound producing parts of the recording groove. Unlike monophonic records, in which the gradual loss of dynamic range potentials and the decreasing of the realism illusion is not unexpected and presents no great problem, in stereo records (although less in the 45/45's than in the lateral hill-and-dale's) this disparate erosion rate—and unequal loss of dynamic range—can result very quickly in such destruction of the realism and fidelity that a recording of a brilliantly conducted symphony becomes a frustrating reasonable facsimile of a Tuesday evening performance by a grass-roots-culture-for-everybody music society.

A simple comparison of two identical stereo records, one of which has been played thirty or so times in normal home use and the other new, will demonstrate this to the extent that, if this unfortunate characteristic were not easily correctible, one would doubt that the cost of stereo records and reproducing systems is justified. Fortunately, however,

* 1302 Atlas St., Murfreesboro, Tenn.

circuitry for the correction of—or compensation for—such dynamic range inequalities that may develop is fairly simple to understand and may easily be incorporated into the design of a two-channel preamp or control amplifier, of the "panphonic" type, without modification of either the functional flexibility or monaural uses of the pre-power-amplifier stages.

Johnson¹ some years ago suggested an effective "expression" circuit by which variable, selected amounts of volume compression could be obtained by use of an ingeniously designed device for controlling the bias voltage on the grid of one stage in the control amplifier in such a way so that the grid bias voltage varied in proportion to the general audio levels of the signal; thus increasing or decreasing the amplifying function of the stage to provide volume expansion or compression as desired. However, there was, at that time, very little practical demand for the volume compression features of his circuit, and since there were equally effective circuits to provide volume expansion which were simpler and less costly (in components) to construct, few persons other than experimenters and those having special needs for volume compression for recording purposes—and those who must attach every new device, no matter

¹ Johnson, Maurice P., "Hi-Fi Control Amplifier with 'Expression'" Hi-Fi Annual and Yearbook, 1956, p. 20.

how weird, to their hi-fi rigs—explored the potentials of Johnson's "expression" circuit, despite its immediately apparent theoretical excellence.

Nevertheless, the principles involved in the basic design and the functions of the "expression" circuit, are, with some modification and adaptation, ideally suited to the problem of compensating for and restoring the dynamic range balance necessary to obtain the full realism potentials of stereo discs as they age with use. Too, when incorporated into the design of a two-channel control amplifier, this circuit will greatly enhance the realistic illusion of spread-sound reproduction of monophonic records and tapes, of AM and FM Radio, and of certain TV programs (although a single sound source is usually preferable for most TV programs). Also with proper switching arrangements the "expression" circuit will contribute as much to the increased realism of the (pseudo) stereophonic AM-FM and AM-TV simultaneous broadcasts now available in most communities, as to the enjoyment of stereo records; and should therefore be incorporated into a "panphonic" type control amplifier which allows two-channel reproduction and control of signals from a single (monophonic) source or signals from various combination (stereo) sources. Such a control amplifier is represented in the schematic, with variations in the "expression" circuit represented in an alternate schematic, Fig. 2.

Construction

The panphonic control amplifier, Fig. 1, was constructed for the author's use in his home system and is designed for use with a Pickering stereo cartridge and with two 35-watt Williamson-type power amplifiers. Modification to meet the needs of ceramic cartridges is fairly simple and may be provided for by the inclusion of two closed circuit input jacks as suggested in the "alternate input switch" arrangement in the insert in Fig. 1.

Since the signal output of most magnetic pickups is very low, in order to afford sufficient amplification in the pre-

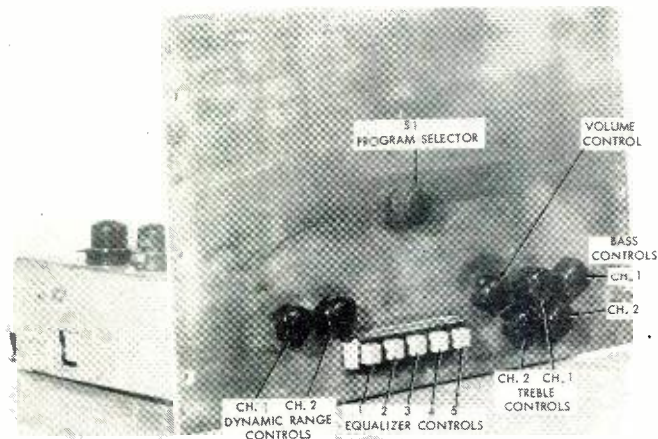


Fig. 1. The author's amplifier—constructed to mount on a standard rack.

Early American Model,
in fruitwood,
30" wide, 24¾" high, 13½" deep.
\$279.95 user net.



Furniture courtesy of Lopipero Inc.



Containing two complete multi-speaker systems in one compact enclosure, the 'Trimensional' TMS-2 projects frequencies of both channels to the rear and side walls of the room. Thus, one large wall area becomes channel A; another channel B... exactly as if you had a series of widely distributed speakers for each channel.

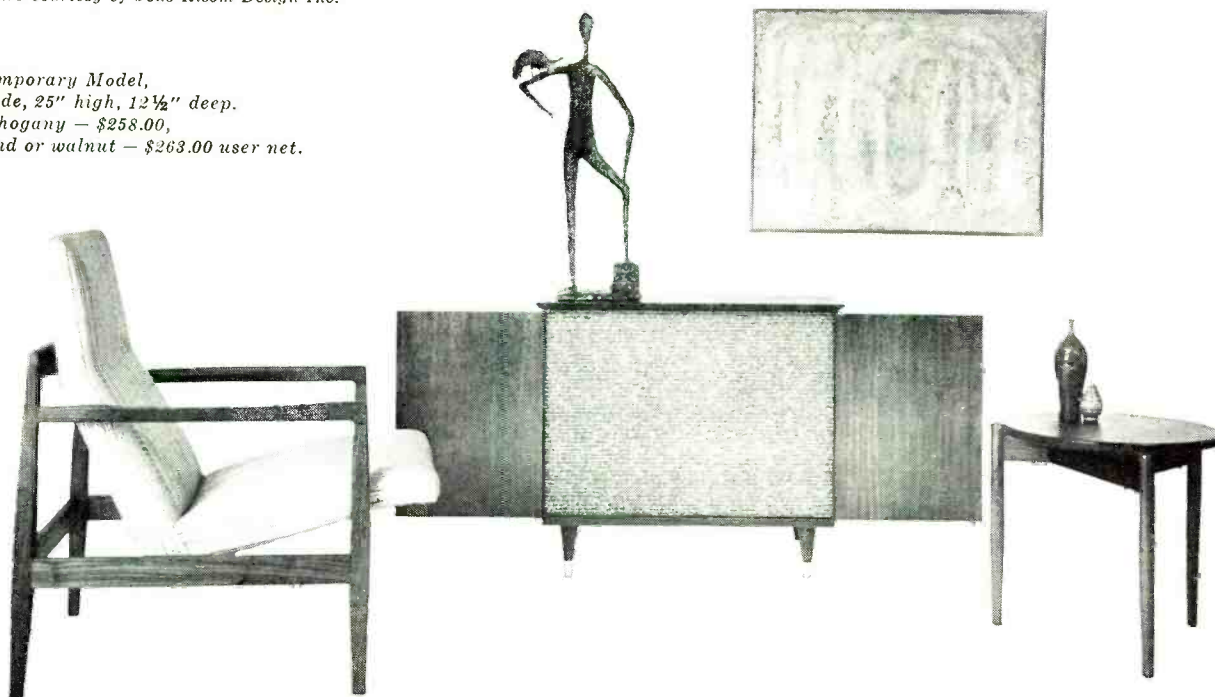
TMS-2... most sensational advance in stereo reproduction

When you listen to the TMS-2, you will experience stereophonic reproduction that no conventional system can ever achieve. Its entirely new principle of operation permits every listener *throughout* the room to enjoy fully balanced sound with such extraordinary breadth and three-dimensional depth that it seems to originate beyond the confines of the room itself. Full controls and adjustable doors allow the 'Trimensional' TMS-2 to be placed *anywhere* — along wall or corner — without affecting its performance capabilities. The full TMS-2 story is a fascinating one. Write for it today.



Furniture courtesy of Jens Risom Design Inc.

Contemporary Model,
30" wide, 25" high, 12½" deep.
In mahogany — \$258.00,
in blond or walnut — \$263.00 user net.



WRITE DESK R-6, UNIVERSITY LOUDSPEAKERS, INC., WHITE PLAINS, N. Y.

amp stages without using more than one tube-envelope for each of the stereo inputs and to allow for the loss in the equalization circuit, two 6U8 tubes were employed, although these tubes are comparative newcomers to the audio field and have, when new, greater microphonic tendencies than some of the usual types used for preamp circuitry. With care in wiring, sufficient cathode bypassing, and shielded grid leads whenever more than an inch in length, if properly mounted and placed on the chassis for a minimum of mechanical, external vibration, 6U8's may be operated with almost complete absence of noise. Certainly with as little noise as the favored 6SC7 preamp tubes used in some circuits.

However, if the microphonic tendencies of the 6U8 tubes are considered ob-

jectionable, and if metal octal type tubes are preferred—and if one does not mind the addition of another tube to the preamp stages—a combination of one 6SC7 and two 6SJ7's can be used by devoting each triode of the 6SC7 to separate stereo channels, coupling the section plates to the separate pentodes for the necessary second stage of the preamp to permit a feedback type of equalizer and still have sufficient gain to activate the "expression" circuit.

In any arrangement it is important, however, that the triode stage precede the pentode stage since a gain of more than 50 is needed in the preamp for stereo reproduction. By using the 6U8's as shown in the schematic one may expect an over-all mid-band gain from the first (triode) section of 25-30; and although the over-all gain of the pentode

section is about 185 it is reduced by the equalizer feedback to approximately 1.85. The over-all gain of the two sections is therefore sufficient to activate the "expression" circuit and to meet the requirements in signal strength of the power amplifier. (V_3 and V_4 barely amplify the signal sufficiently to compensate for loss in the tone controls, and hence for all practical purposes in construction may be disregarded as signal amplifiers).

Equalization Network

The equalizer circuit preferred for use with 6U8's is of the "between stages" network type, and although other arrangements for obtaining the exact equalization required for optimum reproduction are possible, they will gen-

(Continued on page 86)

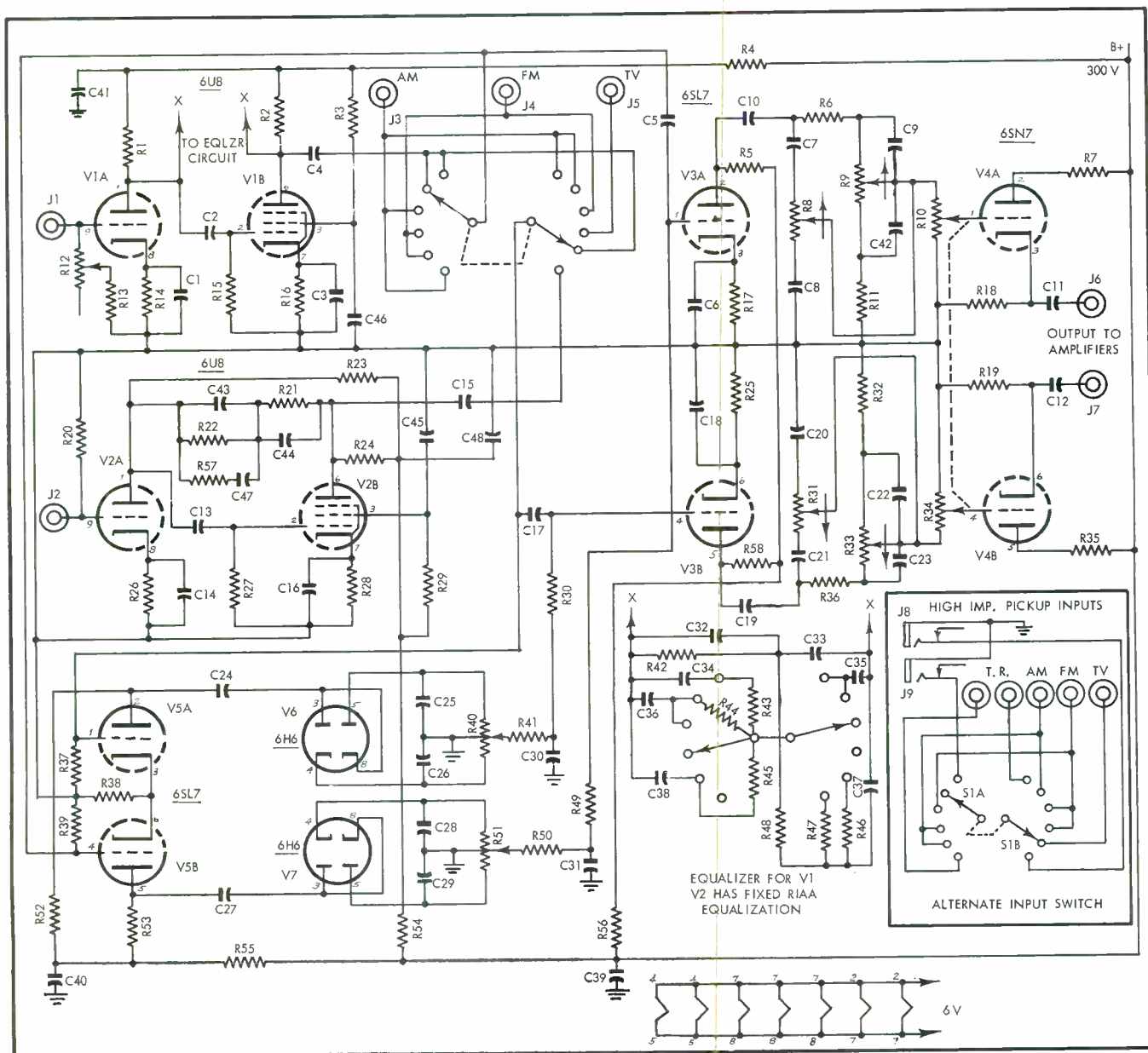


Fig. 2. Over-all schematic of the panphonic amplifier.

the "fourmost reasons" why Audax Paraflex* is not "just another speaker system."

George Silber, as President of Rek-O-Kut and its new Audax Division has been a pioneer in the manufacture of the highest quality components. In Audax Speaker Systems, you will find the same uncompromising standards that have made Rek-O-Kut Stereo Tables the most respected brand in high fidelity.

Saul White, well known design engineer and writer on transducers and inventor of the patented Paraflex foam compound suspension, the greatest step towards the reproduction of *natural* sound.

Tom Mulligan, representing the great Union Carbide Company who researched and developed the Dynel fabric adapted by Audax for its "Acoustiscreen."

George Nelson, one of America's greatest industrial designers, brilliantly styled the enclosures and developed the Dynel three-dimensional "Acoustiscreen" grille.

TWO MODELS now at your dealer's — CA-80 System, 12" x 12" x 24", \$99.95 CA-100 System, 15" x 12" x 25", \$139.95.

PARAFLEX

Write for free catalog and specifications, to:
AUDAX Division of the Rek-O-Kut Co., Inc.
38-19 108th St., Corona 68, N. Y. Dept. A9

Name _____

Address _____

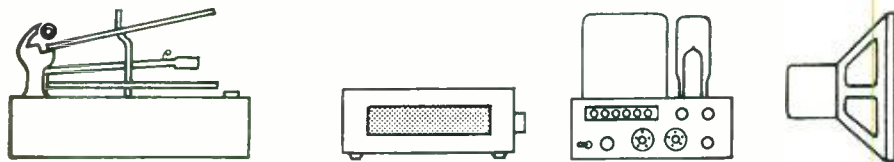
City _____ State _____

**SPEAKERS
BY AUDAX**



Export: Morhan Exporting Corp., 458 Broadway, New York 13, N. Y. Canada: Atlas Radio, 50 Wingold Avenue, Toronto 19, Ontario RA-8

EQUIPMENT



PROFILE

- Pilot SP-216-A Preamplifier-Control Unit
- University Model TMS-2 "Tri-dimensional" Stereo Speaker
- The Leak Amplifier Line—"Point One" Stereo and Monophonic
- Dynaco Stereo 70 Power Amplifier Kit

PILOT SP-216-A DELUXE STEREO PREAMP-CONTROL UNIT

When the Pilot SP-215 stereo preamplifier and control unit appeared on the market last year, we reported it briefly in these pages in conjunction with the SM-244, a complete stereo amplifier-preamp unit. It was then described as being "extremely flexible, well engineered, and carefully built," and after a year of use we are of the same opinion still. Its successor, the SP-216-A, is an "improved" version of the same basic unit, which is somewhat like painting the lily, since the earlier model was sufficiently excellent to satisfy most users.

However, careful study of the SP-216-A brings out the points of superiority of the new model, both from the standpoint of user convenience—which is obvious to the eye—and to the reduction of the already low distortion throughout the circuit, which is not so obvious on casual inspection. In general appearance the new model is not radically different, in spite of the more attractive finish of panel and frame, the latter being heavily gold plated and highly polished. The knobs are also gold plated, and the over-all appearance is quite luxurious. The cabinet is steel, with a black grained vinyl covering permanently bonded to the metal.

Basically, the circuit consists of two identical sections comprising a dual-triode preamplifier, tone-control amplifier, and an output cathode follower. Side amplifier circuits feed from the selector switch through separate volume controls, another amplifier, and a cathode follower to feed a tape recorder, with a tube-driven VU-type meter indicating the recording level being fed to the tape machine. In addition, a panel-mounted switch connects both metering circuits to the audio output terminals to facilitate balancing the two channels for stereo reproduction.

The 216-A has a total of 14 inputs—seven pairs for phono changer, phono turntable, tape head, microphone, tuner, multiplex, and tape amplifier. These inputs are selected by a rotary switch, except for the change from changer to turntable, which is effected by a slide switch along the lower edge of the control panel. Equalization in the preamplifier stages is provided from feedback circuitry in the 216-A, whereas in the 215 equalization resulted from a between-stage loss network. Because of the feedback, the new circuit has less distortion than before. The function switch has four positions, the usual stereo and stereo reverse, and monophonic output from either channel A or

channel B inputs. The ganged master volume control is in two sections (four pots altogether), one immediately following the selector switch and one in the grid circuit of the output cathode-follower stage. Thus any hum or noise which might originate in the tone-control stages is reduced as the output level is lowered, while the input section of the control prevents overload of the intermediate stages in case of higher-than-normal input levels. The volume controls of the two channels track within 2 db over the majority of the range. The loudness-contour switch is ganged for both channels, and provides a normal or flat position, and four separate contours for correspondingly reduced levels. Dual-knob potentiometers are used for both bass and treble tone controls, permitting separate adjustment of tone in the two channels. The knobs may be locked together with the exclusive Pilot "TroLoK," a simple mechanical means for coupling the knobs for simultaneous control of both channels. The power switch has three positions—ON, OFF, and AUTOMATIC, and in the latter position the cutoff switch on a record changer can serve to turn off the entire amplifier system. The remaining panel control is for balancing, with one channel being cut off at each extreme of rotation.

The rear apron mounts two dual level-set controls, together with a ganged control for recorder output. This permits adjusting the recording signal to any level from 0 to 1.3 volts at zero indications on the two meters. This is extremely desirable because it enables the recordist to operate with normal meter swings regardless of what level his tape recorder requires. When switched to the MONITOR position, the meters indicate the audio output level, and the user then adjusts the balance con-

trol to get equal outputs.

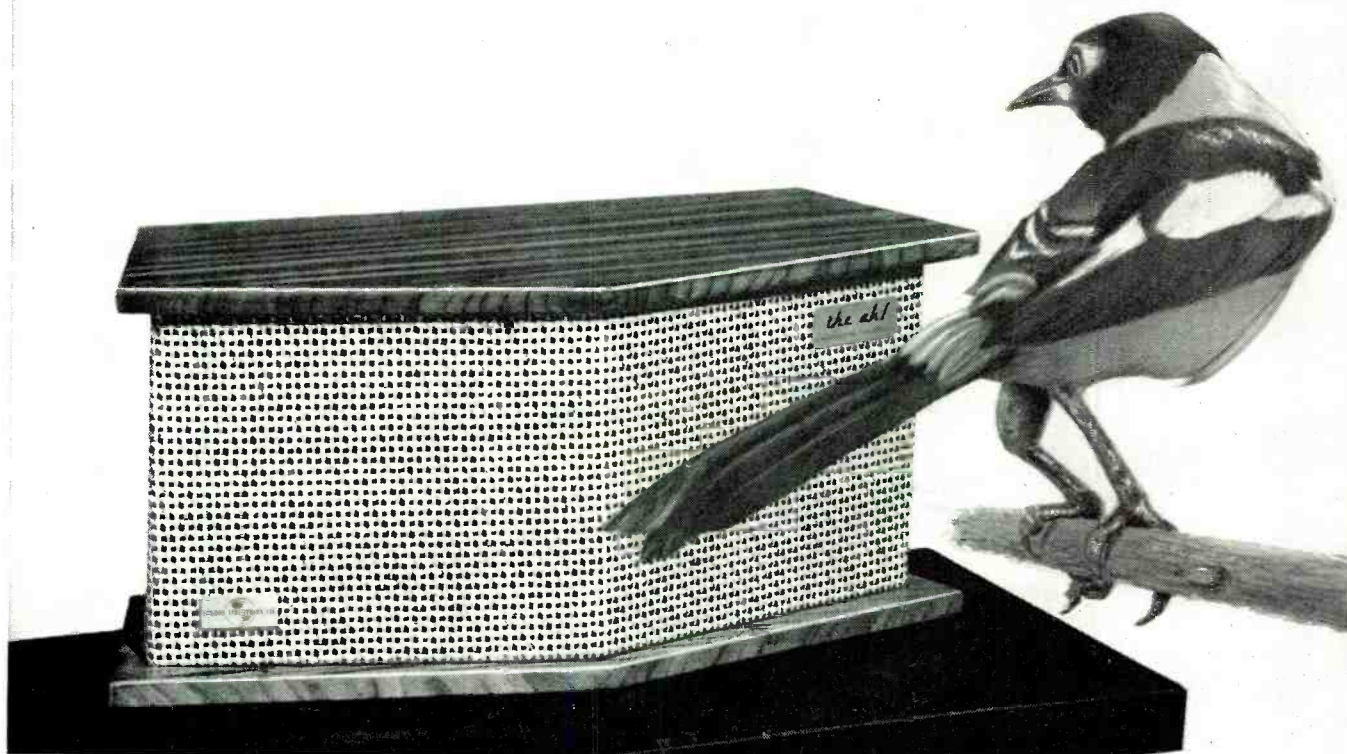
Frequency response was measured at a 1-volt audio output and was found to be within ± 1.3 db from 20 to 20,000 cps. Minimum input signals for a 1-volt output were: tape head, 1.9 mv; phono, 3 mv; microphone, 2.8 mv; and for the high-level inputs, 0.11 volts. Hum and noise measured at 82 db below 1 volt on the high-level inputs and 66 db below 1 volt on the low-level inputs with volume control at maximum. D.c. is used on the heaters of all the audio stages (not the side amplifiers nor the meter amplifiers) and power supply filtering is generous so that hum is never a problem with this unit.

Listening quality with the 216-A is slightly better than the earlier 215, although unless they were played side by side the difference would scarcely be noticed. On the debit side—and it is difficult to find anything about the unit with which one could find fault—is the lack of a phasing switch, and possibly the lack of several different equalizations for older records. We modified the 215 to provide the phasing switch, and could easily do so with this one if we considered the need sufficiently important. As to other equalizations, the tone controls are marked to indicate the approximate settings for NAB, LP, and AES curves, which should be adequate for anyone. The serious experimenter will find the 216-A ideal for recording and for general "tinkering" where a meter is desirable. Many of these preamps are being used in broadcast stations for record reproduction, and we believe that an optional satin chrome panel for rack mounting might engender still more interest in professional applications. At least, the unit is good enough for such uses. J-10



Fig. 1. Pilot SP-216-A Deluxe Stereo Preamp.

a new tweeter that solves at least three of your speaker problems!



SOUTH AMERICAN TROUPIAL BIRD PHOTOGRAPHED AT TREFFLICH'S, NEW YORK

the 'ah!'^{*} electrostatic transducer

A Combination Mid-Range and Super Tweeter

- ① The 'ah!', because of its revolutionary new construction gives clear, transparent response on all frequencies from 600 cps to beyond the limit of audibility and has none of the limitations of tonal coloration and exaggerated peaks found in cone or piston type tweeters!
- ② The 'ah!', because of its omni-directional characteristics, offers tremendous advantages in your stereo system. The 'ah!' enables you to space out speakers to achieve the dramatic effects associated with wide separation *without* the disturbing "hole-in-the-middle" caused by the directional characteristics of conventional speakers . . . or by single-ended, high distortion, limited range electrostatic speakers.
- ③ The 'ah!' electrostatic transducer is superior in quality and performance to speakers selling for almost twice as much, but, because of expert research facilities and newly developed materials it is offered at an unprecedented low price . . . **only \$49.95.**

Nothing else to buy — R/C crossover network and AC power supply are built in. 8 or 16 ohm L pad may be added to attenuate tweeter, if desired.

*An American-made speaker — patent applied for by COSMOS INDUSTRIES.

GUARANTEED FOR FIVE FULL YEARS, elements are practically indestructible.



Mates easily and quickly to any speaker made.
Frequency Response: Full flat, lifelike midrange plus UHF coverage—600 cps to past the limit of audibility. Roll off 6 db/octave of speaker and crossover network below 900 cps. Backwave completely undamped.
Impedance: Designed to match 8 or 16 ohms output of 15 to 50 watt amplifier.
Crossover: Self-contained R/C crossover network; recommended crossover point between 650 to 850 cps. May be connected in parallel directly across any low frequency woofer without additional network.
Sound Dispersion: Full 180° coverage (front and backwave) when speaker is mounted at least 6" from back wall.
Distortion: Practically unmeasurable. Radiation area is 62 sq. inches.
Polarizing Voltage: Fused currentless 1000 volt DC power supply. 110 volt AC power line. Hand rubbed genuine walnut cabinet, other finishes available on special order.

EAST COAST		the 'ah!' electrostatic transducer can now be seen at		WEST COAST	
HUDSON RADIO 48 West 48th Street New York City 212 Fulton Street New York City 35 William Street Newark, New Jersey	LEONARD RADIO 69 Cortlandt Street New York City HARVEY RADIO 103 West 43rd Street New York City	IN THE MIDWEST Allied Radio Corp. 100 N. Western Avenue Chicago, Illinois	AT THESE ALLIED HIGH FIDELITY STORES Voice & Vision Inc. 921 N. Rush Street Chicago 11, Illinois Evergreen Allied High Fidelity Inc. 2025 W. 95th Street Chicago, Illinois	Voice & Vision Inc. 7055 W. North Avenue Oak Park, Illinois	See your local high-fidelity dealer. Allied High Fidelity Stores 602 Davis Street Evanston, Illinois



For complete information and specifications write to:

COSMOS INDUSTRIES, INC.

31-28 Queens Boulevard
 Long Island City 1, New York

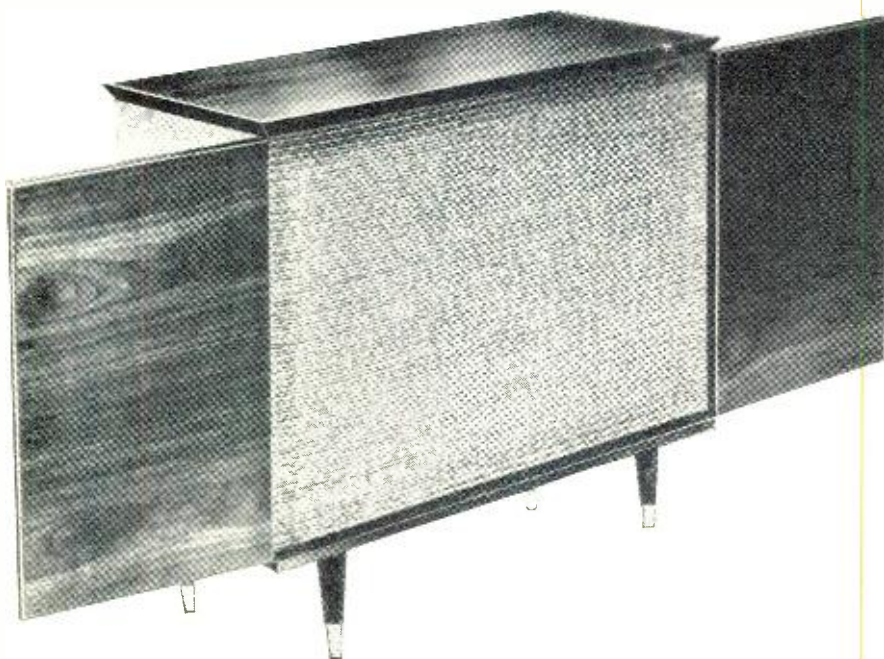


Fig. 2. University "Trimensional" stereo speaker system with the "doors" opened for stereo reproduction.

UNIVERSITY "TRIMENSIONAL" STEREO SPEAKER, MODEL TMS-2

One of the principal problems in laying out a satisfactory loudspeaker system for stereo reproduction in the home is the provision of adequate space in the right places for two separate loudspeakers—completely aside from the fact that in many homes it is difficult, if not impossible to obtain sufficient cooperation from all members of the family to put the speakers where they should be regardless of the appearance. Loudspeaker cabinets have not been around long enough for us to have acknowledged their snob appeal as we do with the architectural monstrosity known as a grand piano, yet space will be made for one of these even though it may never be played but serve only as an ornament. Aside from the problem of space for two cabinets, there is also the problem of cost. There are, undoubtedly, some people in the world to whom the extra outlay of a few hundred dollars for another loudspeaker system may not upset the budget, but this is not a universal condition.

Understandably, therefore, speaker manufacturers have introduced many types of speaker systems aimed at the largest section of the home market—both with respect to price and to acceptance. Practically all small cabinets have been presented as "ideal for stereo," but they had nothing special to offer except their small size, and while many gave excellent account of themselves as to the performance, two were still required, and in most instances they were simply rectangular speaker enclosures just like their larger counterparts in appearance but perhaps half as big.

Another solution—which appears to work quite well—is to use a single woofer which reproduces the low-frequency portion of both channels and a small separate speaker for each channel to reproduce the high-frequency portion. When properly disposed in the room and properly phased, this system works well, and if the crossover is sufficiently low—that is, not over about 600 cps—the stereo effect is satisfactory. Two different methods of combining the low-frequency outputs of the two channels have been used—in one an isolating net-

work couples the two systems together in additive phase, while in the other a dual voice coil is used with the two electrical outputs being fed to separate voice coils on the same former and driving the same cone. Thus motion will be imparted to the cone in direct proportion to the vector sum of the two signals.

The principal advantage of this system is that a dual-voice-coil woofer costs only slightly more than a single conventional unit of the same size, not two times as much as two separate speakers do.

The next step in developing a single-unit stereo speaker is the placement of the high-frequency units for proper dispersion. Unless the cabinet is at least six feet long, the speakers can not be placed far enough apart for good results, if they are to face the front. If they are made to radiate outwards from the ends of a smaller cabinet, then reflections from the walls can create a spatial feeling. Regardless of where one is in the room, there are many paths of reflection coming from each channel. This is what the University TMS-2 purports to do, and does.

When we first heard this unit it was being demonstrated in a room about 15 feet wide and 30 feet long. Across one of the narrow ends a scrim was placed so we could not see the speakers being A-B'd against each other. We learned later that one condition comprised two S-10 speaker systems spaced about 8 feet apart; the other was the TMS-2. Some form of screen is always a great advantage in a stereo speaker system, for it is a human characteristic to hear two sound sources if we can see two. You can prove this to yourself with any two-way system. Take off the grill cloth so you can see two speakers, and they will seem not to blend together at the crossover as they should, but will appear to be separate sources. Cover them and you again hear only one apparent source.

With the TMS-2 system, you always had the feeling of good stereo reproduction in every part of the room; with the two S-10's, either channel would seem to predominate as you came closer to it. We have since lived with this speaker for some weeks and the illusion persists—the stereo effect is excellent no matter where you are

in the room.

Figure 2 shows the TMS-2 as it is used for stereo. The two doors are opened outwards to screen leakage directly forward from the two high-frequency sections so that all the sound from them reaches the listener in the form of reflections. For various placements in the room, the positions of the doors may need to be varied for optimum effect, but that requires only a little experimentation. For monophonic listening, the doors are closed, resulting in a more normal type of single-channel sound.

The system consists of a heavy-duty 12-in. dual-voice-coil woofer which covers the range up to 150 cps, and two separate high-frequency sections, each employing an 8-in. midrange cone and a wide-angle compression-type tweeter using a 3000-cps crossover. The woofer section is ducted, with both cone and port projecting sound out the back of the unit. The high-frequency sections project the sound from the ends of the cabinet to the right and left.

While it is only of academic interest, we tried the speaker outside in an area well away from any reflecting surfaces, and the stereo effect was very well suppressed, with the over-all reproduction sounding quite dull, as would be expected. None of this was observed in a typical room, however, unless the speaker were placed where drapes absorbed the side-projected sound, in that case the stereo effect again suffered, and reproduction was dull. But in the average room the stereo effect was always good, and no hole in the middle was observed once the phasing was correct. As to range, reproduction without doubling was heard down to 32 cps, and the controls provided allowed for a well-balanced overall range. J-11

THE LEAK AMPLIFIER LINE—STEREO AND MONOPHONIC

Once upon a time there was only one Leak amplifier available in the U. S.—the TL/12, with its preamp. It was called the "Point One," referring to its distortion at rated output. There are now five power amplifiers and three preamp-control units, and they are still called Point One for the same reason as before.

The TL/12 Plus has a maximum output of 14 watts with 0.1 per cent distortion at 12 watts, frequency response flat within ± 0.5 db from 20 to 20,000 cps, and a damping factor of 25. The 12-watt output is obtained with an input signal of 125 mv. Two EL84's are used in the Ultra-Linear output stage, and the amplifier can feed loudspeakers of any impedance between 3 and 20 ohms.

The TL/25 Plus has 0.1 per cent distortion for an output of 25 watts, while other specifications remain the same except for the output stage which employs two KT66's. Maximum output is 32 watts.

The TL/50 uses KT88's, and its distortion is 0.1 per cent at 50 watts. Other specifications are the same.

The "Stereo 20" is essentially the same as two TL/12's on the same chassis, and the "Stereo 50" is almost the same as two TL/25's on the same chassis. This model is described more fully in the following paragraphs.

Preamplifiers

Three preamplifiers are now available—two for monophonic and one for stereo. The "Point One Plus" employs two EF86's (or Z729's or 6267's), has inputs for tuner, tape, and four phonograph equalizations; it has bass and treble tone controls, a volume control, and a filter control,—the lat-



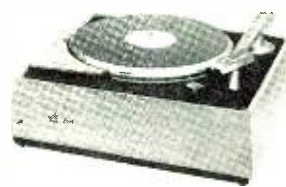
START YOUR HIGH FIDELITY SYSTEM WITH A GRAY COMPONENT KIT OR ASSEMBLED

...GRAY COMPONENTS for expert workmanship at low cost to you



GRAY Hysteresis-Synchronous Turntable Kit

Precision engineered parts. Balanced for both stereo and monophonic use, 33 $\frac{1}{3}$ RPM belt drive.
 HSK-33 turntable .. \$49.50
 SAK-12 tone arm.. 23.95
 TBA base .. 17.95



GRAY Custom DeLuxe turntable, arm and base

Factory assembled components that give you all the extras you need for the most complex system.

33 H (Hysteresis-Synchronous)
 Turntable \$79.95
 212 SX 12" arm..... 34.00
 33 C Wood Base..... 23.95



GRAY Tone Arm Kit

Outstanding features such as linear fluid damping, quick-change cartridge slide, adjustable static balance, and versatile wiring.

ing for all cartridges makes SAK-12 tone arm your best buy.
 SAK-12 12" arm kit..... \$23.95



GRAY Micro-Balanced Pressure Gauge

Indicates pressure on record surface so that adjustments can be made for proper tracking. A true balance without springs.

PG 200 gauge..... \$2.50

Visit your friendly quality Gray dealer for a full demonstration. Write to us for complete literature.

GRAY our 67th year in communications...
High Fidelity Division
 DEPT. X • 16 ARBOR STREET, HARTFORD 1, CONN



Fig. 3. Leak "Point One Stereo" preamplifier, deriving its power supply from a Leak power amplifier.

ter providing a low-pass filter at 4000, 6000, or 9000 cps, as well as an off position. Two jacks are mounted on the panel for use with tape recorders—one to feed the recorder and one for replay. The input sensitivity is 9.5 mv for rated output, 125 mv.

The "Varislope III" has all the same features as the "Point One Plus," and in addition has a control which varies the slope of the cutoff filters over the range from 5 to 35 db per octave. It also has a slide switch for selecting between two pickups so the user with both changer and turntable has a panel control between the two so as to eliminate the need for plugging in or out cables when changing from one listening mode to the other. A rumble filter is also provided, with a cutoff at 70 cps. The jacks for use with tape recorders are retained with this model.

The "Point One Stereo" preamp, Fig. 3, is essentially the same as the "Point One Plus" except it is in duplicate, but with the addition of the rumble filter and the necessary function switch. Connections to the tape recorder are made at the rear rather than through panel-mounted jacks.

Using only two tubes, the circuit arrangement of the "Point One Stereo" is considerably different from typical U.S. preamps. All input signals are fed to the grid of the first tube through level-set controls except microphone and tape head, and the phono and tape head equalization is provided by feedback around the first tube, a pentode. Gain is reduced for the high-level inputs by using only resistive feedback, while the equalization is achieved with reactive networks in the feedback circuit.

Following the first stage is the tone control network—the Baxendall type. In most circuits, the Baxendall network is used between two triodes, but when used with the pentode sufficient gain is obtained to permit operation with only the two tubes in the entire preamp. The balance control follows the second pentode, and it is followed in turn by the rumble filter and the volume control. Output is not from a cathode follower, which is almost standard in U. S. designs, but the average output impedance is about 37,000 ohms. A 4-ft. cable is used to connect the preamp to the power amplifier, and extensions are available up to a maximum of 16 ft., so the output impedance does not appear to create any problem.

From the specification standpoint, the input impedance on phono ranges from 70,000 to 100,000 ohms, depending on the position of the level-set control, and the input signal for full output (125 mv) is 5 mv. On the microphone input, the input impedance is 120,000 ohms, and the required maximum signal is 3 mv—adequate for practically any high-impedance microphone, although crystal and ceramic units may find the input impedance too low for normal bass response. The tape-head input has an impedance of 120,000 ohms, and full output may be obtained from an input of 4 mv. The high-level inputs have an impedance of 70,000 to 100,000 ohms, with a 50 mv signal being sufficient for full output. The bass controls give a range of ± 16 db at 30 cps, and the treble control provides a range of ± 14 db at 20,000 cps. Over-all distortion at normal output is less than .01 per cent, and hum and noise measured 55 db below one watt when used with the "Stereo 50" power amplifier on the high-level inputs, and 52 db below 1 watt on phono and tape-head inputs.

Mounting of the "Point One Stereo" preamp is simple and effective. Using a panel

of any thickness, a cutout $3\frac{7}{8} \times 10\frac{5}{8}$ in. is made and the preamp is inserted from the front. Then a U-shaped bracket is placed over the amplifier and secured firmly with a wing screw into a threaded bushing in the back of the preamp. Power and signal are furnished to the power amplifier through a single 6-conductor cable, while the a.c. line is fed to the switch through a separate shielded pair.

Stereo 50 Power Amplifier

The Stereo 50, shown in Fig. 4, comprises two identical amplifiers employing EL34's, KT66's, or 5881's in the output stage, which is of the Ultra-Linear type. Output-stage bias is obtained from separate cathode resistors for the output tubes, each being bypassed by a 50- μ f capacitor. The phase splitter is of the "long-tailed pair" type using a 12AX7, while the first stage is one half of another 12AX7—the two sections of the amplifier sharing one tube. Feedback returns from the secondary of the output transformer to a tap on the cathode resistor of the first stage, and the output impedance is selected by a movable plug arrangement on the transformer itself. A similar arrangement serves to select the input tap on the power transformer, with values of 110, 117, and 125 being provided on U. S. models to accommodate different line voltages. The British models have input voltages of 205, 225, and 245 volts. The design of the amplifier is such that it is not critical as to balancing of output tubes, and only a slight change was noted when tubes of widely different mutual conductance were used in an output stage.

In general, observers have noted that there is a different tonal quality to British-made amplifiers. The reason for this is hard to explain, since measurements are not appreciably different from many domestic amplifiers of equal quality. One might say that there are some things we have not yet learned to measure, which seems doubtful. However, one must admit that the Leak amplifiers have a definite cleanness of tone which makes them a pleasure to listen to, a crispness usually associated with very low distortion. Regardless of the reason, we find that the Leak equipment has little or no coloration of its own, and it is convenient to use and of ear-satisfying quality. J-12



Fig. 4. The Leak "Stereo 50" power amplifier, a pair of 25-watt amplifiers on the same chassis.

A professional quality tweeter for use in 2-way speaker systems exceeds 3-way systems and gives you a complete high fidelity reproduction even in lack of a mid-range unit.

As this tweeter has a large power handling capacity and a very low crossover frequency, you can save your money by omitting a mid-range unit and enjoy flat response over wide range.

Pioneer offers PT-5

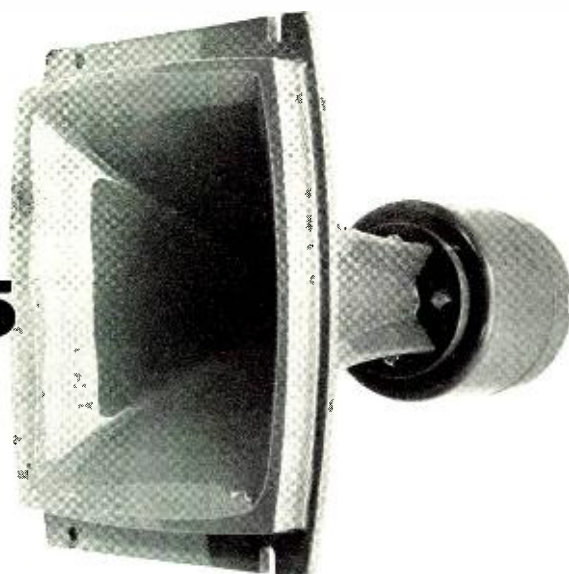
Features:

* Having large power handling capacity, this tweeter gives you an excellent performance when used as home hi-fi sets, theatres and auditoriums sound systems.

* Being adopted a comparatively low crossover frequency, it is not necessary to use a mid-range horn and worry about the troublesome distortion, which often occurs between 2,000 and 3,000 cps.

* A peculiar rectangular exponential horn of thick diecast material gives you clear sounds free from rattles.

* The diaphragm is of a special polyester film molded under heating process, which enables to endure high temperature and humidity free from any changes in characteristics.



Best suitable Pioneer's professional woofers assembled with PT-5 tweeter:

PW-30C
PW-38C



Specification:

Model No. PT-5

Power handling capacity: 35 Watts
Voice Coil Impedance: 16 ohms
Frequency range: 600—16,000 cps
Sensitivity: 108 db
Cutoff Frequency: 600 cps
Crossover Frequency: 1,200 cps
Total Flux: 73,000 maxwell
Flux Density: 13,500 gauss
Weight: 5.4 kgs. (11.9lbs.)
Front Dimensions: 7³/₈" x 5³/₄"
Depth: 16¹/₂"

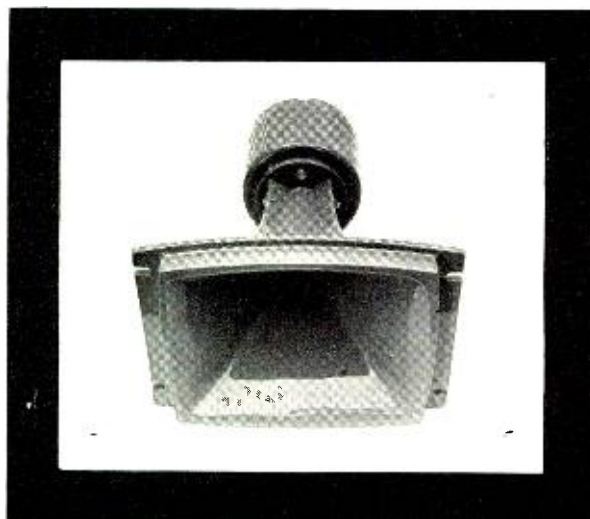




Fig. 5. Dynakit "Stereo 70" power amplifier kit with its protective cover.

DYNAKIT STEREO 70 POWER AMPLIFIER

Carrying on the tradition of high quality at a considerable saving over an equivalent unit in factory-built form, Dynaco now has a dual power amplifier which serves admirably for a home stereo system. Essentially duplicating the original Dynakit Mark II amplifier in specifications, the Stereo 70 comprises two identical channels employing EL34's in the output stages. Working at slightly less power supply voltage than the Mark II reduces the maximum power output, but only to a slight degree—since 35 watts is only 1.6 db less than 50 watts. This unit, shown in Figs. 5 and 6, is completely enclosed in a protective screen. It provides power for Dynakit preamplifiers or for others of similar requirements, and while intended primarily for stereo installations, the two channels can be connected together by a convenient switch to furnish 70 watts to a single channel. Output impedances of 4, 8, and 16 ohms are available on both channels, and an input signal of 1.3 volts is required for a full 35-watt output.

As in the Mark II and Mark III models, each channel of the Stereo 70 employs a triode-pentode and two output tetrodes—in this model EL34's being used. The triode-pentode is a 7199, and all of the difficult wiring of the voltage amplifier stages—pentode for the input stage and the triode for the split-load phase-splitter—is already performed on a printed circuit furnished in the kit. Thus about all the con-

struction required is to mount the parts, connect plate and heater windings as well as the power and output transformer leads, and make a few connections to the printed circuit boards. Average construction time is said to be about 5 hours, but we did somewhat better than that, as would anyone who had previously built any electronic equipment.

In any modern amplifier of good quality it is now expected that frequency response will be flat within ± 1 db over the entire audio spectrum from 20 to 20,000 cps, and such was the case with the unit measured. There was less than 0.2 db difference between the two channel responses at 20 cps and less than 0.3 db difference at 20,000 cps. Damping factor is rated at 15, which was borne out by a measured source impedance of 1.1 ohms on the 16-ohm tap. We measured 0.9 per cent IM distortion at 35 watts equivalent sine wave power with the 2-per-cent point appearing at 41 watts. Hum and noise measured at 71 db below 1 watt with the input shorted, which is exceptionally good for a high-power amplifier. This figure is somewhat better than the original Mark II amplifier but the newer model employs a choke in the filter circuit, as does the Mark III.

The amplifier runs cool, and with the lower plate voltage should "coast" at any normal output requirements. Listening quality is clean, and the unit has no quirks of operation—it is completely stable under all conditions to which we have been able to expose it. J-13

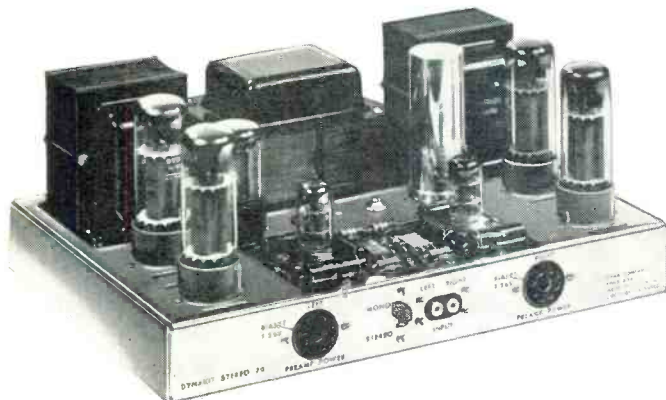


Fig. 6. The Stereo 70 with cover removed to show printed circuit unit, which is furnished already wired.

THE FISHER Stereo Perfectionist III

INCLUDES THE FOLLOWING:

FISHER X-101A



Stereo Master Audio Control and Duplex Amplifier—the world's most versa-

tile control amplifier! 40 watts in stereo operation; peak power, 75 watts. 12 inputs. 8 controls, plus 6 chassis adjustments. 8-position Input Selector: 78, LP, RIAA-1, RIAA-2, TAPE, TUNER, AUX-1, AUX-2. 4-position Output Selector: Reverse, Standard, Channel A+B and Channel B+A (for two-speaker monophonic operation.) Separate Bass and Treble controls for each channel. Record-Monitor facilities. Rumble filter. Provision for all stereo and monophonic program sources, present and future. **\$194.50**

Cabinet **\$24.95**

FISHER FM-100



Stereo Tuner—the most sensitive FM tuner in the world!

Requires only 0.8

microvolts for 20 db of quieting. Equipped with 4 unusually wide-band and flat-topped IF stages for unexcelled fidelity. Inter-Station Noise Silencer (automatically eliminates side-band response, inter-station noise, weak and noisy signals.) Absolutely hum-free ratio detector. Less than 0.5% harmonic distortion at full modulation (completely inaudible!) MICRORAY Tuning Indicator designed for maximum sensitivity to weak signals. Provides space, power and electrical connections for plug-in installation of THE FISHER MPX-20 Multiplex Adaptor. Can also be used for FM-AM and FM-FM stereo with external tuners. **\$159.50**

Cabinet, **\$15.95**

MPX-20 Adaptor, **\$49.50**

FISHER XP-1



Free-Piston THREE-Way Speaker System for bookshelf or floor installation—the

world's first high-compliance PLUS high-efficiency speaker system! Magnet assembly is 92% more efficient than that of its nearest competitor because the magnetic flux is fully concentrated in the air gap, thus preventing even the slightest waste of energy. Bass and transient response unmatched by any other compact speaker system. Use it with any amplifier, 10 watts to 60 watts. Equipped with one 12" woofer, one 5" mid-range and one super-tweeter. Uniform frequency response from 30 cps to well beyond audibility. Hermetically-sealed enclosure, completely free of nails and screws. Available in Mahogany, Walnut, Cherry or Blonde. **\$129.50** Unfinished Birch, ready for staining. **\$124.50**

■ THE FISHER Stereo Perfectionist III, complete with two XP-1 Free-Piston Speaker Systems. **\$703.40**

Other Stereo Perfectionist Systems Priced From \$626.45 to \$900.35. All Prices Slightly Higher in the Far West.

YOUR GATEWAY TO PERFECT STEREO

The Stereo Perfectionist

FISHER

Complete Stereo Systems

THE ELECTRONIC DEMANDS of stereo are far greater than those of monophonic reproduction. IM distortion, as an example, as objectionable as it is in a monophonic system, is much more so in a stereo system. For stereo demands *uncompromising* quality and *maximum* compatibility. Those who desire the absolute will find it in the FISHER Stereo Perfectionist Systems, masterpieces of electronic integration. Each component has been perfectly matched to the other, and to THE FISHER XP-1 Free-Piston, THREE-Way Speaker System—*each unit the supreme example of its type*. At your first opportunity, plan to hear this equipment at your high fidelity dealer.



■ These FISHER products may also be purchased INDIVIDUALLY, to augment the performance of any quality component you already own.

WRITE TODAY FOR NEW STEREO LITERATURE
FISHER RADIO CORPORATION • 21-29 44th DRIVE • LONG ISLAND CITY I, N. Y.
Export: Morhan Exporting Corp., 458 Broadway, New York 13, N. Y.





CHARLES A. ROBERTSON*

STEREOPHONIC

The Famous Castle Jazz Band in Stereo
Stereo Records S7021

Castle Jazz Band: The Five Pennies
Stereo Records S10037

One of the early outposts in the traditional jazz revival was Portland, Oregon, where a resolute bunch of semiprofessionals gathered under the captaincy of Monte Ballou in 1948. They manned a cooperative venture called the Castle Jazz Band until 1950, when divergent vocations sent them along separate paths. Left behind was a small legacy of 78-rpm records, treasured by collectors but not suitable technically for release on LP's. Two recent reunions, held with the full benefit of stereo in the studios of the Good Time Jazz label, remedy this situation and find the original sextet reclaiming many happy memories and all its youthful enthusiasm.

Still vocalist, banjos, and guiding spirit is Ballou, who commemorates the first meeting with a heartfelt delivery of Tommy Lyman's *The Torch*, better known as *When the Gang's All Gone*. Both he and Bob Gilbert, the clarinetist and an advertising executive with General Electric, are back in Portland and play together weekends. Trombonist George Bruns is a musical director at Walt Disney Studios, busily coining *The Ballad of Davy Crockett*, and other hits. Drummer Homer Welch is employed in San Francisco radio, and pianist Freddie Crews works as a single in Bay Area clubs. Currently the Firehouse Five Plus Two's tubaist, Don Kinch, returns to trumpet, while Bob Short, most recently cornetist with Turk Murphy, is back on tuba.

A clue to the band's leading characteristic is the versatility acquired by several members. While not fully detailed in the roll call, enough evidence is given to indicate the thoroughness with which they pursue the basic truths of New Orleans style. Each musician is not only able to anticipate the others but, most likely, is capable of assuming their parts. The ensembles are played with a togetherness that completely transforms Sylvia Fine's four new songs for the Red Nichols saga. All the lavishness of the screen production and the sentimentality of other performances are stripped away. The remaining melodies are reexamined in the light of the period they are supposed to represent and made to sound as though they were written by Jelly Roll Morton.

The same principles of collective creation are applied at length to eight dixieland reliables, no matter how briefly they are introduced in the picture. Included are *Indiana*, the cornetist's trademark, *Battle Hymn of the Republic*, and the Castle's own distinctive marching on the *Saints*.

They undertake to restore a dozen of their older recordings with the benefit of modern sound at the first session. So deeply engrained is the feeling for ensemble interplay that the years they were apart do nothing to lessen its intensity. Seemingly reluctant to forego the satisfaction of working as a team, they would maintain a classic diffidence toward soloing unless Ballou urged them on. Any inhibitions are dispersed by his disclosure

that *I've Been Floating Down the Old Green River*, and the others clambered aboard to test the current on *Smoky Mokes*, *Farewell Blues* and *Kansas City Stomps*. Functional and to the point, the solos never outlast their welcome or become boring. Gilbert proves that General Electric's gain is a loss for jazz.

The stereo spread allows ample room for the rhythm section, while avoiding a ping-pong effect from the horns. The monophonic versions are available on *Good Time Jazz*.

Jo Jones Plus Two
Vanguard Stereolab VSD2031
More Drums On Fire!
World Pacific Stereo 1022

On these exciting drum romps, the solo prowess of Count Basie's first drummer is brought into direct comparison to that of the latest in the line of succession. Jo Jones is heard with his current trio, his collaborators being the Bryant brothers from Philadelphia—Ray on piano and Tommy on bass. Together they have worked up five stunning originals, and four standards which include *Satin Doll*, *Sweet Lorraine*, and *Sometimes I'm Happy*. The great strides made by Jones since being relieved of the necessity to drive a big band are everywhere evident. Only Shelly Manne can also create, with equal discretion and swinging beat, a small orchestra from drum and cymbal timbres. In ticking of the rhythms on *Cubano Chant*, he makes no recourse to the usual Latin American trappings, relying on his own setup to obtain a percussive sound which is unique for such excursions. Some of the freedom he now enjoys is due to the strong left hand of his pianist, and Jones need waste little effort on the fills and backing required in most trios. Ray Bryant's performance on two blues is dynamic and masterful. When considered with his set of blues solos for Presige, it will cause his stature to rise considerably in many eyes.

One of Sonny Payne's current display pieces with Basie is *Old Man River*, and Jones presents his version in a sustained solo. Payne responds in kind at a World Pacific session held while the band was in Los Angeles, playing *Clap Hands Here Come Charlie*. As to a decision, you'll be too limp to make one. The other items on the anthology, the second in a series, feature Mel Lewis' brushwork on a blues, Benny Barth of the Mastersounds, and Armando Peraza and Ray Mosca of the George Shearing group. The last pair make a duet of Stan Kenton's *Artistry in Rhythm*, giving it a more musical reading than some bands, and Peraza's conga drums encore with Freddie Gambrell on *Triste*. In every case the drums are well placed in stereo.

Buddy Bregman: Swingin' Standards
World Pacific Stereo 1024
Ray Anthony: Sound Spectacular
Capitol ST1200

These fine dance sets from the West Coast are distinguished by a big sound and a multitude of stereo attractions. Buddy Bregman's arrangements, played by sixteen top studio musicians, look back at the swing era from a latter-day vantage point. Especially appeal-

ing are his theme, *My Buddy*, Ellington's *In a Mellow Tone*, and three by Cole Porter. A stellar saxophone section of Bob Cooper, Richie Kamuca, Bill Holman, and Bill Perkins is shepherded by an inciting beat from drummer Mel Lewis. There are sparkling solos all around, but the personnel listing is replaced in the stereo by a description of the recording method.

Because it concerns one of the first sessions held at Bill Putnam's new United Studios in Hollywood, it holds considerable interest, assuming he shares the views expressed by Richard Bock. After stating that two basic recording techniques emerged out of the chaos that was stereo recording just a few years ago, it reveals that both are employed: "Side one uses the technique generally favored by recording engineers and stereo 'purists.' The approach might be called the 'all-the-way-across' technique. Here the orchestra is presented exactly as it might be encountered 'live' in a ballroom—the saxophone section in front, the trombones directly behind them, and the trumpets occupying the back row. The soloists are heard from the positions they occupy in their respective sections.

"Side two employs the 'divided sections' technique which, in some respects, is the most startling of the two techniques. This presentation results in more 'ping-pong' effect since the saxophone section is heard from the extreme left to the center, and the brass section is heard from slightly left of center across to the extreme right. Both sides of this album were recorded in the same studio using the same mike placement. The playback perspective was achieved entirely through expert mixing from the control booth." Something for everyone here, and without distortion.

Ray Anthony tricks out a dozen good old tunes in modern dress, augmenting his band to twenty-five pieces to suit the occasion. Two separate brass sections are banked on either side—one forming a lead section with the reeds, while the other responds with the support of Red Callender's tuba. The success of the date pretty much depends on this lone instrument, a section in itself. It failed to swing, the whole unwieldy operation would never get off the ground, despite the efforts of drummers Lou Singer and Alvin Stroller. Callender does a marvelous job, giving an unusual zest to *Camptown Races*, *American Patrol*, and *Chop Sticks*. The leader's trumpet solos soar straight down the center, as do Plas Johnson's hearty tenor-sax passages.

One of Anthony's best albums, it presents yet another instance of divided sections. The two basic techniques allow for endless variations, particularly when the tennis game begins. When there is intelligent cooperation between the musical director and engineers, a basic principle followed in these examples, either can be handled successfully.

Freddie Gambrell: Mikado
World Pacific Stereo 1023
Shelly Manne & His Friends: Bells Are Ringing
Contemporary Stereo S7559

By choosing a Gilbert and Sullivan operetta for his first album of show material, Freddie Gambrell discloses yet another aspect of his talent. Being unsuspected, it is all the more welcome. Nothing in his previous work indicates that he learned the score before losing his sight more than four years ago and is able to recall the piano part as written. When he introduces the themes, with the help of Paul Horn on flute, the effect is more Elizabethan than 19th Century, resulting in a curious mixture of periods and styles. The jazz passages are improvised in a manner that is definitely mid-20th Century.

Since this music is now open to all comers, the confirmed Savoyards will become more embattled than ever. Only the staunchest defenders will find anything to complain of here, and those who enjoy humming their own variations will be entranced. Ben Tucker plays bass throughout, and drummers Ray Mosca and Armando Peraza give a Latin lilt to *Tit Willow*, and *I Am So Proud*. Guitarist Dempsey Wright lends the correct troubadour touch to *A Wandering Minstrel*, I. The piano dynamics are superb in stereo.

Shelly Manne and the Friends who started the trend of jazz renditions of musicals are

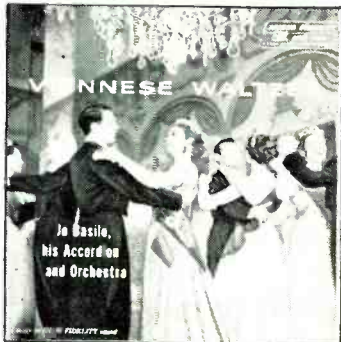
*732 The Parkway, Mamaroneck, N. Y.

the original and positive sound reproduction techniques necessary for true high fidelity are presented on



AUDIO FIDELITY RECORDS

the highest standard in high fidelity



The romantic music of gay Vienna captured in all of its tuneful beauty by the artistry of Jo Basile and his accordion.

AFLP 1868/AFSD 5868



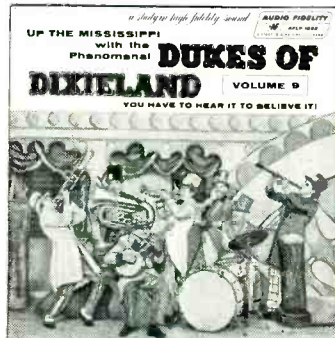
Jo Basile and his accordion are ideally suited for the rich and graceful mood of the sophisticated tango.

AFLP 1869/AFSD 5869



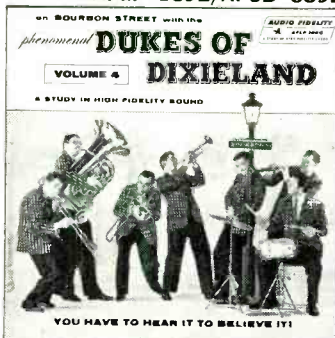
Jo Basile brings his skillful artistry to the haunting beauty of Italian song favorites for your listening pleasure.

AFLP 1871/AFSD 5871



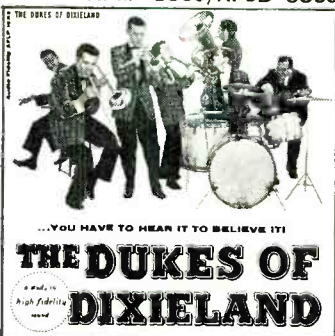
Listen to the mellow trumpet and wailing trombones of the latest and most phenomenal of Dukes of Dixieland recordings

AFLP 1892/AFSD 5892



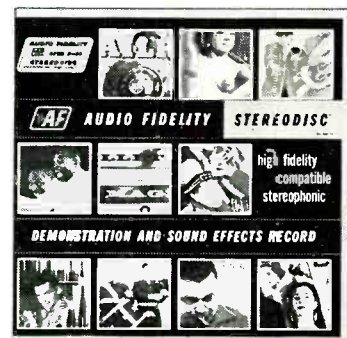
Join the phenomenal Dukes of Dixieland as they march along ON BOURBON STREET in true New Orleans fashion.

AFLP 1860/AFSD 5860

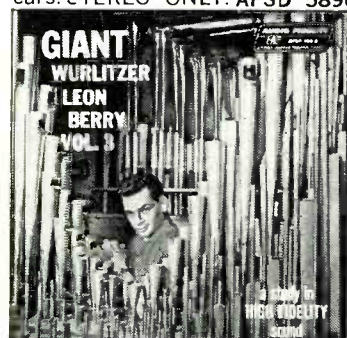


The album that made dixieland as played by the Dukes of Dixieland. You have to hear it to believe it!

AFLP 1823/AFSD 5823



An informative and fascinating demonstration of stereophonic reproduction including sounds of cannons, fire engines and sports cars. STEREO ONLY. AFSD 5890



A shining example of the remarkable clarity and realism is heard with the artistry of Leon Berry at the Giant Wurlitzer.

AFLP 1844/AFSD 5844



The brilliant highs and dynamic lows of the theater organ are musically displayed by the versatile Al Melgard.

AFLP 1887/AFSD 5887

FREE

Complete illustrated catalogs of the entire Audio Fidelity library are available from:

Audio Fidelity, Inc.,
Dept. A - 9, 770 11th
Ave., New York 19, N. Y.

HEAR the fabulous 1st Component Series

The finest classical performances available in stereophonic high fidelity. These recordings reproduce in proper balance and spatial relationships the musical elements as heard only before in the concert hall.

SUGGESTED PRICE — \$6.95 EACH 12 INCH STEREO DISC
SUGGESTED PRICE — \$5.95 EACH 12 INCH LONG PLAY

ALL ALBUMS EXCEPT AFSD 5890 ARE AVAILABLE BOTH MONOPHONICALLY AND STEREOPHONICALLY



ESL Gyro/balance arm

GRAVITY CONTROLS

- ▶ If your stereo system often sounds unbalanced, the fault may lie in the arm. In many cases, proper channel balance can be achieved by replacing your present arm with the superlative new **ESL Gyro/balance**.
- ▶ For balanced playback of stereo discs, the stylus must be kept in perfect contact with the record groove. No turntable is always level; with a conventional arm, even a tiny tilt may result in gravitational pull which adds pressure on one side of the groove. This uneven pull deteriorates the sound, and greatly increases wear on valuable records and styli.
- ▶ A Gyro/balanced arm can eliminate gravitational pull caused by an unlevel turntable, and **only** the **ESL arm** is Gyro/balanced. Even with the turntable tilted ninety degrees, the **ESL Gyro/balance arm** keeps the stylus perfectly centered in the groove, and the output of both channels balanced!
- ▶ Join the thousands of musicians, engineers, and music lovers whose records sound better and last longer with the **ESL Gyro/balance arm**. Only \$34.95 at your dealer's.
- ▶ It's no secret that the most advanced stereo pickup—for the **Gyro/balance** or any other arm—is the world-famed **ESL Gyro/jewel** electrodynamic cartridge. At only \$69.95 (far less than the cost of a comparable stereo amplifier or pair of speaker systems), can you really afford **not** to own the finest?



FOR LISTENING AT ITS BEST
**Electro-Sonic
Laboratories, Inc.**
Dept A • 35-54 36th Street
Long Island City 6, NY

at it again, it being the drummer's turn to lead. Whether he or Andre Previn is at the helm, the outcome is bound to be a quick-witted, swinging collaboration. Underlined by Red Mitchell's pulsing bass, the fifth in the series is similarly disposed. The pianist unleashes his classical training on *I Met a Girl*, and a ballad. *The Party's Over*, is played at a normal tempo and then reprised for a lively finish. On *Mu-Cha-Cha*, Manne evolves one of his few lengthy solos, exploring the tonal qualities of his drums with rhythmic precision and melodic insight. The first jazz reading of Jule Styne's score will be hard to top, especially as detailed in stereo.

Jo Basile: Viennese Waltzes
Audio Fidelity Stereodisc AFSD5868
Ruth Welcome: At A Sidewalk Cafe
Capitol ST1209

Vienna is never far away when these two LP's are on the turntable. Jo Basile, in continuing his tour of European capitals, gives the required lilt to a dozen enticing waltzes, including Anton Karas' *Third Man Theme*, and *Cafe Mozart*. Some others are as familiar as *Play Gypsy*, or Strauss' *Waltz Dream*, while a new experience may be in store on the rollicking *We're On Our Way To Nussdorf*. The lush, romantic tones of the leader's accordion are closely miked and centered in stereo.

Ruth Welcome strays from the Danube city on *Non Dimeticar*, *Under Paris Skies*, and *Arrivederci Roma*. But the program of zither music which avoids it entirely has yet to be designed. She soon returns with the tidings that *The Trees Bloom Again in Prater Park*. The Milt Shaw trio, her accompaniment, is grouped in stereo with bass and the leader's violin on one side of the zither, while the accordion fills out the other. The sound on both discs has a you-are-there quality.

MONOPHONIC

Sonny Rollins & The Contemporary Leaders
Contemporary M3564

Eddie Davis: "Jaws" **Prestige 7154**

On his second visit to the Contemporary studios, Sonny Rollins becomes a member of a quintet, except on one number, *You*, when Victor Feldman joins in on vibes. Like the late Billie Holiday, he has the capacity to transcend his material. But where ordinary popular songs were forced on the singer, he delights in searching out titles usually scorned for modern jazz improvisation, carrying the sheet music around in his saxophone case until ready to amaze his auditors. This time he uncovers hidden beauties on Billy Hill's *Chapel in the Moonlight*, and tempers with some serious moments a humorous approach to *Rock-A-Bye Your Baby with a Dixie Melody*. A spare copy of *Sweetheart Of All My Dreams*, anyone?

To complete the parallel, a session with Rollins also places the other musicians on their mettle. Did Miss Holiday's accompanists ever sound so good behind another vocalist? This is his first recording with a guitar and Barney Kessel does his best to prove the instrument essential. His main chance develops on a trio number, *How High the Moon*, with Leroy Vinnegar on bass. The nearly eight minutes of improvisation, which the tape recorders caught before the start of the second session, may well lead to an encore. On *The Song Is You*, the swift tempo allows two rapid-fire piano choruses by Hampton Hawes, and brisk drum exchanges from Shelly Manne.

With due cause, critics cite Rollins as the most important and influential tenor saxist around. Specific instances of his influence are rare, however, as it leads musicians to a quiet reappraisal of their work, rather than an imitation of his distinctive style. John Coltrane plays under his spell and now there are signs of it reaching out to Eddie "Lock-jaw" Davis. On his current album, Davis sounds like the connecting link between Coleman Hawkins and Rollins, cutting with emotional, if not quite historical, accuracy across the gap which separates the two colossi. This feat is accomplished most notably on *You Stepped Out Of A Dream*, *Old Devil Moon*, and *But Not For Me*. His regular organist, Shirley Scott, and drummer, Arthur



ESL Dust Bug

CONTROLS DISC DIRT



- ▶ Have you solved the problems of dust, lint, and static buildup on records and styli? More than 200,000 delighted users throughout the world have—with the ingenious **ESL Dust Bug**, which cleans the record as it is being played.
- ▶ As dust is always present in the air, it settles on records as fast as it can be removed. Any wiping of a record grinds dirt into the groove and also increases the charge of static electricity normally present, and attracts more and more dust to the record.
- ▶ No longer is it necessary to place fond hopes in inadequate or injurious attempts at cleaning records, such as liquids, sprays, brushes, cloths, and sponges.
- ▶ The **ESL Dust Bug** installs instantly on turntables or record changers, gently removing all dust and lint at the moment of playing, and reducing surface noise (especially evident on stereo discs).
- ▶ It prevents distortion caused by stylus clogging, and dramatically improves the sound of old records. Every point on a twelve-inch stereo or mono LP record is cleaned by the **Dust Bug** approximately one hundred times during a single play! The **Dust Bug** also minimizes static which would attract more dust. Only \$5.75, complete (record changer model only \$4.75), at your dealer's.



FOR LISTENING AT ITS BEST
**Electro-Sonic
Laboratories, Inc.**
Dept A • 35-54 36th Street
Long Island City 6, NY

Edgehill, are augmented by George Duvivier on bass. Stereo versions of both will be forthcoming.

Saka Acquaye: Gold Coast Saturday Night Elektra 167
The Drums Of Africa 20th Fox 3000

An opportunity to examine the music of Africa, both in traditional forms and their modern extensions, is offered on these albums. Before coming to the United States on a scholarship from the Pennsylvania Academy of Fine Arts, Saka Acquaye represented his native Ghana as hurdler at international meets and headed a dance band. In addition to winning prizes for sculpture here, he organized an eleven-piece African Ensemble, appearing in concert at Town Hall and elsewhere. Striking examples of the new "high life" music, which originated in the nightclubs of Accra and spread from the capital city to other parts of the continent, are conveyed on the calypso *Concomba*, *Saturday Night*, and *Bus Conductor*. Other numbers are popular or serious adaptations of folk themes or work songs. By American standards, the rhythm section is exceptional and the drumming always attracts. Of the instrumentalists, the leader is most competent and plays beautiful flute passages, but his mastery of the tenor sax is less evident.

One reason given for the rise of jazz in New Orleans is the number of military instruments abandoned in pawnshops after the Civil War. If UNESCO or some other cultural agency could find ways to send a few Army surplus clarinets and trombones to the new republic, they might help the local musicians considerably.

Recent films have displayed the colorful ceremonial dances and tribal drumming of the Watutsi, from the Lake Kiva area of the Belgian Congo. Their fierce challenge to the lion, with spears beating in rhythm to feet pounding the earth, is a dramatic experience. Prince Omaga and Princess Muana chant love ballads or native melodies. Notes describe the dozen items, but fail to reveal who made the recording. The excellent sound bears all the earmarks of something a film company made on the scene and filed away for possible use on a sound track. If so, more field recording should be made under such auspices.

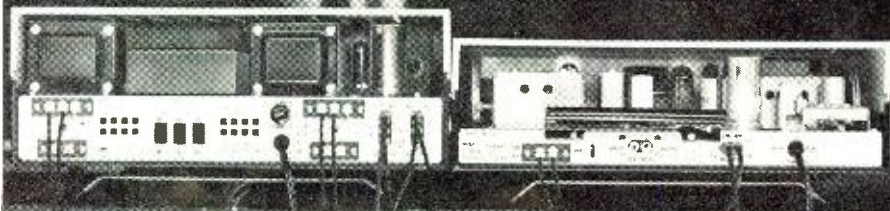
Glenn Miller: For The Very First Time RCA Victor LPM6100

When Glenn Miller and his orchestra broadcast three nights a week on the CBS network from 1940 to 1942, the programs were recorded on some 900 glass-base acetates. Although the inheritance tax appraisers regarded them as valueless, they were preserved as part of the Miller estate. Some were reclaimed to be used in two volumes of limited editions, giving much satisfaction to his numerous fans. Reposing on the three LP's enclosed in this sumptuous folio album, complete with an appreciation by Richard Gehman and a history of the band, are all the other selections worth salvaging.

To edit the material, Fred Reynolds spent two weeks listening to playbacks, checking off titles duplicated in the studio and available in better form for reissue. The useable remainder was transferred to tapes and Mickey Crofford went to work on the sound. To bring it up to the broadcast quality of the period was quite a task. The acetates were manufactured for about a dozen plays and not meant to be stored more than a decade. If you detect tape splices, remember that a side often ended in the middle of a number and there was a slim chance of the next side picking up at the same bar and volume level. But where the average radio set added distortion of its own, especially at high volume settings, the resulting sound on the LP's will not increase in distortion at any level.

Miller put a great deal of thought into the broadcasts, and Reynolds follows his format closely. Medleys account for many of the fifty titles, and the leader is heard introducing the voices of Marion Hutton, Tex Bencke, Ray Eberle, and The Modernaires. During some of the pop tunes, Miller's heart is obviously on the golf course, but he returns to form on *Blues In The Night*, *Rockin' Chair*,

His Glow Comes From An Investment Well Made



EXCITED, CONFIDENT, PROUD. He started his stereo system with the Bogen DB230A Stereo Control Center and ST662 Stereo Tuner. He's set for the future.

The choice was easy...once all the facts were in. First, he learned that Bogen has the experience. That's because Bogen has a larger engineering staff...has made more sound equipment than any other hi-fi manufacturer.

Next, he compared prices. Found out he'd have to pay as much as \$50 more for components with power, sensitivity and versatility to compare with Bogen's.

Then he listened. Incomparable!

Finally, the most exacting test of all... his wife's opinion. Not only did wife like Bogen's clean styling, she was amazed to discover how easy it is to use the complete, yet uncomplicated controls.

That did it. Our friend took the DB230A and ST662 home with him. The glow hasn't worn off.

And it won't for you, either. Get the Bogen glow today...at your hi-fi dealer.

Write for information to:
BOGEN-PRESTO CO., Paramus, N. J.
 A Division of the Siegler Corporation



The Bogen DB230A



DB230A. Output Power: 60 watts (two 30-watt channels). Distortion: less than 1% at 60 watts. Response: 20 to 20,000 cycles ± 0.5 db. Controls: Input Selector, Loudness, Lo Filter, Hi Filter, Stereo-Monophonic, Balance, Power, Phasing, Cartridge (Stereo, Mono), Speaker Selector and separate Bass, Treble and Volume for each channel. Price: \$189.50. Enclosure and legs: \$8.00. **ST662.** Companion Stereo FM-AM Tuner with built-in provision for Multiplex. \$189.50.

Memphis Blues, and *Solitude*. The set will wear best at a dancing party and there is nostalgia aplenty for his countless followers.

Herbert Pilhofer: Music With The Modern Touch
Audiophile AP61

In order to circumvent any association with progressive jazz, apparently believing the words to be incompatible, E. D. Nunn exercise his prerogative as company head and avoids mentioning jazz at all on this album liner. Although preferring to note that the interpretations "suggest the European touch," he must hold a grudging admiration for Herbert Pilhofer's work in order to record it so well. The young German pianist came to this country in 1954, settling at the University of Minnesota where he is a staff member. His group makes a Minneapolis night club its headquarters and appears in concert each summer at the Walker Art Center. The present nucleus is a trio, boasting an exceptional bassist in Stuart Anderson, and a guitarist, Dale Olinger, who for sensitivity can only be compared to Charlie Byrd. Besides playing melodic improvised passages, he varies conventional rhythms by a drumlike beat ticked off on muted strings and striking unison effects with bass or piano. It is most effective on Don Specht's *Monk' Cloth*. Seven selections range from a Werner Heider canon, to Duke Jordan's *Jordu*, and Thelonious Monk's *Round About Midnight*.

When arranging for a nonet, the leader explores the possibilities of instrumentation even further, also playing celesta. There is fertile interplay between David Karr, flute, and Robert Crea, bass clarinet, on *I'm Beginning To See The Light*. Jack Coan, trumpet, has a fine open solo on *You're My Thrill*. Paul Binstock, French horn, and Stanley Hauge-sag, trombone, blend well and add to the depth of sound, as does the placement of Robert Pope's drums. The influence of Monk, everywhere present to some degree, returns on *Bemsha Swing*. The composer should hear this treatment before his next Town Hall

concert. Some of Pilhofer's ideas would fail to swing without considerable rehearsal, but his group smoothed out any uncertainties before recording. They blow a fresh breeze through their chosen area of modern music, call it what you will, and the recorded sound is bright and dynamic. Should Pilhofer write a concert piece for Doc Evans' cornet, perhaps his engineer will be won over completely.

A Concert With Hillel And Aviva
Elektra 171

The Tarriers: Hard Travelin'
United Artists UAL4033

Folk singers are fortunate in their ability to resist pressures that would force them into rigid molds. Perhaps they are aware of what happens when a small but influential clique persuades a jazz artist to discard the elements which make him an entertainer. The performers engaged on these albums, at least, are venturesome in choosing material and use it with originality and wit. Recorded in concert at New York's Town Hall last March, Hillel and Aviva combine the old and the new in a stimulating mixture. As most of the fourteen songs are from Israel, they are accustomed to a music that is vital and growing, yet steeped in tradition. On turning to English, they are well equipped to bring a youthful freshness to the ancient tale of Joshua's providential victory at Jericho. And an account of a poultry farmer's solution to his troubles, one of the funniest songs ever recorded, causes the audience to roar with laughter. They accompany themselves with Hillel's shepherd's pipe and Aviva's Miriam drum, supported by Anatoly Malukoff, guitar, and Bracha on drums.

The Tarriers never hesitate to refashion a song to fit the special needs of the group and are determined to get the most out of each one. A lively enthusiasm leaves little room for anything static in their concept, and the dozen arrangements used here may

sound different the next time out. Erik Darling, who turns up at many such fests, is on banjo, while Bob Carey and Clarence Cooper play guitar. Besides the harder side of life, they consider *Love Oh Love, Darlin'*, and *Hush Little Baby*. Bassist Chet Amsterdam and drummer Charlie Persip are in attendance.

Stuff Smith: Sweet Swingin' Stuff
20th Fox 3008

Florika Sava: The Mad Gypsy
Capitol T10139

Ever wondered about the violinists who used to prepare silent movie stars for emotional scenes? Well, here are two who can do the job without half trying. Always unpredictable, Stuff Smith stretches his flair for the unexpected over into the domain of mood music. Words are superfluous when he describes the pathos of *A Bird in a Gilded Cage*, *Hearts and Flowers*, and *O Promise Me*. Now that smellovision is in the wind, perhaps this label's parent company is getting ready to pull a switch and try a film without spoken dialogue. His voice is ir-repressible, however, and gives needed spice to the bland material. John Letman's muted trumpet adds a dash of pepper, and the rhythm section of Jimmy Jones, George Duvi-vier and Denzil Best is well seasoned. When Smith had a stand opposite Louis Prima on 52nd Street, his was the noisier side. After this, Prima may respond with lullabies.

Florika Sava departed his native Rumania for Istanbul in 1940, moving on to Buenos Aires after the war. There he combined the sweep of the pampas with his already fiery melodies, making him easily the wildest of the gypsy fiddlers. Both he and Smith, when most daring, are willing to try the seemingly impossible and, more often than not, achieve it. He leads his ensemble on a dozen tunes, many traditional Romany airs, while others are as current as *To Zsa Zsa*.

AE

INTEGRITY IN MUSIC...

PR-500 MANUAL TURNTABLE AND TONE ARM FOR STEREO AND MONAURAL USE

SIZE: 14 3/4" wide, 14 3/4" deep (including arm overhang) and 2 7/8" above and 2 1/8" below mounting plate.

COLOR: Black and brushed chrome.

PRICE: \$69.95 (Audiophile Net, Zone I).

STEREO MULTIPLEXING AND MATRIXING

(from page 30)

variety of recorded material, that should have proved their proponent's contentions applicable to any kind of program technique. But there is at least an equal variety of loudspeaker types, methods of arrangement, and types of listening room. How many have *also* conducted extensive tests in this area?

Probably millions of people, on single channel hi-fi, could not tell the difference when frequencies above 8000 cps (or even 6000 cps!) are removed or left in. But there are also many discerning enthusiasts who would immediately notice this difference. It is largely a matter of listening education. But because of these differences, various test groups would lead to varying results and conclusions.

There are many contributing reasons why all the tests quoted may be quite truthful *against their own*, often unstated, *terms of reference*, and yet apparently contradict other equally truthful results, because neither presents the whole story.

Prospects

There is a sense of urgency about the whole thing. The high fidelity industry wants to get stereo "on the road" and right now radio is a "hole," or weak spot. Availability of radio as a stereo source would help sell stereo as an entity to the public. The FM operators and

multiplex manufacturers want to see a decision because meanwhile everyone is waiting to see "which way the cat jumps."

However, the fact is that there is as yet insufficient evidence on which to base a decision, in either area. The FCC needs answers as to the practicability of putting however many channels on one carrier they may ultimately decide to allow. Radio is still a public medium, and all interests must be properly protected. As yet there is insufficient data.

Just what stress will go to the importance of maintaining potential fidelity of future stereo transmission remains to be seen. But I feel that stereo is only just beginning, and that efforts so far will be judged as crude by tomorrow's standards. Not only will it be possible to transcribe better fidelity on two channels, but new techniques will emerge, enabling the two channels to contribute to an overall result with much better precision. In consequence, differences which are today observed as indistinguishable may become important tomorrow.

So I cannot advocate the built-in quality limitation of Calbest, which may not be discernable today, but may become very important tomorrow. The intentional quality difference of the original Halstead system has already been aban-

doned, so I need say no more about it. Both the Burden and Bell systems (if the latter should be so applied) are methods of maintaining compatibility with a system (AM/FM) where quality was inherently different anyhow. This may aid the transition, but I also feel there is a danger that commitment to such a system as standard will restrict the possible future of stereo.

Work in other areas, both with recording media and speaker development, suggests the stereo of the future may utilize channels that are basically "mono" and "stereo," rather than "left" and "right." From this viewpoint, I cannot help feeling that the Crosby system is compatible with the "stereo of the future."

But, much as many would like to see an early decision, I do not think we can expect one, nor would it be good to have on, in the long run. The analogy with the decision on color TV is often mentioned, from various angles. Maybe it's a good one too, if we don't try to apply it in detail: at the time, the decision seemed long in coming; but how far has color TV progressed since? It can hardly claim widespread acceptance. The FCC should not be pressured into an early decision, but will, we hope, wait until sufficient facts are available for a clear-cut decision. Æ

NEW SINGLE-SPEED MANUAL TURNTABLE BY STROMBERG-CARLSON

From the same engineers who created the widely acclaimed "Perfectempo" turntable comes a revolutionary new concept in turntable design: a dual-drive system consisting of two hysteresis-synchronous motors, operating in tandem through one belt drive!

Motors are spaced exactly 180° apart. Any variations in speed are automatically compensated for by the interaction of the motors and impregnated belt. Rumble and noise are virtually eliminated by the belt drive and unique double-acting suspension system.

Complete with tone arm, pin plugs, A.C. cord, wired for stereo, ready to use.

Your dealer is listed in the Yellow Pages. Or write for complete information.

"There is nothing finer than a Stromberg-Carlson"

STROMBERG-CARLSON
A DIVISION OF **GENERAL DYNAMICS**

1418 N. GOODMAN STREET • ROCHESTER 3, NEW YORK

Your best single source of matched components for complete systems—Stromberg-Carlson. These tuners are typical of the line.



AM-442 AM Tuner



FM-443 FM Tuner



SR-445 AM-FM Stereo Tuner

AUDIO ETC.

(from page 14)

ting the record onto the changing post and pushing the start button, is seldom an out-and-out pleasure. Just a nuisance, and the wait for the cycle to complete itself and the music to start can seem exasperatingly long—especially when the arm returns placidly to its rest position, instead of settling onto the record, or whips into the ten-inch or seven-inch location. It shouldn't do these things but somehow, it often does.

Nevertheless, the automatic start, when it works, insures a clean beginning and an undamaged groove and pickup. What we need, I think, is a simpler one, much faster working, minus the fancy cycling motions of the full-scale changer. Push the button and the music should begin, say, within three or four seconds. That would do it. With such an automatic starter and with the standard, time-proved automatic stop, a manual record player really has 99 per cent of the advantages of a changer. No wonder the changer manufacturers now like to boast of their changers as manual players too.

Dual 1006

The Dual 1006, which I've been using on and off for the last month or so, is a good example, as they say, of recent trends. This changer is German and shares some of the conventions usual in that country with the long-familiar Miracord line—the same push-button controls, including STOP, START and that cryptically spelled REPET—which might be either bad English or good German, for all I know. (*Actually the abbreviation for REPETITIVE operation.* Ed.)

There's the same pair of removeable spindles, a long one for changing and a short one for "manual" operation; the Dual and Miracord also share the absence of overhead arms or platforms—the records are supported for changing entirely by the center spindle's small protuberances. Clearly, both of these machines come from a common tradition of changer thinking.

Refinements in changers are now to be classed as small and large. Small refinements are involved in such crucial matters as arm mass and freedom of movement, rumble and the like in motors, smoothness of the whole drive mechanism, gentleness in the treatment of the stylus and the record. I say "small" because refinements in these areas are physically on a delicate plane, often quite invisible to the eye.

These smaller refinements are by far the most important, given stereo and our new standards for stylus force and all the rest; but they don't show up very dramatically on casual trial—they are negative in effect. If the machine *works*; if it changes, plays, is reasonably rumble-free (and especially, if the rumble ratio between mono, or lateral-only, playing and stereo, or lateral-vertical, playing is acceptable), if it skips no grooves, leaves records and stylus undamaged, drops, lifts, turns on and turns off correctly and in the right place at the right time, in spite of featherweight arm and feather-free bearings, then the machine benefits from optimum "small" improvement. Lack of these minute but crucial adjustments in design makes many an older changer useless for today's stereo, even with four-wire stereo harness, new cartridge and every modernization you can think of.

By "large" refinements I mean those dramatic new methods of operation that really make a changer look and act new, right off. They are good for sales, and usually useful as well, though the small

things are really far more important. The GS 77 changer, for example, stops its table dead during the entire change cycle, picking up speed after the stylus is lowered to the record; the cycle itself is fixed in speed, independent of the four playing speeds. Two good ideas, both on a relatively large scale—call them macro-improvements. The Dual changer has comparable features, though somewhat different in detail.

Dual's change cycle is also independent of playing speed, but the table keeps turning—not, however, at the speed setting indicated by the records you are playing. As the change cycle begins the table suddenly lets go and turns at 45 rpm. On LP and 16 it speeds up; at 78 it slows down. This is an odd thing to watch—and, indeed, the Dual's actions are startling to the eye in a number of interesting ways. Looks as if the table had suddenly gone out of control, as it speeds up and begins churning around wildly, while the record drops! But the system works beautifully: the proper speed is resumed in plenty of time for the music to begin (if it didn't there'd be some dreadful sounds!) and all is just dandy.

Reminds me of my first LP-speed changers, which changed so slowly (having been geared for the old 78's—that in exasperation I used to throw the speed switch up to 78 to hurry things up. Dual does it for you, automatically.

But the most startling thing about the Dual changer is the unique "feeler" mechanism, which tells the stylus where to drop for any size record, standard and all sizes in between. It presents the most amazing psychological hazards, purely visual, that I have yet encountered—but it works, and has been working entirely satisfactorily for me to date without the slightest damage to records and stylus.

The psychological hazard is in the extraordinary arm motions that takes place

INTEGRITY IN MUSIC...

PR-499 MANUAL TURNTABLE FOR STEREO AND MONAURAL USE—
Recommended by a leading consumer Research Organization.

when this machine goes into its change cycle. The first time I saw them, I couldn't believe my eyes. Here's what you seem to see:

Push the START button and the arm lifts off its rest, swings quickly out over the inner record grooves and proceeds to drop all the way down onto the disc with a thump—then it drags itself straight across the entire surface sidewise, out to the edge, where it proceeds to fall off. Your eyes are quite right—it *does* ride on the record grooves. If you are able to watch this far without flinching, you'll then see the arm rise up nonchalantly once again, move serenely over to the first groove and lower itself piously and gently at the correct spot, meek as a lamb. Crazy.

The first time I saw this, unforeshadowed, I grabbed the arm off the record and swore! One disc ruined, I thought. But what actually happens, what really goes on, is an ingenious new device that is more practical than it sounds. The arm doesn't scrape the stylus over the record at all; instead, there is a tiny wheel, canted a bit, which rides lightly over the tops of the grooves and steers the arm back to the edge, where it falls off—onto another, which sends in a figurative message to the changer's mechanical brain, saying, here is the spot where the arm must come down. It is the spot too—without fail. Can't go wrong, no matter what the size, unless maybe you have an elliptical record to play.

Once all this is taken care of, things retract and when the arm comes down the next time, rightly positioned, the stylus is finally exposed, to play the grooves.

I admit it sounds zany, but I can't really find anything too seriously wrong with the system, once you get used to the psychological hazards involved in watching it. Remember that this system operates with

an extremely light arm, designed to track at from 2 to 4 grams or so. The small wheel does not "scrape" the record surface; it rolls on it; and I have so far been unable to find any trace of a mark where it passed. The "fall-off" principle is infallible, since it measures every record impartially for size without preconceived notions, and this is clearly a good idea, other things being satisfactory.

I do have two suggestions, though. First, in my Dual, the arm definitely drops too suddenly onto the record surface and onto the small wheel—it bounces, and oscillates as it rides back towards the edge. No harm done, but a more gentle descent—easily managed, I think—would add a safety margin and make for better visual appearance. I hear rumors that this has already been taken care of in later production.

The other suggestion is simply that there is an inherent difficulty here worth a thought, well understood by the makers and amply provided for, but still a difficulty. The small wheels on the arm require the stylus to be placed with extreme accuracy, within a very small vertical tolerance. If it extends a fraction of a millimeter too far down, there will in truth be a catastrophic squawk when it gets dragged over the record!

Once correctly mounted, there is absolutely no way in which further trouble can occur, and the Dual's designers have provided all that is needed to get things right the first time. Nevertheless, caution is advised, and you will find that one or two cartridge models cannot be used at all in the Dual, as now manufactured. My Pickering fits to a T and works to perfection.

What else? The Dual is absolutely silent in use; the motor is so quiet you must put your ear to the table to hear it. Rumble and pitch steadiness are absent and ex-

cellent, respectively—very good for a changer. The machine is small, compact, without fancy arms and legs and extensions; with the smaller spindle in place it looks altogether like a manual player—nothing protrudes higher than a couple of inches. Good. There is automatic retracting of the drive and, for double safety, a neutral position on the speed shift. (Indeed, once in awhile my Dual goes into neutral at the beginning of a record when it ought to be playing. That's efficiency for you.)

Manual Playing

The best features of the Dual, for my listening, are its excellent "manual-play" facilities, which are more serviceably "manual," more flexibly "automatic" than any changer I've tried before. It will do more things that please me, plays fewer nasty tricks on me, than any "changer" so far. (Excuse the quotes—it's getting so that one can't be sure when a changer is a "changer," and that is all to the good.)

The Dual, in its alternative "manual" operation (with short spindle inserted) gives you a sensible and useful choice at all times between semi-automatic and strictly manual operation. You can do it either way, without adjustments. To start it you may press the regular START button and the machine goes through its usual cycle (as above) and plays the record. Or you may lift the arm manually by its "wing" lift (not far enough from the record surface for fat fingers to get hold of, but OK for my medium-gauge ones), flip a little white slider marked MANUAL and the record turns. Replace the arm on its rest by hand at any point and the table stops, via one of those microswitches mounted in the arm rest. Entirely manual, you see.

"PERFECTEMPO" MANUAL TURN-TABLE BY STROMBERG-CARLSON

The contribution of the "Perfectempo" by Stromberg-Carlson to your high fidelity system is professional performance with complete versatility.

This turntable incorporates every valid, time-proven design principle: belt drive, stroboscopic speed indicator, high-tolerance precision machining, weighted table, high-quality precision motor—plus Stromberg-Carlson's own unique and original double-acting motor and table suspension system that effectively isolates the table and arm from all unwanted, extraneous noise.

Your dealer is listed in the Yellow Pages. Or write for complete information.

SPECIFICATIONS

SIZE: 15 3/4" wide, 14 5/8" deep, 5 1/2" below and 2" above mounting plate (not including tone arm).

COLOR: Morocco red with aluminum trim.

SPEED: 14 to 80 RPM.

WOW: 0.14% rms.

FLUTTER: 0.09% rms.

RUMBLE: -55 db re 20 cm/sec (1 1 kc).

PRICE: \$99.95 (Audiophile Net, Zone 1).

Hardwood base (PB-497) available.

"There is nothing finer than a Stromberg-Carlson"

STROMBERG-CARLSON
A DIVISION OF **GENERAL DYNAMICS**

1418 N. GOODMAN STREET • ROCHESTER 3, NEW YORK

Your best single source of matched components for complete systems—Stromberg-Carlson. These tuners are typical of the line.



RA-498 Tone Arm



SR-440 AM-FM Tuner

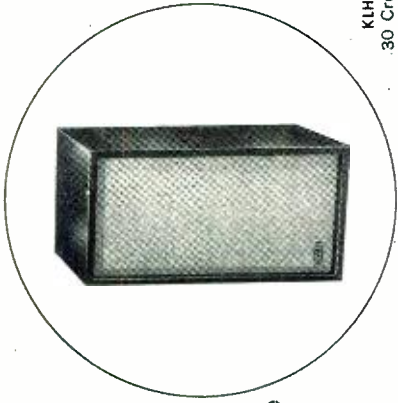


ASR-444 "Stereo 60" Amplifier

incomparable

KLH

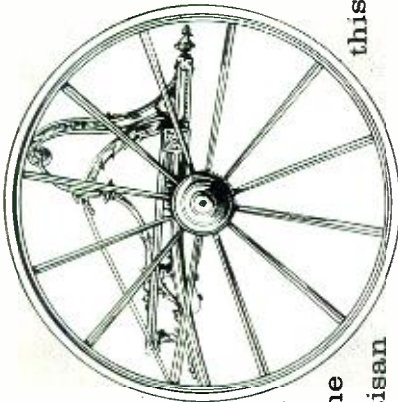
KLH Research & Development Corp.
30 Cross Street - Cambridge, Mass.



the

is

this...



artisan

the influence

of

imagination

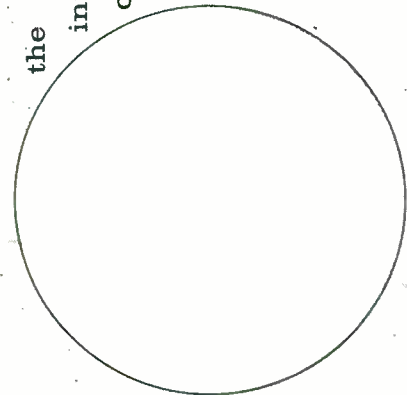
...the

skill

of

the

influence



ADDRESS DEPT. S119 FOR COMPLETE INFORMATION ABOUT THE MODEL SIX.

The best thing is that you can put the arm down in any groove right up to the final one and the music will play—the automatic trip does not snatch the arm rudely out of your hands, as in so many changers in the past. This has long been one of my pet changer beefs. Now, *enfin*, I am satisfied. Yep, the trip does work, when the stylus reaches the lead-out grooves, eccentric or non-eccentric. The arm then—and only then—returns to its rest position. Now that's what I call real manual automation.

You can use the automatic STOP button alternatively, if you want, to shut the thing off in the middle of a record. The cycling goes through in its usual form (with a few more of those visually odd spasmodic heavings that are typically Dual, as though the arm couldn't make up its mind; it does of course—the effect again is purely visual). Or you may just lift the arm off the record and set it on its rest. Either way works, and the machine doesn't mind a bit which way you do it. Even the REPEAT button can be used; push it down and at the end of the record the cycle will begin the same side again, automatically. (The REPEAT cancels if you push one of the other buttons.)

There you have it. Uh, Oh yes . . . I forgot a couple of dozen details, like, for instance, that this is a stereo changer, complete with a four-wire system (*how* could I forget that . . .) the cartridge holder lets the cartridge out with a quarter-turn of a little top lever—very neat—and there is a mono-stereo switch (paralleling the two sides of the cartridge for mono playing) that is *not* placed underneath the turning record, but out in a good spot at the arm pivot, marked with a single circle for mono and two linked circles for stereo. (You have to use your imagination on that.)

Ah yes . . . there's a built-in stylus force gauge, too, a little red hook next to the arm rest that operates a pointer on a dial below. Does it read correctly? I wouldn't know; I didn't bother to try. (But you'd better.) I'm getting so my finger, lifting the stylus by its point, is a fairly good indicator of proper stylus force, or weight, anyhow. (Not pressure; the styli don't usually stick out far enough to hurt your finger in proportion to actual point pressure and, anyhow, my skin is too tough.) Still . . . a stylus force gauge right at the spot where it counts is a *very* good idea—if it reads right. **AE**

TAPE GUIDE

(from page 38)

within the tape machine. In one position of the A-B switch, the tuner signal is routed to the control amplifier; in the other position, the playback signal from the tape machine is fed to the control amplifier.

Figure 11 shows a hybrid arrangement. The playback signal from the tape machine may be fed to the control amplifier in the same manner as other high-level signals, if desired. Then the signal enters the amplifier at an early stage and is subject to the frequency-shaping controls, which is desirable when playing a previously recorded tape. On the other hand, if one is in the process of recording, say, the tuner signal onto tape and wishes to hear the tape playback signal for comparison with the tuner signal, it would be necessary to set the play-monitor switch to the tape position; this introduces the tape playback signal at a late stage, after the tuner signal has been fed to the tape recorder.

Summary

The foregoing discussion has indicated that the control amplifiers and integrated amplifiers on the market employ various means of feeding a signal to the tape machine and of accepting a signal from the machine. Also, the tape ma-

chines vary in their signal switching facilities. Therefore, when incorporating a tape machine into an audio system, it is necessary to take into consideration the characteristics of both in order to be certain that the two are compatible with each other and satisfy the needs of the owner. Otherwise it may happen that the operator finds himself having to connect and disconnect cables every time he switches between the recording and playback modes.

Physical Installation

Most tape machines in home use are designed to be portable. In the process of installing a tape machine in the audio system it may be wise to do so in a manner that facilitates removal of the unit from its normal location in case it is desired to record or play back at other sites.

Whether or not portability is a consideration, the tape machine should be readily accessible for servicing and adjustment. Proper maintenance requires getting into the transport mechanism periodically to clean and lubricate parts, as well as to make minor adjustments. If the unit is "buried" in a cabinet in a way that makes access arduous, maintenance is likely to be neglected. **AE**

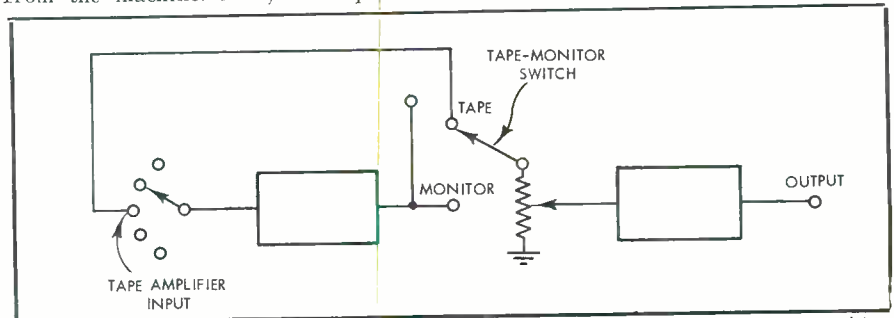
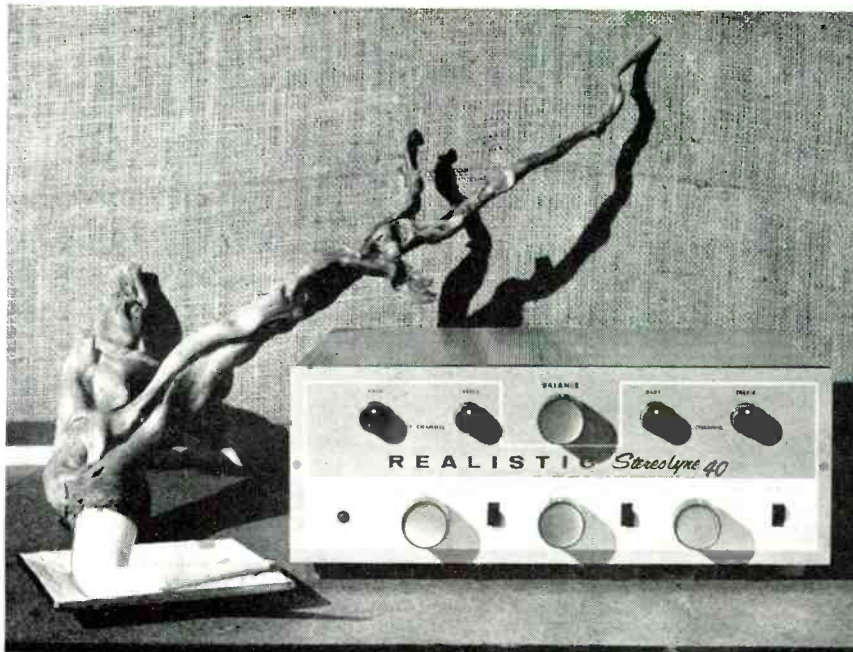


Fig. 11. Hybrid arrangement for accepting the playback signal from a tape machine.



LOWEST PRICE EVER

FOR A **40-watt** **\$79⁵⁰** **STEREO AMPLIFIER!** \$8 DOWN \$7 MONTHLY INCLUDING CABINET

\$50 TO \$90 LESS THAN COMPARABLE QUALITY UNITS

REALISTIC STEREOLYNE-40 AMPLIFIER Only REALISTIC could bring you this sensational value! Our buyers shopped the entire market. Our engineers made comparison test after test. All agree the REALISTIC-40 delivers more watts per dollar than any other stereo amplifier on the market today! Note that it's not a kit . . . the REALISTIC-40 is completely wired, and this amazing low price includes the cabinet . . . there's nothing else to buy! Read the specs. You'll agree it's one more reason why REALISTIC is America's best buy in HI-FI!

SPECIFICATIONS and FEATURES: Two 20-watt stereo channels or 40-watts monaural; 80-watts total peak audio output. Frequency Response: 20-20,000 cps ± 1 db. Feedback: 20 db Less than 1% total R.M.S. Harmonic distortion at 400 cps. Hum Level: -59 db on phono and tape head inputs; -79 db on tuner input. Controls: individual bass and treble controls for each channel; balance control and phasing switch; single volume control adjusts both channels simultaneously; separate loudness control; AC accessory outlet. Inputs: Tuner, Stereo Phono, Stereo Tape Head. Outputs: 4/8/16 ohms and Tape Recorder. 117 VAC, 50/60 cycles. Size: 12" W x 4 1/8" H x 9 1/16" D. Custom-styled gold, maroon and white metal cabinet.

REALISTIC... *America's* **BEST BUY in HI-FI!**



STEREO AND MONAURAL AMPLIFIERS



AM-FM AND FM TUNERS



TURNTABLES AND CHANGERS



THE FAMOUS ELECTROSTAT-3 TWEETER



SPEAKERS AND SPEAKER SYSTEMS

PLUS a complete line of audio accessories at "maker-to-you" prices.

FREE!



12 MONTHS SUBSCRIPTION TO BARGAIN BULLETINS

Page-after-page, month-after-month. Exclusive bargains in HI-FI, AMATEUR RADIO, LP RECORDS, POWER TOOLS, OPTICAL GOODS and TEST EQUIPMENT. Write today.

COMPLETE GUIDE TO ELECTRONIC PARTS BUYING

250 pages, 8 1/2 x 11, illustrated handbook. Articles, engineering data, plus buying guide. Over 30,000 items. Available Sept. 1



35c

FILL IN — CLIP — MAIL TODAY

RADIO SHACK CORPORATION, Dept. 9H, 730 COMMONWEALTH AVENUE, BOSTON 17, MASS.

Please Send me:

- Bargain Bulletins for 1 year FREE! 1960 Guide to Electronic Buying 35¢

Quan.	Color	ITEM	SHP. WT.	ORDER #	SALE
		REALISTIC-40 AMPLIFIER*	22 lbs.	90LX023	\$79.50

- Check Money Order C.O.D. *Shipped by express only

NAME _____

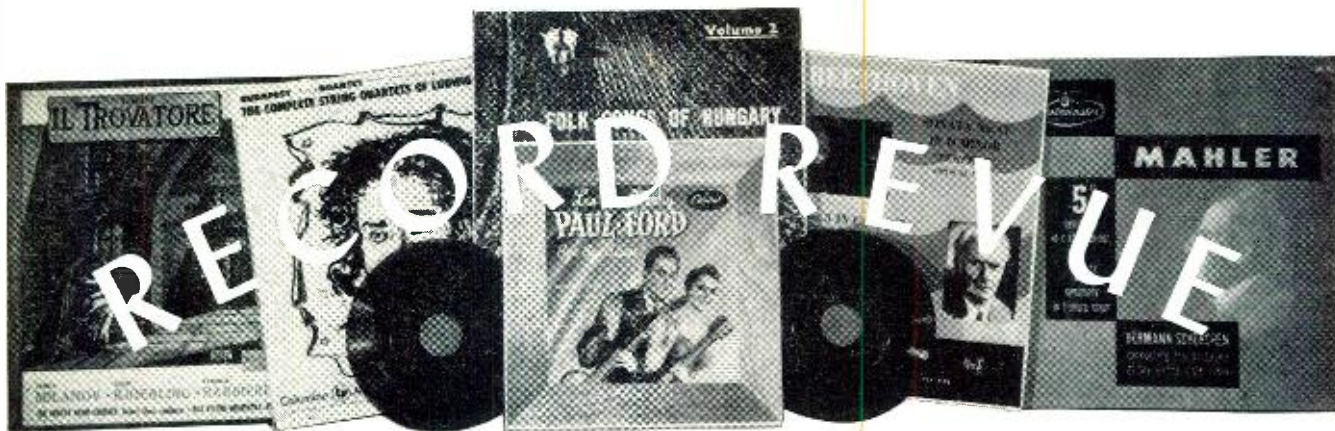
ADDRESS _____

CITY _____ ZONE _____ STATE _____

RADIO SHACK CORPORATION



167 WASHINGTON STREET, BOSTON 8, MASS.
730 COMMONWEALTH AVENUE, BOSTON 17, MASS.
230-234 CROWN STREET, NEW HAVEN 10, CONN.



EDWARD TATNALL CANBY*

Summer is a parlous time in the record reviewing world. In audio itself, nobody's at home in summer—everybody and his brother are on vacation and unavailable, just when you (I) want desperately to get the latest gossip for the big fall issues of our magazine.

In records its the other way 'round. I'm the one who has to get a bit of a vacation from listening—and right, plumb in the middle of it, out come all the fall records, by the hundreds, not to mention most of the Xmas Specials, wreathed in holly. Ugh.

Thus I'm admittedly a bit behind, this month; the following are mostly chosen from the huge piles of interesting material that were on hand for me to sample before the fall rush even began. No great matter—they're still fine records, and by next month I will have ploughed through the huge new pile of autumn releases, including a whopping batch of Telefunken stereos at \$2.98, via London. Better look at those soon; I'll be in the midst of them next month, to help you. *E. T. C.*

1. SPECIALTIES

Brahms: Piano Sonata in F, Op. 5, Intermezzo, Op. 117. Geza Anda.

Angel 35626.

The young Brahms was an interesting character, not nearly well enough known today in contrast to the crotchety old man with the beard. Brahms in his late years. The youngster, aged 20 or so, was blond of hair and beardless with blue eyes and a strong face; he was an earnest modernist of that day, the early 1850's—which meant that he wrote loud, sincere, brash, impressively Romantic music that made his piano shout and roar. Schumann immediately spotted him as a coming genius, raved over his music, called it "veiled symphonies"; in short order, Brahms was writing in a Schumann style, but more extrovert, headier, stronger.

The third of these early sonatas, part of it written after the meeting with Schumann, Anda plays here with remarkably sound styling. This is a big, solemn, grand performance of music that surely seemed big, solemn, and grand to Brahms himself, the young stalwart. It should sound that way, even though its content is often windy, its expression youthfully overblown. No use apologizing for it, as some do in the playing; no use modernizing it into a furious frenzy, as others do, trying hard to make more of the music than is in its nature. The best thing is to play it as young Brahms must have felt it, his newest, most advanced, biggest piano work to date.

Anda seems to be a natural Brahms player—which is mighty unusual these days. Some of his earlier recording of other composers seemed to me hard and unmusical; the only possible criticism here, on the score of musicianship, is a certain blurring with the pedal that occasionally smears the harmonies.

* 780 Greenwich St., New York 14, N. Y.

The three wise, restrained Intermezzi, from the end of Brahms' life, are played with equal perception and style—they seldom sound better. Late Brahms fares as well as early.

The recording is technically one of the finest examples of piano sound I've heard, big, natural, unforced and well balanced with sharp, clean transients and fine bass, clear treble. It's an excellent demonstration disc.

Shostakovich: Piano Concerto #2. Ravel: Piano Concerto in G. Leonard Bernstein, N. Y. Philharmonic.

Columbia MS 6043 stereo

This seems to me very much Bernstein's meat, both sides of the disc—in different ways. He plays and conducts both ways.

The Shostakovich is one of his lighter, brassier pieces of recent days (1957) in which Bernstein's best dry-style pianism comes nicely to the fore. Shostakovich is not personally at all like Bernstein, but his musical expression is within that modern, slightly dry, almost classically wry sort of restraint that is Bernstein's best natural expression—even in his popular music. I enjoyed the Shostakovich no end here, whereas some of the more bloated pieces for orchestra alone I find pretty heavy going.

As for Ravel, the exquisitely expressive G major piano concerto, actually his second (the other is for left hand alone and so doesn't quite rank), is out of Ravel's American Gershwin period, yet it is also full of the familiar Ravel old-world elegance, of the "Mother Goose" suite, the "Pavane for a Dead Princess" and the like.

Ravel was always a curious and explosive mixture of sensitively felt opposites, of violence and good breeding, elegance and hysteria. He was enormously impressed both by America and by Gershwin and if you'll listen, you'll spot Gershwin everywhere in this music. Bernstein is a natural to express the bitter-sweet, almost enviously beautiful Ravel "jazz"—so elegant, yet so explosive, too. Ravel envied Gershwin's untutored freedom and directness, as Gershwin admired Ravel's incomparable, incredibly polished technique; neither could match the other, both recognized the priceless values in the other's work.

All this is wonderfully evident in the first and last movements of the Concerto, which Bernstein plays in his most effectively jazzy classical style—just the right combination for him. But something goes wrong in the elegant, wistful slow movement with its long and faintly blues-like tune for the piano. It should pulse steadily and evenly; Bernstein suddenly goes off on one of his (to my mind) unfortunate Romantic jags—he plays this melody like so much Chopin, full of *rubato*—slows-down, unevenness—and I find it dimly false in effect, inconsistent with the rest of the interpretation.

But the outer movements, the fast ones, are unbeatable. Every other performance that I can remember treats these movements in purely European fashion without so much as a thought, as strictly "classical" music—only Bernstein understands the deeper Gershwin implications and gives the music the greater

dignity and elegance it gains through the expression of its American feeling. I say he's tops.

Stravinsky: Agon (ballet). Berg: Three Pieces for Orch. Op. 6. Webern: Six Pieces for Orch. Op. 6. Sudwestdeutsches Orchester, Rosbad.

Westminster XWN 18807

As you may possibly have heard, old Stravinsky has taken over the "twelve-tone" technique for his own, lately (though, needless to say, in his own special way); here he is in one of the notable works of this new Stravinsky period, right along with the music of two of the original early twelve-tone men, main disciples of Schönberg himself. An interesting trio of works and though I don't pretend to be able to "explain" any one of them in orthodox twelve-tone theory, I still have ears and so have you; the music will interest you and no doubt about it.

Webern, the miniaturist, is the toughest of the early twelve-tone boys for us adults. But it is astonishing to discover that today, untutored teenagers with normal musical ears find him very much to their liking. I saw it happening recently. Six short sections, each a highly skilled patterning of abstract sound-building blocks, good for hi-fi as well as the musical-mathematical mind. Alban Berg, the incurable late-Romanticist among the early Twelve-toners, is noticeably more expressive in the old-fashioned manner—you'll find him the easiest, most likely.

As for Agon, it's a ballet, a "competition" among twelve dancers (*not* representing the 12 tones of the scale!) and though entirely abstract and plotless is a superbly integrated musical-ballet whole, quite easy to watch and hear simultaneously, as I found out recently at a New York performance. Farts of it are highly humorous, in a severe, Stravinskian way. It's dry in sound but fascinating in both rhythm and tone color and you won't need to think twice about the twelve-tone aspect. It tells its own story in musical terms, as all good music should do, I think.

A nice record for aural experimenting, if you're interested.

Rosetti: Concerto in E Flat for Two Horns. Dittersdorf: Concerto in D for Double Bass and Viola. Soloists, Copenhagen Symphony, Jenkins.

Hayden Society HS 9052

Newell Jenkins' characteristically bright, nervous style of conducting, in the resurrected works of the eighteenth century that are his specialty, carries over into this disc out of Denmark—he has conducted Italian and German orchestras and has his own American group in New York who give the annual Clarion Concerts. This record is a product of the newly resurrected Hayden Society, which has as many lives as a kitty cat. Don't know how many times it has been pronounced dead in the past—but it is definitely alive now, or was when this disc came forth.

(Continued on page 81)

from **McIntosh...**

PERFECTION in Stereo Control



Industrial design by George H. Kress Associates. • \$225 less cabinet

The **C 20**
COMPENSATOR
FOR
STEREO

Simplicity, flexibility, and beauty have been integrated by careful engineering and design in the McIntosh C-20 Stereo Compensator. The greatest listening pleasure in stereo or monophonic reproduction is assured as a result of over a year of careful and diligent research in the requirements of a new preamplifier designed for stereo. Full stereo flexibility has been provided plus built in protection for your investment in monophonic records. McIntosh has designed in the C-20 Stereo Compensator the necessary features required to give the finest monophonic reproduction the keenest listener may require.

Complete satisfaction is yours in monophonic and stereophonic with the McIntosh C-20 Stereo Compensator.

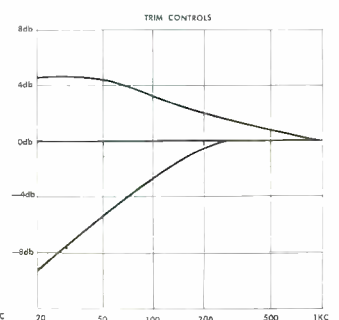
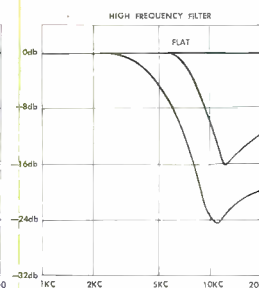
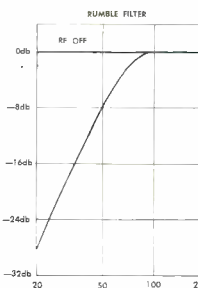
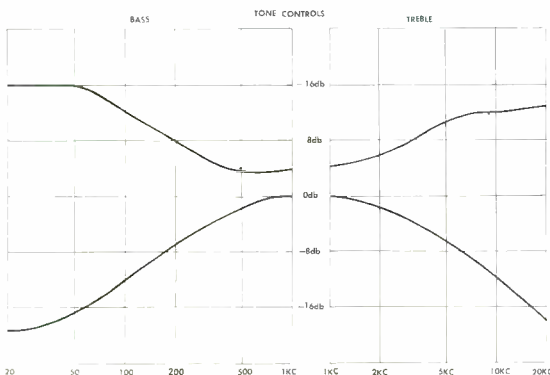
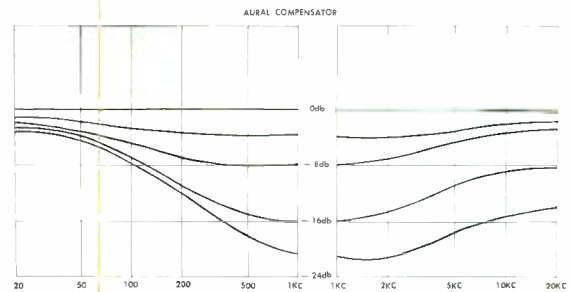
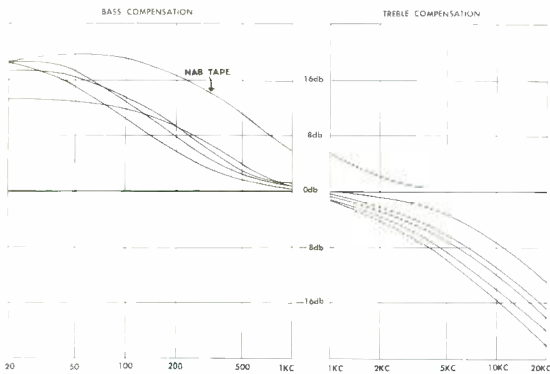
McIntosh... the Mark of Excellence

FACILITIES

- Mode Selector:** 6 positions including Stereo, Stereo Reverse, Left channel on left speaker only, Right channel on right speaker only, Left channel on both speakers, or Right channel on both speakers.
- Monophonic:** Internally parallels and decouples a stereo phono cartridge to offer best quality reproduction from monophonic records.
- Tone Controls:** Treble: boost 13 db at 20 KC attenuate 18 db at 20 KC
Bass: boost 16 db at 20 cycles attenuate 20 db at 20 cycles
- Trim Controls:** Separate channel back panel controls to balance the frequency response of the system independent of front panel controls.
- Equalization:** Separate bass and treble 6 position switches, including NAB tape and flat for any low level flat source.
- Aural Compensator:** Fletcher-Munsen compensation, continuously variable.
- Rumble Filter:** Rolloff to reject low frequency disturbances such as rumble.
- High Frequency Cutoff:** Two positions, 9 KC and 5 KC to suppress hiss and noise.
- Phase:** 180° phase reversal to phase speakers or source material.
- Balance:** Attenuates alternate sides of center 40 db each channel to balance for unequal source material.
- Tape:** Front panel jacks, push button controlled, to permit the use of a portable tape recorder without disrupting permanently installed equipment.
- Tape Monitor:** To permit instantaneous monitoring of tape while recording.

SPECIFICATIONS

- Power Requirements:** 117 VAC: 35 watts
- Input Sensitivity and Impedance:** Auxiliary, Tape, and 2 Tuner 0.25 V at 470K
2 Phono. Low: 2.5 MV at 47K
High: 12.5 MV at 47K
XTa1: 0.1 V, very high
2 Tape Head, Low: 1.25 MV at 47K
High: 6.25 MV at 270K
Tape Monitor: 0.25 V at 130K
- Frequency Response:** ±0.5 db 20 to 20,000 cycles
- Distortion:** Less than 0.2% at rated output, 20 to 20,000 cycles
- Hum and Noise:** High level inputs: 85 db below rated output
Low level inputs: less than 2 microvolts at input terminals (—115 dbm)
- Outputs:** Main: 2.5 V with rated input
Tape: 0.25 V with rated input
- Gain:** Low level inputs: 1000-1 Main Output
Low level inputs: 100-1 Tape Output
High level inputs: 10-1 Main Output
High level inputs: 1-1 Tape Output
- A.C. Aux. Outlets:** 1 unswitched for tape machine or turntable and 3 switched
- Size:** Chassis: 14½ inches wide; 4¼ inches high; 12 inches deep
Front panel: 14¾ inches wide; 4¼ inches high
- Weight:** 17 pounds



McIntosh

LABORATORY INC., 4 Chambers St., Binghamton, N. Y.

IN CANADA: MANUFACTURED BY McCURDY RADIO INDUSTRIES, LTD.; 22 FRONT STREET WEST, TORONTO

PRODUCT PREVIEW

A continuation of last month's "look into the future," covering phono pickups and arms, microphones, and a few miscellaneous items.

AFTER LAST MONTH'S ATTEMPT to include all of the products of all the manufacturers in the high fidelity industry, we learned that there was considerably more than we expected that needed to be covered, and we did at least indicate that there would be more material to follow in the succeeding issue on the subject of phonograph pickups and arms, and on microphones. In addition, there were a few manufacturers whose products were not covered at all, either because of space limitations or because their material had either been mislaid or had not arrived in time to be included.

Even after this issue it is likely that there will be some products that are considered of great importance to the individual manufacturers but which did not seem to our editors to be of sufficiently great importance to be included. And, regrettably, when it comes to the final allocation of space it is these same editors who must be responsible for the decisions as to what goes in and what doesn't. Of one thing we are sure—we have made a valiant attempt to include all the material available. If not every product of every manufacturer is not represented in these two sections, it may be that we did not have the information, or that we have had to try to make a fair space allocation. Naturally a manufacturer who makes two hundred different products can not expect to have two hundred times as much space as the manufacturer of only one product. We only hope we have selected products that interest our readers as much as they interested us, and that the information contained herein will be of some reference value throughout the year.

As we said last month, this is a catalog-type presentation and it must be remembered that the statements made about the various products described are not the results of our own testing, but are the specifications as furnished by the manufacturer with occasional observations of our own. Actually, in the case of phonograph pickups, we have personally tested most of the models described, but naturally we cannot indicate any preference. Phonograph cartridges are in a somewhat similar category as loudspeakers—not all of them sound the same, and what one listener likes another may not. We have this to say, however—given a blindfold listening test on an A-B-C-D-E-F-etc. basis,

we do not believe we could say which pickup was *best*; one might be described as being harsh, possibly due to a peak in the upper-high-frequency range; another might be described as being extremely smooth; another mellow, and so on. Naturally, any product which is expected to compete with all the others on the market must be assumed to have some good qualities. Perhaps one pickup has more hum than another, yet in a proper installation the hum is of no problem and its user will swear by it. Another pickup may have an exceptionally extended high-frequency range, which could sound good on a system inclined to be dull whereas the same pickup might sound harsh on a system which in itself was inclined to be too bright. If all systems were exactly alike it is possible that every experienced listener would choose the same pickup. Since all systems are far from alike, it is probable that their owners would choose pickups which were complementary to the over-all system with the result that they would begin to sound similar. This is somewhat akin to the well-known "Hi-Fi Show Response Curve," which is a common term for an over-boosted bass and treble. Given a system with "perfect" reproduction, it is likely that the average show-goer would walk past without even a look-in. But with really flamboyant reproduction—with over-stressed highs ("Oh boy, listen to them triangles!") and super-boosted lows ("Listen to that cat on the doghouse!") people are sufficiently impressed to come in and listen. Not that they would continue that type of reproduction in their own homes for more than a month after they got the equipment installed—but at least they come in and listen.

Who's to say what is right? One listener may like the sound equivalent to what he hears from the top seats in the Hollywood Bowl while another may want to sit in the second row at Carnegie Hall. And if that's the way the listener wants to hear music, why shouldn't he make it sound the way he wants it in his home?

So we say about pickups as we have always said about loudspeakers—listen to all of them you can get an opportunity to hear and then pick the one *you* like best. It's *your* ear that must be satisfied, not anyone else's. Given a good system, a good turntable, and a good

record, we are firmly of the opinion that we could be satisfied with at least half of the pickups described here. Change the amplifier and speaker combination, and we might choose the other half just as quickly. We shall try to give you the specifications and descriptions with relatively little comment as to our subjective reactions. And we will never allow ourselves to get in the position of having to say which pickup is which in a series of listening comparisons. One thing we believe firmly—practically any high-quality pickup will give satisfactory performance with practically any system, even though some tone control adjustments may be required to make it seem entirely satisfactory to a given person's ear. Just remember that there must be some good qualities in every product or it would never have reached the market—since the manufacturer is not likely to risk financial ruin with a poor product; and if a product stays on the market for any appreciable time there must be plenty of people who really like it.

One final comment—judge for yourself. Use the specifications as a guide, but when it comes to laying out the hard cash, make sure the product satisfies you—not only in hi-fi but in everything else you buy.

STEREO PICKUP CARTRIDGES

At this stage of hi-fi development, we feel it is necessary to list only stereo cartridges—by now, everyone who has an interest in monophonic reproduction will almost undoubtedly have acquired a mono pickup. In general, stereo pickups will do a satisfactory job of reproducing monophonic LP records provided their two output circuits are paralleled, which will cancel out all vertical components (including turntable-induced rumble). For the ultimate in monophonic reproduction, a top-quality mono pickup will undoubtedly give better performance, although unless the entire system is of the very highest quality it is doubtful if the difference would be apparent to the ear. Most people who are buying pickups these days are choosing from the stereo models that are available since it practically doubles the total cost to have separate cartridges for mono and stereo, in addition to complicating the playing operation by necessitating a change from one to the other as the records are changed.

Stereo pickups are of three basic classes: magnetic, piezoelectric (crystal or ceramic), and electrostatic or capacitance, sometimes called frequency modulated. Magnetic pickups are divided into three types: moving iron or variable reluctance, moving coil, and moving magnet. In all of these the output is directly proportional (over most of the range) to the stylus velocity in the groove. Since their output is relatively low—reaching a usual maximum at full modulation of somewhere in the vicinity of 30 mv per channel—they require preamplifiers to raise their output level up to a par with the high-level signals received from tuners and tape amplifiers. These preamplifiers provide equalization to compensate for the recording curve on the record. Some packaged-set manufacturers claim their pickups do not require the “distorting” preamplifiers, thus giving a false impression to the buyer. Actually, since the frequency response of the preamp is not flat, it can be described correctly as having “amplitude distortion,” but the average person does not know of this and he becomes frightened and unduly influenced by the word “distortion.” Distortion, as usually understood, is likely to be less than 0.1 per cent in a good preamplifier at any normal output voltage.

All of the magnetic pickup types employ coils in some form or another, and it is a common property of coils in a magnetic field to respond to the field, regardless of its source. Since phonograph turntables and changers all have motors, there is some a.c. field in their vicinity, and without proper precautions it is possible that some hum pickup may result. Shielding and coil structure reduce the susceptibility to external fields so that little if any trouble is encountered from this source.

Piezoelectric pickups have considerably higher outputs—usually in the vicinity of 0.25 to 1.0 volts—and can therefore be used with simpler amplifiers. Furthermore, they can be designed so that they compensate directly for the

recording curve and little or no additional circuitry is required. This limits the flexibility of the pickup circuits in matching various curves, but the RIAA curve has been practically universal for several years, and is accepted by all manufacturers of stereo records. However, when a piezoelectric pickup is fed into a specified (relatively low) load resistance, usually combined with a voltage divider, it may be connected directly into a circuit designed for magnetic pickups, since the low load impedance makes the electrical output signal almost identical with that of magnetic cartridges. This restores all the flexibility of the preamp with its usual accommodation for many recording curves. The values for the termination may differ with each type of pickup, but the correct termination is usually specified by the manufacturer. The piezoelectric pickups are not susceptible to external magnetic fields, but they are affected by electrostatic fields because of their higher impedances, and hum may be noticed when a hand is brought in proximity to the pickup head. This may be eliminated by using a metal head or by shielding inside the head. Another successful method is to paint the inside of a plastic head with silver paint, making sure that the paint extends over a ground terminal in the head.

To the best of our knowledge, there are no electrostatic or capacitance-type stereo cartridges on the market so far, although Weather's makes a mono version which is a favorite of many users. In general, this type of pickup requires a specific type of associated circuitry, reducing the interchangeability feature of the other pickup designs.

Magnetic Types

Among the magnetic pickups the moving-iron or variable reluctance type has long been the best known. In this model the magnetic fields reacting upon two coils or two pairs of coils are caused to vary as the armature or stylus bar, to which the stylus is attached, moves from

side to side and/or up and down as the stylus follows the groove.

In the moving-coil pickup, the signal is generated in a tiny coil (or pair of coils) located in a constant magnetic field. As the stylus causes the coil to move, the turns of wire cut through the magnetic lines of force and the corresponding signal voltage is generated in proportion to the velocity of the motion.

The principle of the moving-magnet pickup is similar to the variable reluctance or moving-iron type, since the flux flowing through pole pieces is caused to vary as the stylus moves, although the variation is due to moving the magnet itself rather than a part of the magnetic circuit. Some modern magnetic materials can be energized to have strong fields even in very small sizes, and thus the moving mass of the stylus and the magnet can be relatively small. All design of pickups is likely to be the result of compromises—if the magnet were larger, greater signal output could be obtained, but that would increase the mass too much; more turns in the coil would give greater signal output, but the increased inductance would probably lower high-frequency performance; heavier armatures would carry more lines of force, giving greater signal, but the increased mass would lower resonance well into the audio spectrum. These are only a few of the compromises that must be made, and when one considers all of the requirements of pickup design and the practical construction of the various models, it is a wonder that they all sound as good as they do. Of course, we could go back through the recording stages from microphone to cutting head, which would simply serve to increase the wonder that record reproduction is at its present stage of excellence.

All pickup models listed are described as to type, and specifications as to output, frequency response, stylus force, and so on, are those furnished by the manufacturer. Unless otherwise stated, all net prices quoted are for cartridges with diamond styli.

STEREO CARTRIDGES

AUDIO EMPIRE

• *Dynamagnetic Stereo Cartridge.* The Empire 88 utilizes the moving magnet principle with a four-pole hum-balanced construction for full channel separation, balanced high-frequency output on each channel, and hum-free operation. This unit (which was described fully in the May, 1959, issue of *AUDIO*)



offers equally high compliance of 5×10^{-6} cm/dyne both vertically and laterally, and will track with stylus forces ranging from 2 to 5 grams, depending on the arm in which it used. The stylus is changed by removing a single screw which releases the entire stylus-armature-polepiece assembly, reducing the likelihood of damage in handling. Frequency response is from 20 to 20,000 cps ± 2 db, with an output voltage of 5 mv for a stylus velocity of 5 cm/sec. Channel separation, 20 db. Recommended load impedance, 47,000 ohms. Inductance, 500 mh; resistance, 1000 ohms. Four-terminal output; normal stylus radius, 0.7 mil.; other radii available are 1.0 and 2.7 mils., with all three in either diamond or sapphire. Audio Empire, Division of Dyna-Empire, Inc., 1075 Stewart Ave., Garden City, N. Y. User net price, \$24.50. Replacement stylus assemblies: diamond, \$12.50; sapphire, \$6.50.

AUDIOGERSH

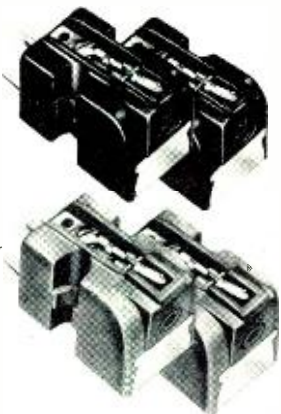
• *Stereotwin 210/D stereo cartridge.* The latest model of the original Stereotwin 200



which introduced the moving-magnet principle first in stereo cartridges. Under average home conditions, frequency response is within ± 2 db from 30 to 18,500 cps without resonant peaks, and signal output is 12 mv per channel at a stylus velocity of 5 cm/sec, which with mu-metal shielding results in extremely low hum. Compliance is 4×10^{-6} cm/dyne, and the recommended load impedance is 37,000 ohms. Channel separation is in excess of 20 db, and recommended stylus force is 3 to 5 grams. Unit is held in spring clip, and is removed from clip for greatest ease in mounting. Design of clip provides for optimum stylus position with either turntables or record changers. Four terminals, easily replaceable stylus without tools. Audiogersh Corporation, 514 Broadway, New York 12, N. Y. User net price, \$34.50; Stereotwin 200, \$44.50.

CBS-HYTRON

● *Constant Displacement Stereo Cartridge.* Four versions of this ceramic pickup have been introduced—with either diamond or sapphire, and either in-phase or out-of-phase—these terms referring to the phasing of the two channels of the ceramic element. In-phase cartridges, SC-1, provide conventional phasing of the output signals for each channel, which permits the use of the cartridge with either stereo or monophonic records in any dual-amplifier or conventional stereo amplifier system, or it can be used in monophonic systems



by connecting the cartridge outputs in parallel. The out-of-phase condition, Model SC-2, is used with certain types of two-way stereo amplifiers in which a single push-pull output stage handles both channels, with the matrixing of outputs being done in the secondary circuits of the necessary two output transformers. In-phase models are maroon, out-of-phase models are gray. Frequency response, 30 to 10,000 cps ± 3 db; channel separation, 20 db; stylus force, 5-7 grams. Compliance, 2×10^{-6} cm/dyne; capacitance of each side, 500 μ f. Output voltage, 400 mv at stylus velocity of 5 cm/sec. Stylus radius, 0.7 mil.

● *Professional 55 Model.* Offered with a 0.5-mil diamond, and only in the in-phase condition, this unit is housed in transparent plastic, and is furnished with two plug-in equalizing networks. Specifications are the same as for models SC-1 and SC-2 except for frequency response, which is 20 to 15,000 cps ± 3 db. Stylus can be replaced by the user with only a small screwdriver needed. CBS Electronic Sales Corp., Division of CBS, Inc., 100 Endicott St., Danvers, Mass. User net price: Models SC-1 and SC-2, \$24.25; Professional 55, \$28.95.

CONNOISSEUR

● *Integrated Arm and Cartridge.* Fitting only into the manufacturer's arm, the new stereophonic pickup by Connoisseur is of the ceramic type, and employs extremely small units coupled to a minute cantilever system and fitted with a diamond having a tip radius of 0.5 to 0.6 mils. Frequency response is 20 to 20,000 cps ± 2 db, and output is 20 mv when feeding the recommended load resistance of 50,000 ohms, which will give constant-velocity characteristics and thus make it possible to feed the output into a conventional magnetic



input of a preamplifier. Compliance is 3.5×10^{-6} cm/dyne, and effective mass is 2 mg at the stylus tip. Element capacitance is 250 μ f per channel and tracking force is 3 to 4 grams.

The arm is attractive in appearance, has a tracking error of not over 2 deg. on a 12-in. record. The knob at the back raises and lowers the stylus from the record without offering any turning moment to the arm, making it easy to use with no chance of damage to the record grooves. The base of the arm is adjustable to accommodate turntables of differing heights. Finished in glossy black with anodized aluminum trim. Distributed in the U.S. by Ercona Corporation (Electronic Division), 16 W. 46th St., New York 36, N. Y. User net price, \$59.50.

DUOTONE

● *"Floating Needle" Stereo Cartridge.* Made by Acos in England, the GP71 single-stylus cartridge has a frequency response of 20 to 17,500 cps with an output of 1 volt. Channel separation is 20 db, and compliance is 2×10^{-6} cm/dyne. This model is designed for mounting in Garrard, Collaro, and BSR Monarch record changers, and is furnished with three terminals.

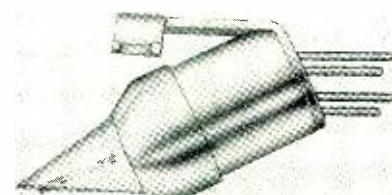
● *Turnover model GP73.* Designed for use where standard grooves must be played as well as LP and stereo records, this model has a frequency response of 40 to 15,000 cps ± 1.5



db and an output of 1 volt. Compliance is 4×10^{-6} cm/dyne and channel separation is 25 db at 1000 cps. Four-pin construction, with 2-4 gram tracking force. Distributed in the U.S. by Duotone Company, Inc., Locust St., Keyport, N. J. User net prices: GP71, \$18.75; GP73, \$20.70.

DYNACO

● *Stereodyne II Cartridge.* Utilizing the variable reluctance principle, this cartridge made by Bang and Olufsen of Denmark is designed for superior reproduction from either mono or stereo microgroove records. It has a frequency response from 30 to 15,000 cps ± 2 db, compliance of 5×10^{-6} cm/dyne, and an output of



7 mv per channel for a stylus velocity of 5 cm/sec. Channel separation is better than 22 db, and tracking force is from 2 to 4 grams. Recommended load is 47,000 ohms for rated frequency response. The unit employs an unusual construction, with the entire moving element being enclosed in a plastic cone permanently attached to a metal shell surrounding the body of the cartridge. It is mounted at an angle, as shown. The mechanism consists of a light mu-metal cross which is attached to a slender aluminum tube with the stylus affixed to the end. Four terminals.

● *TA-12 Unitized Arm-Cartridge.* A similar unit to the Stereodyne II is united with a novel arm for use with turntables to work with minimum stylus force, which is adjust-



able. Unit mounts in a single hole. Distributed in the U.S. by Dynaco Inc., 617 N. 41st St., Philadelphia 4, Pa. User net price: Stereodyne II, \$29.50; TA-12, \$49.95.

ESL

● *Gyro/Jewel Stereo Cartridge.* Utilizing a tiny mechanical gimbal and two d'Arsonval type movements mounted at angles of exactly 90 deg., the ESL C100 Gyro/Jewel cartridge has a response which is inherently linear. Frequency response is 20 to 20,000 cps ± 2 db, and output is 1 mv for a stylus velocity of 5 cm/sec at an impedance of 25 ohms at 1000

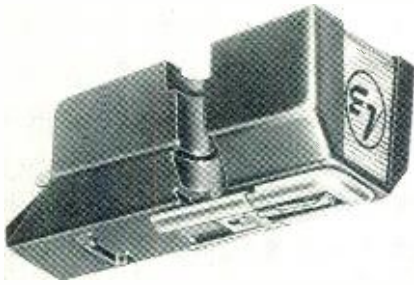


cps. Recommended tracking force is 2-4 grams. The unit is simply mounted on an adapter plate using only one screw, the plate being attached to the usual pickup head with two screws with normal spacing.

● *Professional Stereo Cartridge.* The same type of mechanism is also available to fit the professional series arm, with the designation P100. Both models are normally used with step-up transformers to provide an output comparable with most stereo cartridges, but with preamps of high gain and low noise, the cartridge may be fed directly into the phono inputs. Electro-Sonic Laboratories, Inc., 35-54 36th St., Long Island City 6, N. Y. User net prices: C100, \$69.95; P100, \$79.95; 3108 arm, \$57.00.

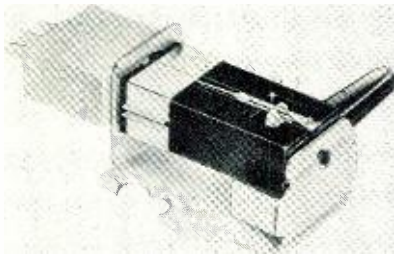
ELECTRO-VOICE

● *Magnacamic 31 Stereo/Mono Cartridge.* Employing ceramic elements in connection with



a special printed circuit which is an integral part of the cartridge, the Magnameric 31 is designed to be fed into the usual magnetic pickup inputs of stereo preamps. Frequency response is given as 20 to 20,000 cps ± 2 db, with a channel separation of 28 db at 1000 cps and an output of 10 mv. Compliance is 3.5×10^{-6} cm/dyne and the cartridge is available with either 0.5- or 0.7-mil styli, the former being recommended for use with transcription arms with a stylus force of 2-4 grams. The cartridge is also available for ceramic inputs.

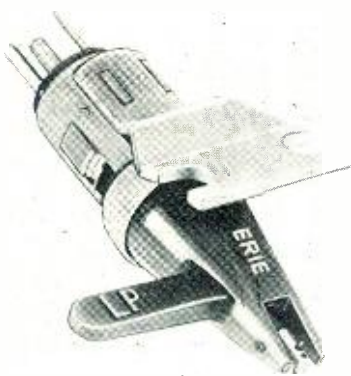
• *20-series Stereo Cartridges.* The original E-V ceramic pickup is available in both standard and Magnameric models—the former with an output of 500 mv and the latter with a velocity characteristic and an output of 20 mv. Frequency response is 20 to 20,000 cps ± 2 db, and recommended tracking force is 5-7 grams in changers, 4-6 grams in transcription arms. Model 21D is standard series, with 26DST comprising the same elements but



in a turnover mount accommodating a 3-mil sapphire in addition to the 0.7-mil diamond for LP's. Electro Voice, Inc., Cecil and Carroll Sts., Buchanan, Michigan. User net prices: Magnameric 31, \$24.00; same, for ceramic inputs, \$22.50; 21D, \$9.00; 26DST, \$9.90.

ERIE

• *Single-Element Ceramic Cartridge.* Using a tiny ceramic tubular element with suitably placed electrodes, the Erie turnover cartridges accommodate both LP and standard records. Frequency response is 20 to 16,000 cps ± 3 db and the output is 500 mv at a tracking force of 5 grams. Channel separation is 20 db. Model



1304 employs a diamond LP stylus and a sapphire standard stylus, whereas Model 1303 uses sapphires in both sides. Electronics Distributor Division, Erie Resistor Corporation, Erie, Pa. User net prices: 1304, \$16.50; 1303, \$8.95.

FAIRCHILD

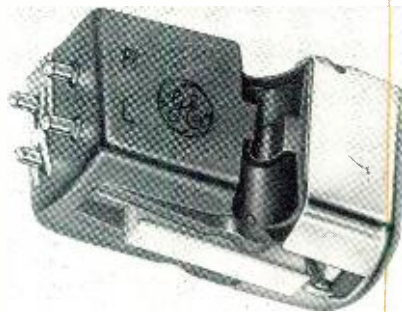
• *Compatible Rotating-Magnet Cartridge.* Model SM-1 is a moving-magnet pickup of unusual design. The stylus bar extends from a precision-ground rubber "ball" in which the magnet is mounted, (the ball constituting the suspension and damping), generating the signal in two sets of coils. Frequency response is from 20 to 15,000 cps ± 2 db, and output is 11.5 mv for a stylus velocity of 5 cm/sec. The unit has a d.c. resistance of 2000 ohms and an inductance of 0.5 Hy, and is designed to operate into a load of 47,000 ohms, with any value from 39,000 to 100,000 being ac-



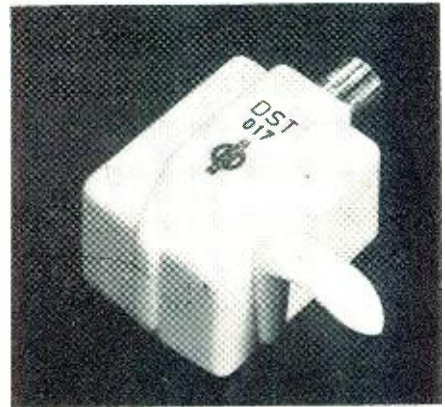
ceptable. Recommended tracking force is 3-4 grams. Channel separation is better than 25 db at 1000 cps, and compliance is 4×10^{-6} . Because of internal copper case for electrostatic shielding and a mumetal outer case, the hum is extremely low, being 65 db below the signal when mounted on the turntable. Fairchild Recording Equipment Corp., 10-40 45th Ave., Long Island City 1, N. Y. User net price, \$34.95.

GENERAL ELECTRIC

• *Variable Reluctance Stereo Cartridge.* With a series of small changes in the design, the new VR-22 stereo cartridge is even better than its predecessor with respect to output, channel separation, and extended frequency



response, and the two channels balance within ± 2 db to 15,000 cps. The shielding has been improved, and the grounding of the shield and the method of shorting the two "ground" terminals are well thought out. Available in two models, VR225 with 0.5-mil stylus and VR227 with 0.7-mil stylus, with the former tracking at 2-4 grams in transcription arms and the latter at 5-7 grams. Frequency response, 20-20,000 cps ± 3 db for the VR225, and 20-17,000 cps ± 3 db for the VR227. Channel separation is up to 30 db at 1000 cps, and output is 9 mv for a stylus velocity of 5 cm/sec. Inductance if the unit is 420 mH, nominal, and resistance is 1600 ohms per channel. Recommended load resistance is 47,000 ohms. Lateral compliances are 4×10^{-6} and 3×10^{-6} cm/dyne and vertical compliances are 2.5×10^{-6} and 2×10^{-6} for the 225 and 227 respectively. Audio Components Section, General Electric Company, Auburn, N. Y. User net prices: VR225, \$27.95; VR227, \$24.95.

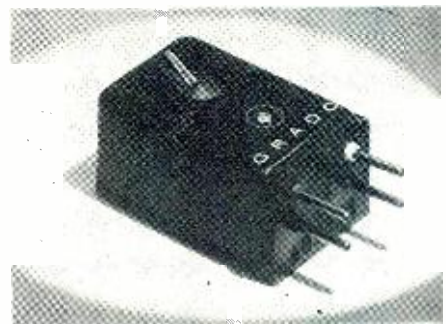


GOTHAM AUDIO SALES

• *Neumann Double-Dynamic Cartridge.* Developed by Neumann specifically for calibration of stereophonic disc recording, the Model DST was not originally intended for general consumer sale. They are designed to fit only such arms as the Ortofon (ESL Professional) or Neumann PA-2 types. When used with the former a special four-contact insert and holding clip must be ordered under the number Z-15. The cartridge has a frequency response of 30 to 15,000 cps ± 2 db and an output of 0.75 mv for a stylus velocity of 5 cm/sec. The output impedance is 18 ohms and should be fed into a load impedance of greater than 50 ohms. Channel separation is greater than 25 db in the midrange, and greater than 12 db over the full audio range. Compliance is 3.6×10^{-6} cm/dyne, and a tracking force of 6.5 grams is required. Stylus radius is 0.6 mils. Use of an input transformer is recommended, with Bever Type TR-145/15 having a turns ratio of 15:1 as a suggested model. Gotham Audio Sales Co., Inc., 2 West 46th St., New York 36, N. Y. User net prices: DST cartridge, \$69.00; Bever transformer, \$11.20.

GRADO

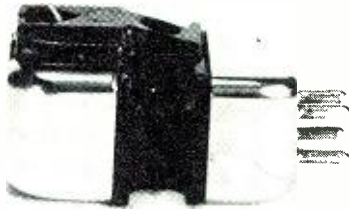
• *Moving-Coil Stereo Cartridges.* Made in two models, the Custom for use in record changers and the Master for turntable use.



these cartridges are similar in design. Both employ a moving element consisting of a hollow plastic cube on which are wound two coils and from which extends the stylus bar. This cube is supported in a rubber "grommet" which serves to hold the coils in the magnetic field as well as provide the necessary damping. The specifications given are for the Custom and Master series respectively. Frequency response, 10-24,000 cps and 10-30,000 cps. Interchannel output balance, 0.5 db on each; frequency balance, 0.5 db each. Output, 3.5 mv and 2.5 mv respectively at a stylus velocity of 5 cm/sec. Impedance, 1000 and 700 ohms; Tracking force, 3 grams each. Input load, any value over 5000 ohms for both models. Channel separation, in excess of 20 db and 25 db. In addition, the Master series is fitted with a radioactive element to reduce static accumulation on the record surface. Grado Laboratories, Inc., 4614 Seventh Ave., Brooklyn 20, N. Y. User net prices: Custom, \$32.50; Master, \$49.50.

KNIGHT

● *KN500 Magnetic Stereo Cartridge.* This unit has a frequency response of 20 to 20,000 cps ± 2 db with a compliance in both vertical and lateral directions of 4×10^{-6} cm/dyne, and an output of 5 mv per channel. Channel separation is more than 20 db, and the recommended load impedance is 47,000 ohms.



The cartridge has four terminals, and uses a 0.7-mil diamond. Tracking force is 2 to 5 grams. Allied Radio Corporation, 100 N. Western Ave., Chicago 80, Ill. User net price, \$16.85.

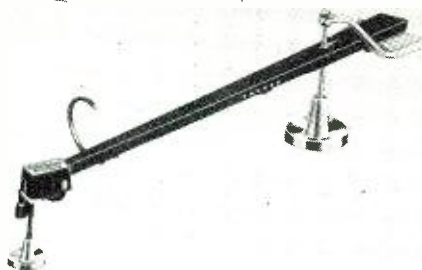
PICKERING

● *Collector Series 380.* Hermetically sealed and fully encapsulated in metal for hum-free performance, the new Collector Series 380 Fluxvalve has two compliance ranges—the "A" type V-guard stylus for transcription arms, and the "C" type for record changers.



Response is flat from 20 to 20,000 cps ± 2 db, and channel separation is 25 db or better. Output is 10 mv for a stylus velocity of 5 cm/sec. Cartridge has four terminals plus an optional metal-case ground to prevent ground loops with metal arms. Unit is available as Model 380E, the "Collector's Ensemble," which includes the Fluxvalve body with three V-Guard styli—one each for stereo, LP, and standard, in transcription arms; as Model 380A for stereo and LP only in transcription arms; and as Model 380C for stereo and LP in record changers.

● *Model 196 Unipoise Arm and Pickup.* An integrated assembly of a Model 371 stereo cartridge with the Unipoise arm, this combination employs a single friction-free pivot



in a strikingly attractive design for use with turntables. Pickering & Company, Inc., Plainview, N. Y. User net prices: 380E, \$60.00; 380A, \$34.50; 380C, \$29.85; 196, \$49.50.

SCOTT

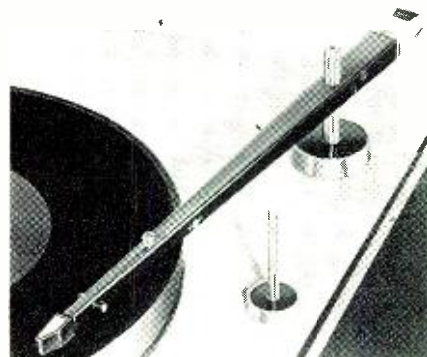
● *London-Scott Arm and Cartridge.* This new magnetic pickup and arm combination was designed with the combined efforts of the



London Recording Laboratories and the H. H. Scott engineering staff. Frequency response of 20 to 18,000 cps ± 2 db, and compliance is 3.5×10^{-6} cm/dyne. Output is 7 mv in the stereo connection. Stylus radius is 0.5 mil, and output impedance is 4000 ohms per channel at 400 cps. Recommended load is 47,000 ohms, and channel separation is better than 20 db. Tracking force, 3.5 grams. The over-all length of the arm is $12 \frac{1}{2}$ in., and the height adjustment range is $1 \frac{3}{8}$ to $2 \frac{1}{2}$ in. above the mounting board. The assembly is complete with arm rest and all mounting hardware and templates, as well as all connecting cables. H. H. Scott, Inc., 111 Powder Mill Road, Maynard, Mass. User net price, \$89.95.

SHURE

● *Studio Dynamic Reproducer.* Combining the moving magnet principle with arms of excellent design, Models M216 (16 in.) and M212 (12 in.) provide excellent reproduction at stylus forces ranging from 1.5 to 2.5 grams. Frequency response, 20 to 20,000 cps ± 2 db at an output of 4.5 mv; recommended load impedance, 47,000 ohms. Higher values of load impedance will produce a slight increase in high-frequency response. Inductance is 400 mH and d.c. resistance is 600 ohms per channel. Lateral and vertical compliance, $9 \times$



10^{-6} cm/dyne; channel separation, more than 20 db at 1000 cps. The arm is mounted so as to place its bottom edge $9/32$ in. above the record surface, and the pickup is raised and lowered with a finger tip on the button near the front of the arm. The arm counterbalance, though not needed for actual balancing since the arm does not move in a vertical plane, is attached by a flat steel spring which is damped to eliminate the usual low-frequency arm resonance. All load-bearing pivots are ruby jeweled.

● *Professional and Custom Dynetics.* These two cartridges are designed for mounting in transcription arms and in record changers respectively. Both have frequency responses of 20 to 15,000 cps, ± 3 db, outputs of 5 mv per channel, and channel separations of more than 20 db at 1000 cps. Recommended load impedance is 47,000 ohms. The Professional model, M3D, has an inductance of 365 mH, a d.c. resistance of 330 ohms, and a compli-



ance of 4×10^{-6} cm/dyne. The Custom model, M7D, has an inductance of 400 mH, a d.c. resistance of 400 ohms, and a compliance of 3.5×10^{-6} cm/dyne. Both have four terminals and fit standard mounting dimensions. Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill. User net prices: M216 and M212, \$89.50 each; M3D, \$45.00; M7D, \$24.00.

SONOTONE

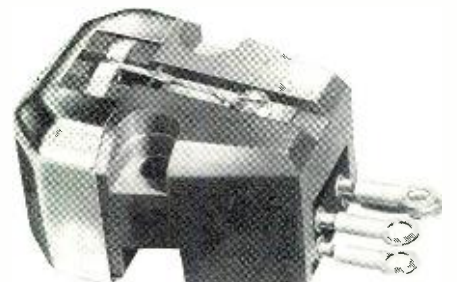
● *Series "ST" Ceramic Cartridges.* Designed for use with records cut to RIAA characteristics, these cartridges will give a response flat within ± 1.5 db to 15,000 cps with a smooth rolloff to 20,000 cps when used with simple loading networks. Working into a flat amplifier with an input resistance of 3.3 megohms, a network consisting of a 600 μ f capacitor in series with 1.5 megohms will give rated response. A flat amplifier with an input resistance of 2.2 megohms will give response within ± 2.5 db up to 1000 cps, together with rated response above that point. For magnetic inputs, the network should be composed of a parallel combination of 68,000 ohms and .001 μ f, connected in series with 27,000 ohms, with the amplifier being fed from the junction of the two resistors. In the flat amplifier connection, the output voltage is 385 mv for a stylus velocity of 5 cm/sec, while for the magnetic inputs, the resistance of the input controls the output voltage; for an input resistance of 10,000 ohms, output is 10 mv; for 33,000 ohms, output is 20 mv; and so on. Ready-made networks are available. Compli-



ance is 3.0×10^{-6} cm/dyne, and channel separation is 20 db at 1000 cps. Stylus force should be 3-5 grams with transcription arms, and from 4 to 6 grams for changers. Available models include various combinations of diamonds and sapphires in turnover mount to accommodate stereo, LP, and standard records. Model 8TA-4SD has a 0.7-mil diamond and a 3-mil sapphire. Electronic Applications Division, Sono one Corporation, Elmsford, N. Y. User net price, Model 8TA-4SD, \$11.70.

TANNOY

● *"Vari-Plein" Variable Reluctance Cartridge.* With moving parts having very low dynamic mass, the Tannoy stereo cartridge takes the form of a plastic molding which encloses the



generating systems, with a mumetal shield against hum. Frequency response is from 30 to 15,000 cps ± 1.5 db, and output is 7 mv per channel. Recommended load resistance is 100,000 ohms, with 50,000 ohms as the minimum. The unit has an inductance of 350 mH in each channel, and tracking force is 4 grams. Channel separation is a maximum of 27 db at 4000 cps, 22 db at 1000 cps. Cartridge mounts in any standard head. Tannoy (America) Ltd., Box 177, East Norwich, L. I., N. Y. User net price, \$43.50.

WEATHERS

● **StereoCeramic Cartridge.** A new development in ceramic pickups, model C-501-D is designed for use in changers and transcription arms and combines low cost with high-quality sound. Frequency response is 15 to 30,000 cps, compliance is 6×10^{-6} cm/dyne, and



channel separation is 25 db. Output voltage is 170 mv for a stylus velocity of 5 cm/sec, and is intended to be fed into magnetic pickup inputs on standard preamplifiers. Unit is also available in Weathers Micro-Touch arm fully assembled as Model MC-1-D. Weathers Industries, Division of Advance Industries, Inc., 66 E. Gloucester Pike, Barrington, N. J. User net prices, C-501-D, \$17.50; MC-1-D, \$55.95.

ARMS

AUDAX

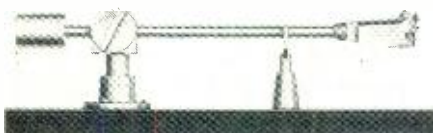
● **Stereo Tone Arm Kit.** If you can use a screw driver, you can assemble this professional-type tone arm in just 15 minutes. No mechanical skill is needed. Precision-engineered to broadcast standards, it offers savings of over 50 per cent because you assemble



it yourself. Only two moving parts—vertical and lateral pivots—give this arm remarkably free motion. Stylus pressure is easily adjustable. Calibrated offset angle assures tangency to the groove. Plug-in shell accepts all standard cartridges. Audax, Division of Rek-O-Kut Company, Inc., 38-19 108th St., Corona 68, N. Y. User net price, 12-in. KT-12 kit, \$15.50; 16-in. KT-16 kit, \$18.50.

AUDIO EMPIRE

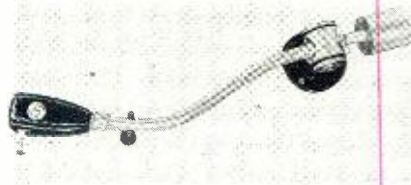
● **Balanced Stereo Transcription Arm.** The Empire 98 achieves dynamic balance in all planes to keep the stylus in proper position even if the turntable is tilted or a record badly warped. Offset pivot design maintains center of mass balanced over pivot in all planes. Other features of this arm include:



accurate stylus pressure adjustment from 0 to 8 grams; maximum vertical and lateral compliance by means of precision ball bearings; resonance below threshold of audibility; arm lift an integral part of arm assembly; interchangeable shell accepts all standard cartridges; patented self-latching arm rest, and lowest possible tracking error. Audio Empire Division of Dyna-Empire, Inc., 1075 Stewart Ave., Garden City, N. Y. User net price, \$34.50.

ESL

● **Gyro/Balance Tone Arm.** Designed on the principle that an arm should be balanced in every plane and the stylus force provided by a spring, the ESL Gyro/Balance arm has many advantages. Because of this design, turntable leveling is unnecessary, and on demonstration the ESL arm is often shown playing records with the turntable in an absolutely vertical plane—in fact, if it were



possible to keep the record and platter in place and provide proper bearings for the turntable itself, the arm would play records upside down. Ball bearings are used throughout for all vertical and horizontal motions, assuring smoother operation, increased record life, and longer trouble-free performance. In operation, the spring force is reduced to zero by turning the two knurled knobs backward; the sliding weight at the back is then adjusted for perfect balance of the arm and cartridge. The knobs are then turned forward to obtain the desired stylus force. The head is of molded plastic and is fitted with four terminals. A wire lead ground is carried through the assembly for connection to a terminal strip under the turntable base. Stylus force adjustable from zero up to 8 grams. Electro-Sonic Laboratories, Inc., 35-54 36th St., Long Island City 6, N. Y. User net price, \$34.95.

FAIRCHILD

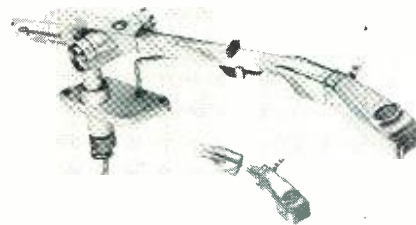
● **Studio-Quality Stereo Arm.** Embodying many refinements and improvements in the well-known Model 280 monophonic tone arm, the new Model 282 is especially suitable for stereo use. Although intended primarily for use with Fairchild cartridges which it accepts as direct plug-ins, it is easily adaptable to



many other cartridges with adapters supplied. Improved bearing action lowers pivot friction and hysteresis. Dual output leads are incorporated in the unit, each set shielded to prevent interaction, as well as a separate ground lead insulated and isolated. Exceptionally low tracking error. This arm will meet studio standards in every respect. Fairchild Recording Equipment Company, 10-40 45th Ave., Long Island City 1, N. Y. User net price \$42.50.

GARRARD

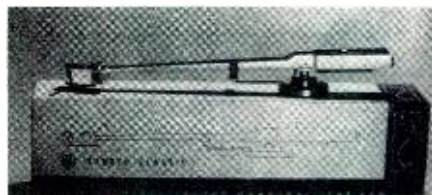
● **Precision Tone Arm.** Despite its modest cost the new Garrard Type TPA/12 will give completely satisfying performance with either monophonic or stereo records up to 16 ins. in diameter. Practically friction-free movement is assured by use of precision spring-loaded cone-type ball-bearing pivots. Suitable for use with any turntable, the TPA/12 is stereo-wired and the plug-in shell will accept any standard cartridge. A new simple weight adjustment is easily accessible, and permits precision control of tracking force. The features of static balance, spring loading, and



viscous damping have all been combined in the TPA/12 to give a remarkable measure of audio performance. Garrard Sales Corporation, Port Washington, N. Y. User net price, \$19.95.

GENERAL ELECTRIC

● **"Stereo Classic" Compatible Tone Arm.** Every design feature of this tone arm is directed toward optimum performance from stereophonic records. These design features also give the Model TM-2G outstanding monophonic qualities. The arm was developed specifically for use with G-E cartridges, as an integrated all G-E pickup system. The arm's primary feature for excellent stereo reproduction is its static balance. When adjusted, the arm maintains its lateral equilibrium at all times, even if the turntable is not perfectly level. An unusual two-step tracking-force adjustment is used for (1) balancing the arm to zero tracking force, and (2) for making a precise tracking-force adjustment between zero and six grams. Among other



features are a built-in arm rest, an easily removable cartridge head, a terminal board with four stereo lead terminals and one ground terminal, and trim, modern styling with brushed aluminum and chrome finish. Accommodates records up to 12 ins. in diameter. Specialty Electronic Components Dept., General Electric Company, West Genesee St., Auburn, N. Y. User net price, \$29.95.

GRADO

● **"Micro-Balance" Stereo Tone Arm.** Engineered as a mate for the Grado cartridge, this arm is constructed of finest gunstock walnut wood. Metal fittings are made of finely machined anodized aluminum. By utilizing a



special micrometer overhang adjustment, the user may adjust the arm for the smallest possible tracking error— $\pm 0.8^\circ$. A second micrometer adjustment accurate to 0.1 gram, is used for setting tracking force. Lateral pivoting of the arm consists of a precision ball thrust bearing. This shaft and bearing assembly is designed to damp out effectively the low-frequency resonance which occurs at 10 cps when the arm is used with a Grado cartridge. Pivot frictions are under 0.1 gram at the stylus. The arm is wired with four shielded conductors. Grado Laboratories, Inc., 4614 Seventh Ave., Brooklyn 20, N. Y. User net price: 12-in. tone arm, \$29.95; 16-in. transcription arm, \$32.50.

GRAY

● **Fluid-Damped Stereo Arm.** Linear fluid damping in both vertical and lateral planes is featured in the Gray Model 212-SX stereo

tone arm. Precision balanced for maximum tracking stability, the unit incorporates such features as adjustable static balance and a quick change holder which will accommodate all standard cartridges. Four leads are included for stereo operation. Tracking error is reduced to an absolute minimum. Available fully assembled or in kit form, this arm will meet every demand of the most discerning music lover. Gray High Fidelity Division, 16



Arbor St., Hartford 1, Conn. User net price: Model SX 12, 12 in. tone arm fully assembled, \$34.00; Model SX 16, same except for 16-in. records, \$36.50; Model SAK 12, same features as SX-12 except in kit form. Can be assembled and wired in 25 minutes, \$23.95.

RECOTON-GOLDRING

• *Arm for Stereo or Mono Cartridges. Made*

of cast aluminum and with Nylon trimming, the vertical movement of this arm is on hardened cone bearings while lateral movement is on steel balls in Nylon cone bearings. Height is adjustable to suit all modern motor units, and stylus force is adjustable from zero up-



wards. The head arrangement is designed to accommodate all cartridges with standard 1/2-in. mounting dimensions, the cartridges being first mounted on a head slide which is instantly removable from the arm. Four terminals are provided, and additional slides may be obtained. The G-60 arm is designed to mount with its spindle 8 3/4 in. from the turntable spindle, which gives it an overhang of 15/32 in. The offset angle is 21.5 deg., and tracking error does not exceed 2 deg. over a 12 in. disc. Recoton Corporation, 52-35 Barnett Ave., Long Island City 4, N. Y. User net prices, G-60 arm, \$19.95; extra head slides, \$2.50.

REK-O-KUT

• *Stereo Tone Arms.* Although similar in appearance to the earlier Rek-O-Kut monophonic arms, these units have been completely redesigned for stereo. Mass of the shell has been increased to lower the point of resonance. Larger, heavier counterweights are employed, and a 4-conductor head accommodates all 3-



and 4-terminal stereo cartridges. A 4-prong shell facilitates phasing. The unit is furnished with wires already connected to a terminal strip. Such desirable features as friction-free micro-bearing pivots, and micrometer-type counterweight adjustment, have been retained. Rek-O-Kut Company, Inc., 38-19 108th St., Corona 68, N. Y. User net price: S-120 12-in. arm, \$27.95; S-160 16-in. arm, \$30.95. Extra plug-in shell, \$5.95.

MICROPHONES

ALTEC

• *"Lipstick" Microphone System.* The Model M-20 condenser microphone system provides all of the outstanding features of the well-known Altec M-11 system, with the latest developments in miniaturization and printed-circuit applications making it one of the smallest quality microphones on the market.



It is literally no larger than a lipstick, and is entirely unnoticeable when mounted on a regular microphone stand. In addition, it is equipped with a fountain pen clip so that it may be carried on the coat lapel or tie, or hidden beneath the tie, a corsage, or other clothing accessories. Its quality and ruggedness are without peer.

CHARACTERISTICS

Frequency range: 20 to 15,000 cps.
 Pattern: Omnidirectional.
 Capacitance: 6 µf.
 Output at 600 ohms: 49 dbm/10 dynes/cm².
 Output impedance: 30, 150, 600, 10,000 ohms balanced; 30, 150, 600, 10,000 ohms unbalanced.
 Power requirements: 117 volts 60 cycle a.c. 15 watts.
 User net price, complete system including Type P-525A power supply and 10-ft. interconnecting cable, \$236.00.

639A Cardioid, three patterns	\$250.00
639B Cardioid, six patterns	250.00
633A Dynamic, non-directional, 30µ	69.00
633C Dynamic, non-directional, 30, 150/250	78.00

CAPPS

• *Studio Condenser Microphone.* Custom-built for major recording studios, broadcast stations, and technical and scientific applications, the Capps "Studio" model microphone is one of the most versatile in its field. It is acoustically faithful to the most complex wave form, free from angular discrimination, blast-proof, and unaffected by moist atmosphere. Extremely modern in finish and form, it is supplied with a chrome swivel as a standard accessory. Both microphone and power supply are equipped with Cannon connectors.



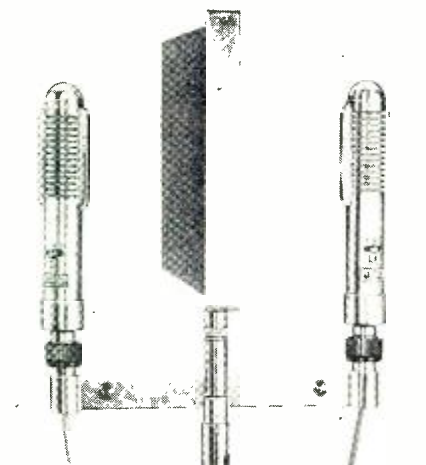
CHARACTERISTICS

Frequency range: 30 to 15,000 ± 3 db.
 Pattern: Omnidirectional.
 Output impedance: Available in three models: CM-2030—30 ohms; CM-2250—50 ohms; CM-2011—high impedance.
 Dimensions: 8 1/4" x 1 1/4" dia.
 Capps and Company, Inc., 20 Addison Place, Valley Stream, N.Y. User net price, \$225.00.

DYNACO

• *Ribbon Microphones.* Suitable for the highest quality recording and broadcasting applications, the Dynaco-B & O Model 53 microphone uses a replaceable duralumin ribbon only .0001 in. thick and weighing 1.3 milli-

grams. The extremely small mass eliminates resonances within the audible range. The unit is bidirectional, which allows controlled discrimination of the pick-up area and facilitates a natural balance of the primary pick-up with room acoustics. When used with the Stereo-Spacer—an acoustically absorbent "partition" between the microphones—these units provide the effect of 10-ft. separation while avoiding unnatural ping-pong effects typical of poor stereo. A 3-position switch provides music, speech, and off positions, and a built-in transformer enables operation at 50, 250, or high impedances. Model 50 is identical in all particulars except output impedance, which is fixed at 50 ohms.

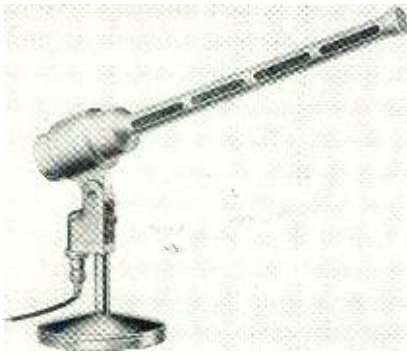


CHARACTERISTICS

Frequency range: 30 to 13,000 cps. ± 2.5 db.
 Pattern: Bidirectional
 Output impedance: Model 53—50, 250, or high; Model 50—50 ohms.
 Dimensions: 7 3/4" x 1 3/16" dia.
 Dynaco, Inc., 617 N. 41st St., Philadelphia 4, Pa. User net price, Model 53, \$59.95; Model 50, \$49.95.

ELECTRO-VOICE

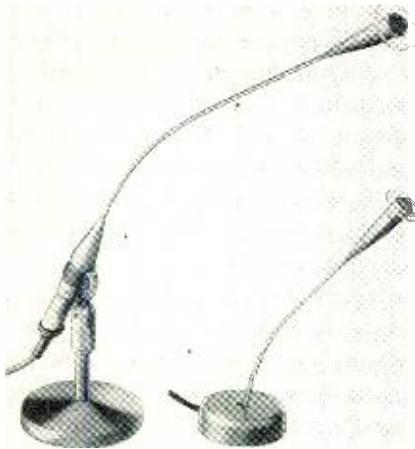
Note: The microphones shown here are E-V's newest models. Because of their unique design features, especially the 6 1/4" which is certain to influence TV mik-



ing techniques, they are listed in this section although complete specifications were not available at press time.

● **"Sound Spot" Microphone.** A new concept in directional microphones, the Model 644 was designed to operate at considerable distances from the sound it is picking up. For this reason, it will permit a far greater degree of TV camera flexibility than has heretofore been possible, especially in intimate dialogue scenes where camera placement has been governed largely by the ability of the microphone to pick up voices of the performers. The 644 uses a combination cardioid and distributed front opening, enabling it to maintain proper response far away from a sound source. Its front effective acceptance angle is 45 deg. on each side of center. Random noise cancellation from the rear and sides exceeds 20 db. Frequency response is smooth from 40 to 12,000 cps. Weight is 2 lbs. 9 ozs. Electro-Voice, Inc., Buchanan, Mich. User net price, \$66.00.

● **Almost Invisible Microphone.** The Model 652 was designed for applications where microphones should not be obvious. It is a dynamic microphone mounted on a thin, non-reflecting tube. It can be used with equal



effectiveness for TV, lectures, and broadcasting where it is desirable that the view of the speaker's face not be obstructed. For added articulation it utilizes two clear plastic baffles to give either a 6- or 3-db boost in the brilliance range of 6000 cps. Output level is -60 db. Weight is 11 ozs. Electro-Voice, Inc., Buchanan, Mich. User net price, \$72.00.

666 Variable "D" cardioid	\$147.00
665 Super-cardioid dynamic	78.00
655C Dynamic, slim-line	120.00
646 Dynamic, lavalier type	84.00
635 Dynamic, omnidirectional	45.00

ELECTRO-SONIC

● **Omnidirectional Broadcast Microphone.** Acclaimed throughout the world for its performance and styling, the ESL-AT2 is unexcelled among microphones of its type for music and speech. The very small probe di-

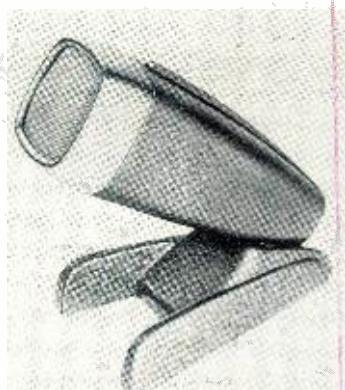
aphragm of the acoustic tube virtually eliminates distortion of the sound field. The mouthpiece position may be widely adjusted by a pivot in the spherical base which contains the moving-coil transducer.



CHARACTERISTICS

Frequency range: 50 to 10,000 cps \pm 3.0 db.
 Pattern: Omnidirectional.
 Internal impedance: 200 ohms.
 Output level: -55 db.
 Probe length: 18 ins.
 Base diameter: 2 1/2 ins.
 Weight: 1 1/2 lbs.

● **Broadcast/Recording Microphone.** This excellent moving-coil microphone will easily meet the most exacting professional requirements for music and speech. A socket at its bottom permits connection to the table-top base supplied, or to a camera tripod. Although regularly used by many European broadcast and recording studios, the surprisingly low price of the ESL-MC1 is within the reach of home recording enthusiasts.



CHARACTERISTICS

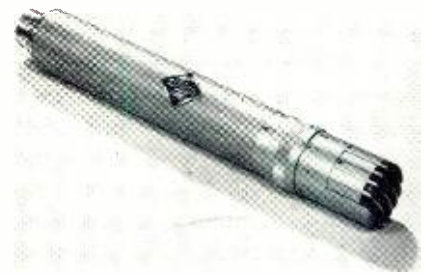
Frequency range: 50 to 15,000 cps \pm 3.0 db.
 Pattern: Omnidirectional.
 Internal impedance: 200 ohms.
 Output level: -47 db.
 Dimensions (plus base): 4 3/4" \times 1 \times 13/16" square.

Weight (plus base): 8 ozs.
 Electro-Sonic Laboratories, Inc., 35-54 Thirty-Sixth St., Long Island City 6, N.Y.
 User net price, \$42.50.

ESL-AT1, Probe type, stand mounting	\$ 80.00
ESL-MC2, Super-rugged dynamic	63.00
ESL-SC403, Cardioid	25.50
ESL-NC2, Noise cancelling	48.75

GOTHAM AUDIO SALES

● **Miniature Condenser Microphone Systems.** The Neumann KM-54a is a cardioid microphone in a miniaturized package, delivering the same excellent performance as the Neumann Studio Standard U-47. Designed with TV and film in mind, it provides more than



25 db rejection to extraneous sounds in the studio. Its pure nickel dual-diaphragms are impervious to influences of heat and humidity, being able to withstand the hottest lighting any film or TV set can produce. Since the entire impedance matching amplifier, including output transformer, is located inside the microphone housing, the microphone may be used as much as several hundred feet away from its power supply. The KM-53a is identical in size but omnidirectional in pattern. It is recommended for the recording of pop orchestras where close-up microphone technique is employed. In such applications, omnidirectional microphones are employed to prevent overloading the console and microphone amplifiers. An accessory, the Z-29 Overload Protector is advised for all applications of the KM-53a and KM-54a in high intensity sound recording.

CHARACTERISTICS

Frequency range: 30 to 15,000 cps.
 Pattern: KM-53a—omnidirectional. KM-54a—cardioid, with front-to-back ratio greater than 25 db.
 Sensitivity: 1.2 mv/dyne/cm².
 Impedance: 50 or 250 ohms (specify when ordering).

RMS harmonic distortion: Less than 0.8 per cent over entire range to 110 db intensity level.

Finish: Matte satin chrome.
 Dimensions: 4 3/4" \times 1 \times 7/8" d.
 Weight: 3.5 ozs.

User net price, complete system consisting of microphone with Type NKM Power Supply: KM-54a, \$435.00; Km-53a, \$415.00.



M49B Variable Direction Condenser Microphone

● **Z-29 Overload Protector.** This is a 3/4-in. switch section inserted between the microphone capsule plug-in head and the amplifier section of the microphone. Three-position ring switch allows straight-through connection, or gain reductions of 10 and 18 db. User net price, \$36.00.

U47/U48a (Studio) condenser	\$365.00
M49b Condenser, variable direction	495.00
KM56 Condenser, miniature	440.00
SM2, Stereo condenser, miniature	815.00

RESLO

• *Studio Ribbon Microphone.* Small and attractively styled, the Reslo "Celeste" microphone has an on-off switch built into the base which adds greatly to its usefulness when intermittent operation is desired. Another operational feature of interest is the ability of the unit to have its response characteristics changed by the user in a matter of minutes. With each microphone are furnished two pieces of felt and a piece of varnished cambric. These are designed to fit into the rear protective shell. For bass reduction, one felt is placed in the shell; for base reduction with rear discrimination, one felt and the varnished cambric are used; for close talking use, a felt, the cambric, and the second felt are placed in the shell. Additional operating flexibility is achieved through variable output impedance. Anyone who needs a microphone for both high and low impedance will find the Reslo units provide an excellent answer.



CHARACTERISTICS

Frequency range: 20 to 15,000 cps.
Pattern: Bidirectional.
Output level: -58 db.
Output impedance: Switchable—low (50 ohms)/high.

Ercoma Corporation (Electronics Division), 16 W. 46th St., New York 36, N.Y. User net price, \$69.95 to 74.95, depending on impedance.

Symphony, RBL/T, low Z	\$ 59.50
Symphony, RBM/T, medium Z	64.50
Symphony, RBH/T, low and high Z	64.50
Avon cardioid, CRL, low Z	79.95
Avon cardioid, CRM, medium Z	84.95
Avon cardioid, CRH, low and high Z	84.95

Any pair factory matched for stereo is available at \$5.00 above the combined price.

SHURE

• *Studio Ribbon Microphone.* The Shure Model 333 is engineered for the most exacting professional requirements. It is well suited for motion-picture studios, TV and radio stations, and professional recording studios. The 333 is super-cardioid, unidirectional—reduces the pickup of random noise energy by 73 per cent. It features the patented Shure "Uniphase" acoustical network system.

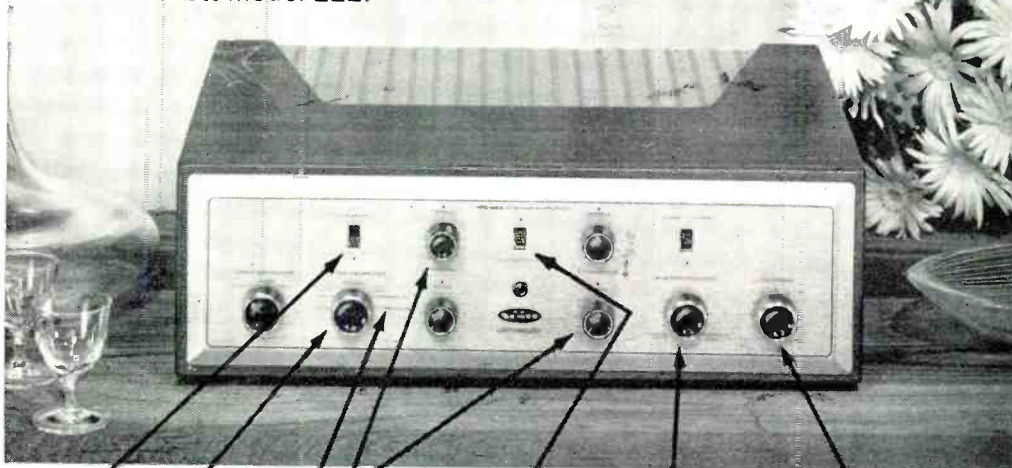
CHARACTERISTICS

Frequency range: 30 to 15,000 cps production uniformity guaranteed to ± 2.0 db.
Pattern: Unidirectional, response at rear down 12 to 20 db from front.
Impedance: Variable—50, 150, and 250 ohms.
Output: -60 db at 50 ohms; -59 db at 150 and 250 ohms.
Finish: Non-reflecting "Bronze-Tone" case with aluminum grill.

AUDIO • SEPTEMBER, 1959

New H.H. Scott Stereo Amplifier has features never before offered at \$139.95*

The new H.H. Scott 24 watt stereophonic amplifier, Model 222, puts top quality within the reach of all. This new amplifier has many features never before available for less than \$200. It is backed by H.H. Scott's fine reputation. Check the features below and you'll see why you should build your new stereo system around the H.H. Scott Model 222.



Equalization switch lets you choose between RIAA compensation for monophonic and stereo records; NARTB, for tape heads.

Separate Bass and Treble controls on each channel let you adjust for differences in room acoustics and different speaker systems.

Effective scratch filter improves performance on older worn records and improves reception on noisy radio broadcasts.

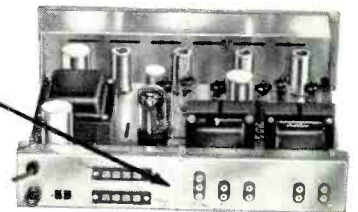
Channel balance control adjusts for different speaker efficiencies and brings channel volumes into balance quickly and easily.

Master volume control adjusts volume of both channels simultaneously. Also functions as automatic loudness control whenever desired.

Special switch positions for accurate balancing, for playing stereo, reverse stereo and for using monophonic records with your stereo pickup.

This position lets you play a monophonic source such as an FM tuner or a tape recorder through both power stages and speakers.

Exclusive center-channel output lets you use your present amplifier for 3-channel stereo or for driving extension speakers. Separate stereo tape-recorder outputs.



SPECIFICATIONS: Dual 12 watt channels; 0.3% 1M distortion; 0.8% harmonic distortion; frequency response 20 to 30,000 cps; extremely low hum level (-80db); DC operated preamplifier heaters; Inputs for stereo or monophonic recorders, tuners, phono cartridges and tape heads. Phono sensitivity 3 mv. Sub-sonic rumble filter prevents overload from noisy changers or turntables. Price \$139.95*

H.H. SCOTT INC. Dept. A-5, 111 Powdermill Road, Maynard, Mass. Export: Telesco International Corp., 36 W. 40th St., N.Y.C.



SEND NOW FOR
FREE HI-FI GUIDE
AND CATALOG



Insist on genuine H. H. Scott components.

*West of Rockies \$143.25. Accessory case extra.

Rush me complete details on your new Model 222 and your complete 1959 Hi Fi Guide and Catalog. Dept. A-9

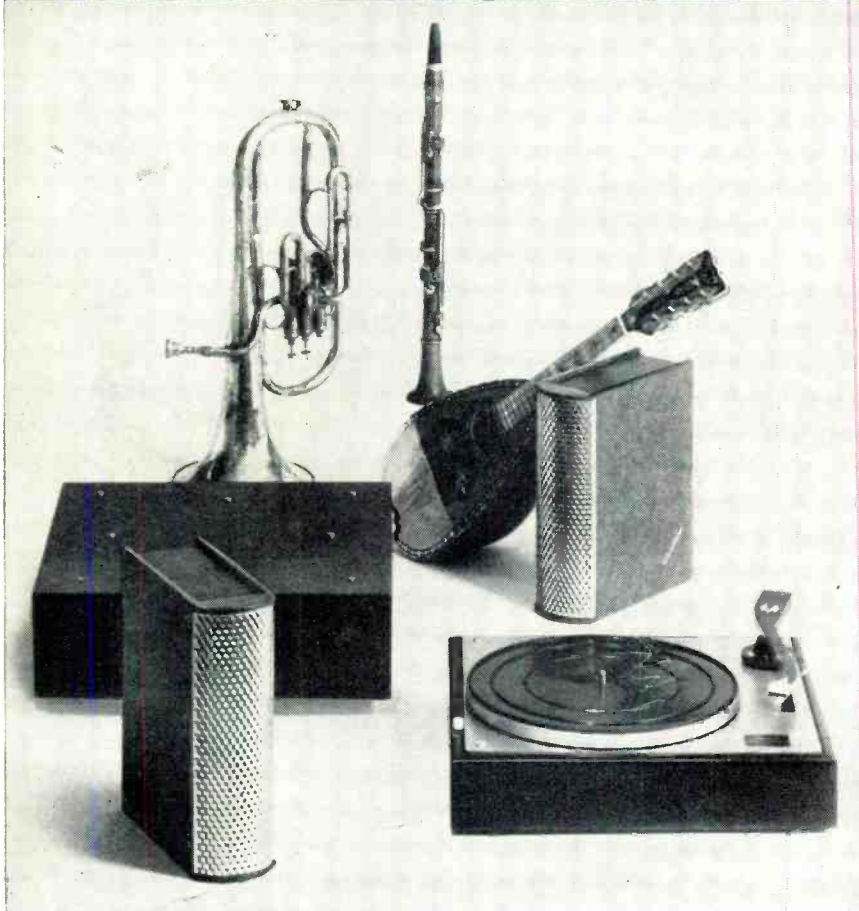
Name _____
Address _____
City _____ State _____

WEATHERS

TrioPhonic

STEREO

THE SOUND THAT OUTMODES
CONVENTIONAL STEREO!



It took the engineering know-how of Weathers to discover this revolutionary electronic advancement in sound and size! TrioPhonic Stereo introduces the listener for the first time to "Equalized Sound." Now you can sit anywhere in the room and experience the same magnificent tonal realism and fidelity of full-range stereo. "Equalized Sound" is produced by two book-size full range stereo speakers and a unique, non-directional hideaway bass.

Ask your dealer today for a demonstration of Weathers startling new audio dimension—TRIOPHONIC STEREO with "Equalized Sound." You must see it, hear it, compare it, to believe it!

For the ultimate in TrioPhonic stereo listening, select the matched Weathers synchronous turntable with StereoRamic pickup system.

For more information of TrioPhonic Stereo write for FREE booklet, Dept. AUD

WEATHERS INDUSTRIES, 66 E. Gloucester Pike, Barrington, N.J.

Division of Advance Industries, Inc.

Export: Joseph Plasencia, Inc., 401 Broadway, New York 13, N. Y.



Cable connector: Cannon XL-3-11.

Shock Mount: Special vibration isolation unit of live rubber construction.

Switch: Voice-music switch to adjust frequency characteristics for optimum performance.

Dimensions: 7-9/32" h x 1-7/32" w x 1 1/8" d.
User net price, \$250.00.

• "Slendyne" Dynamic Microphone. Developed for studio use, the Model 525 is custom-built to provide broadcast quality of reproduction. It is exceptionally versatile, and is entirely reliable for both indoor and outdoor application. It may be used on a conventional floor or desk stand, in the hand, or with lavalier cord and belt clip assembly. The use of high-efficiency magnetic materials and specially-designed magnetic circuits have made it possible to develop this small microphone, at the same time achieving performance standards usually expected only in larger models. The 525 is ruggedly built to withstand hard usage and is not affected by normal temperature and humidity variations.



CHARACTERISTICS

Frequency range: 40 to 15,000 cps, production uniformity guaranteed to ± 2.5 db.
Pattern: Omnidirectional.

Impedance: Equipped with a multi-impedance switch, furnishing a choice of 30-50, 150, and 250 ohms.

Output: -61 db at all impedances.

Finish: Non-reflecting "Bronze-Tone" enamel with beige aluminum grill.

Cable connector: Cannon XL-3-11.

Dimensions: 8-17/32" l x 1" d.

Net weight: 1/2 lb.

User net price, \$120.00.

Shure Brothers, Inc., 222 Hartrey Ave., Evanston, Ill.

SONY

• Variable-Directional-Pattern Condenser Microphone. The Sony C-37A is designed for professional recording and broadcast application where utmost performance, dependability, and



fidelity are essential. Frequency response is stated to be entirely free of resonant peaks and dips within the specified range of 20 to 18,000 cps. The C-37A is operated in conjunction with the Model CP-2 power supply unit. This power supply incorporates a variable switch permitting three different frequency characteristics for complete versatility in any acoustic surroundings. A small screw switch on the back of the microphone housing offers a choice of uni-directional cardioid pattern, or conventional omnidirectional pattern. Microphone and power supply may be separated by as much as 240 feet without affecting performance characteristics.

CHARACTERISTICS

Frequency response: 20 to 18,000 cps \pm 2.0 db.
 Pattern: Choice of cardioid or omnidirectional.
 Output level: Omnidirectional, -72 db; cardioid, -70 db.
 Impedance: 200 ohms.
 Finish: Gray with satin chrome.
 Dimensions: 7-11/16" l x 1-13/16" d, with cradle.
 Weight: Microphone, 1 lb. Power supply, 6 lbs.
 User net price, C-37A system complete including power supply, \$395.00.
 Superscope, Inc., Audio Electronics Division, Sun Valley, Calif.

TELADI

• *Variable-Directional-Pattern Condenser Microphone.* Imported from Germany, the Model K-125 microphone will meet every requirement of the most demanding application. It is imported into the United States by Durant Sound Equipment Co., 80 W. 55th St., New York 19, N.Y.

CHARACTERISTICS

Frequency range: 30 to 18,000 cps \pm 3 db.
 Pattern: Switchable. Either non-directional or cardioid.
 Impedance: Either 200 ohms balanced or 10,000 ohms unbalanced.
 Harmonic distortion: Less than 1.0 per cent.
 Dimensions: 15 1/2" l x 1 1/2" d.
 Weight: 10.4 ozs.
 User net price, \$225.00.



save on everything in

STEREO HI-FI

see the best values in the

1960 ALLIED CATALOG

free send for it

WORLD'S LARGEST SELECTION

Here is your complete money-saving guide to everything in hi-fi, featuring the world's largest choice of systems and famous-name components. See what's new (including products available only from ALLIED), see what's finest—then see how you save! Use our easy terms to fit your budget. For everything in Hi-Fi, for *everything* in Electronics, get the 1960 ALLIED Catalog. It's FREE—write for it today.

ALLIED EXCLUSIVES:

Knight Stereo systems and components are truly "Honored for Value"—equal to the very finest in quality and performance, yet far lower in cost. KNIGHT hi-fi components are exclusive Allied products.

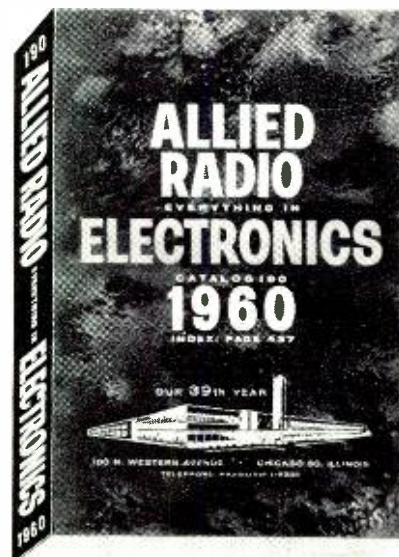
Build-Your-Own knight-kits—save up to 50%! It's easy, it's fun to assemble your own stereo hi-fi components and complete systems for absolutely professional performance and appearance. KNIGHT-KITS are an exclusive Allied product.

Buying Advantages: Wherever you are, you can get *anything* in hi-fi from Allied—fast—and at money-saving prices. Everything you buy from us must satisfy completely, or you get your money back. 15-day free trial on systems and components.

buy on Allied's new

EASY TERMS...

only \$5 down (or less) on orders up to \$200; up to 24 months to pay. Fast handling—no red tape.



see what's **NEW** in

Stereo Music Systems
 Stereo Amplifiers & Tuners
 Stereo Cartridges & Pickups
 Speakers & Enclosures
 Changers & Turntables
 Tape Recorders & Accessories
 Stereo Records & Tape
 High Fidelity *knight-kits*
 Hi-Fi Records and Books
 Hi-Fi Custom Cabinets

ALLIED RADIO

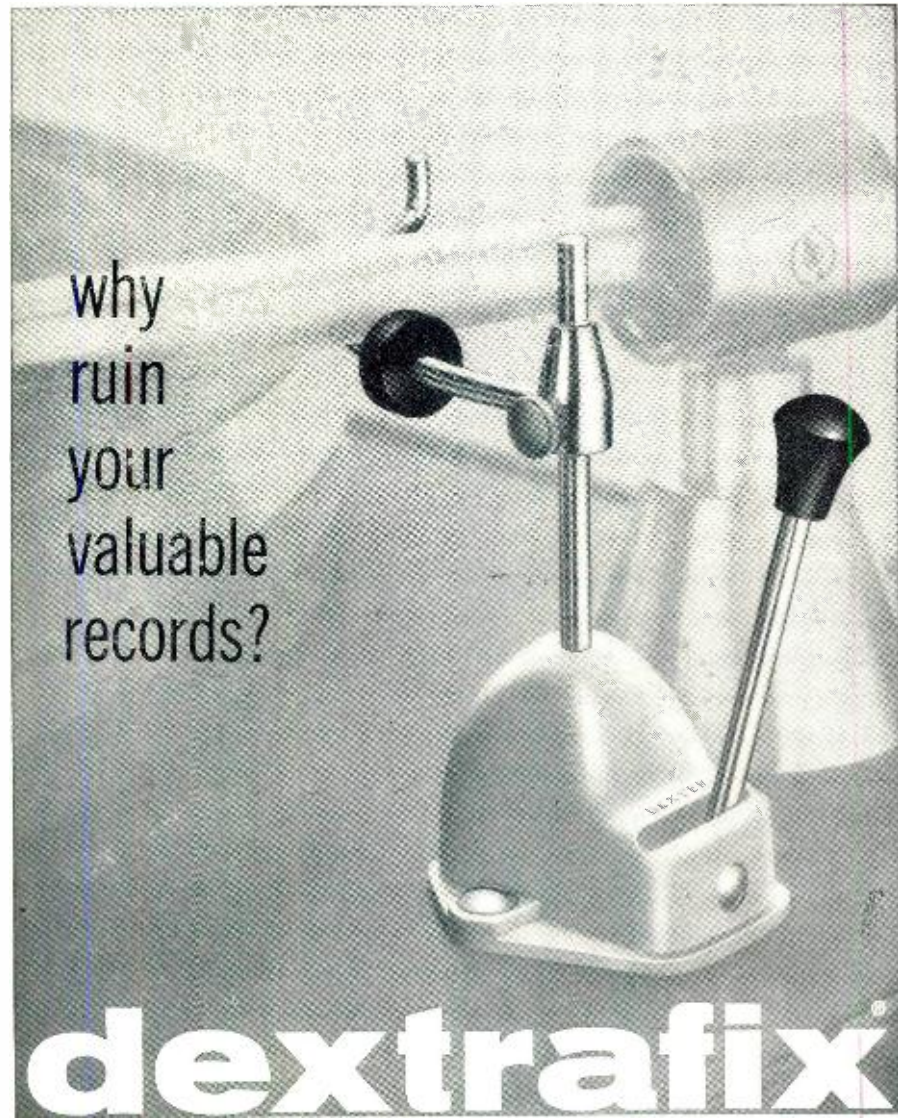
free CATALOG

ALLIED RADIO, Dept. 17-J9
 100 N. Western Ave., Chicago 80, Ill.
 Send FREE 1960 ALLIED Catalog.

Name _____

Address _____

City _____ Zone _____ State _____



why
ruin
your
valuable
records?

dextrafix

TONEARM CONTROL

lowers the
tonearm
into the
lead-in
groove...
lifts it
after play!

If the tonearm slips out of your fingers and bounces over the record—the record is ruined! If you're unlucky, you will also need a new stylus and possibly a new cartridge.

Why take a chance? DEXTRAFIX® TONEARM CONTROL prevents such accidents! It places the stylus in the lead-in groove—gently and accurately. Then, at the end of play or at any point on the record, it lifts the stylus from the record. And the stylus cannot touch the record until the lift bar is again lowered for the next play. The DEXTRAFIX® TONEARM CONTROL also facilitates "cueing" at any point on the record.

A must for turntables—and record changers with manual operation!



Another quality product by the manufacturers of

LEKROSTAT®
Record Cleaning Kit

dexter chemical corp. • consumer products div. • 845 Edgewater Rd., N. Y. 59

MISCELLANEOUS

BOGEN-PRESTO

• *Bogen Mixer-Preamplifier.* Ideally suited for public-address or studio application, the Bogen Model MXM is characterized by wide frequency range, low distortion, and excellent signal-to-noise ratio. Operating features include output-level meter, speech filters, sockets for plug-in low-impedance input transformers, and variable level markers which permit instant resetting of controls to pre-



determined levels. Frequency response of the MXM is 20 to 20,000 cps \pm 2.0 db. Output is 18 dbm at less than 1.0 per cent distortion. It incorporates five high-impedance microphone inputs, one of which may be used to accommodate a tuner or phono cartridge. All channels may be mixed by means of separate level controls, or may be controlled simultaneously by means of a master gain control. Separate bass and treble controls add to the MXM's flexibility. Cathode-follower output permits operation of the preamplifier any practical distance from the power amplifier with which it is used. Dimensions are 16 1/4" w \times 13" d \times 5 3/8" h. Bogen-Presto Company, Paramus, N.J.

FAIRCHILD

• *Electronic-Drive Turntable.* Available as a single-speed (33 1/3 rpm) machine driven directly from ordinary house-current lines, or as a four-speed unit powered by an electronic-drive circuit, this turntable features a minimum of moving parts. Wow, flutter, and rumble characteristics more than meet NARTB specifications, and exceed requirements for professional playback turntables. Motor is of the hysteresis-synchronous type, isolated equally in all directions against vibration. The drive is a two-step elastic-belt arrangement which provides further protection against vibration. In the electronic-drive



model (412-4), the motor is driven by an electronic-drive unit which supplies power at 30, 60, 81, and 141 cycles, corresponding to 16 2/3, 33 1/3, 45, and 78-rpm. Speeds are switchable and may be varied \pm 3.0 per cent by means of a vernier adjustment. The unit functions normally on either 50- or 60-cps line-voltage frequency. The single-speed model may be purchased originally, and later converted to electronic drive if desired. Fairchild Recording Equipment Corporation, 10-40 45th Avenue, Long Island City 1, N.Y. User net price. Model 412-1 single speed model, \$79.50; Model 412-4 four-speed model with electronic drive, \$246.00.

RECORDS

(from page 66)

It's becoming clearer all the time that the Baroque movement in music was very largely preoccupied with exotic and interesting tone colors, odd "combos," intriguing transcriptions (such as Bach's organ transcriptions of orchestral concerti and his frequent transfer of choral works to instruments and vice versa, as well as sacred music into secular, or the opposite). Before we began to restore the original instruments to their proper places in this older music, we could scarcely understand the extent of this interest in tonal oddities. Now that the violas da gamba, the baroque-style organs, the harpsichords, recorders, high trumpets, and what-not are widely accepted and enjoyed, we have begun to go further and uncover dozens—hundreds—of odd works that previously would have been ignored as obsolete freaks, or at best transcribed into some conventional modern format. Now, we enjoy them for their own high coloration and we feel towards them much as their original listeners did. Interesting change of attitude on our part.

So—this Rosetti and Dittersdorf disc, among dozens and dozens. Rosetti is a "new" rediscovered composer who is actually German; he took an Italian name when that was the popular thing to do. I find this particular opus for two horns not particularly exciting; it is musically insipid, just pleasant, without bite. Sure, horns were limited in scope and relatively clumsy then, but that's not the reason here—look what J. S. Bach did even earlier with horns, as in his Brandenburg Concerto #1. Rosetti just doesn't use enough harmonic salt, at least for my ears.

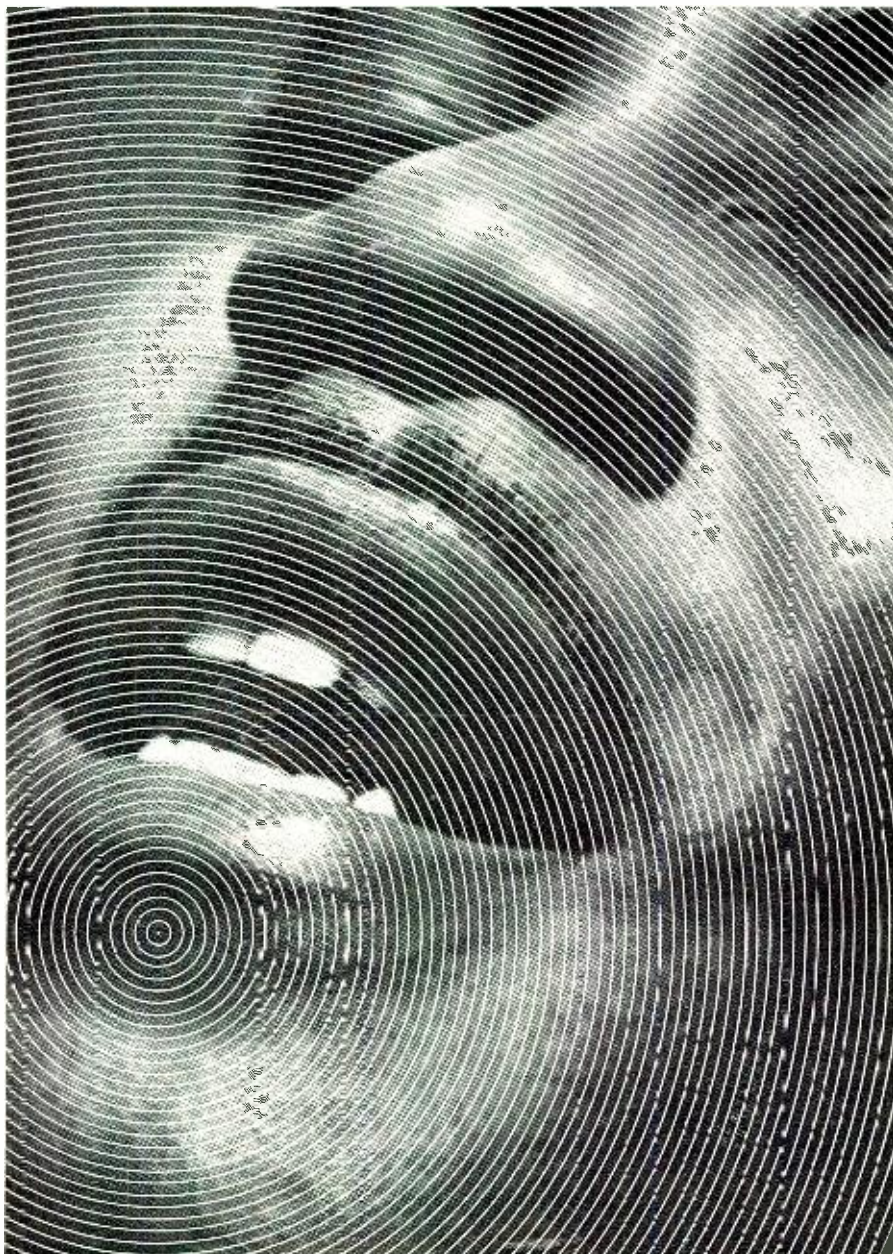
Dittersdorf is better. He has been around in a small way all along; he is of the Mozart-Haydn era and writes a fluent and expressive sort of music, light but relatively substantial. The preposterous combination of viola and string bass works out surprisingly well in his hands. The bass does all sorts of pleasant gymnastics, down in the nether regions, such as you wouldn't have thought possible; the viola is the one that gets buried, thanks to a lot of doubling of its melodies by the higher orchestral violins for brightness. The viola always seems to get into this sort of fix—it's neither high enough nor low enough to stand out on its own, along with other solo instruments.

Bach on the Biggest. Robert Elmore, Atlantic City Convention Hall organ.
Mercury SR 90127 stereo

Biggest organ in the world with some thousands of stops and the power of twenty-eight brass bands (it says here) . . . and, as you may guess, old man Bach on this machine sounds pretty puny unless you jack up your volume to size. Musically there is no point whatsoever to this experiment but music isn't all that is involved; if you want simply to hear this monster well controlled, if you'd like to hear how Mercury manages to cut through a prodigious reverberation via stereo (this being one of stereo's abilities) then you'll enjoy the noise. There's the Toccata and Fugue in D Minor—of course; also a brace of less familiar items, including a whole side devoted to the Toccata, Adagio, and Fugue in C, an ambitious work for any convention hall organ, to put it mildly!

Bach: Complete Organ Works. Toccata and Fugue in D Minor, Passacaglia and Fugue in C Minor, Prelude and Fugue in A Minor, E Minor. Carl Weinrich, Organ of Varfrukyrka.
Westminster WST 14043 stereo

I'll get in a mention every so often of this Westminster series, which goes on towards infinity (in effect) and probably won't get there soon. This one was instructive for me by chance—I happened to play it in an extremely live listening place and found that the characteristic Westminster ultra-close pickup, via numerous mikes, made an excellent effect in such a room. Might have guessed the same—but then, one doesn't think of such matters



*you never
heard it so good...*

The microphone can make or break a sound system or recording set-up . . . and it takes a GOOD microphone to pick up every bit of the sound, without hiss, hum, or howl. The Unidyne suppresses feedback superbly, cuts random noise pickup by 73%! High output makes it ideal for use with low-gain tape recorders and p.a. systems.

UNIDYNE BY **SHURE**

*the world's most famous
ultra-cardioid microphone*

SHURE BROTHERS, INC.
222 HARTREY AVENUE, EVANSTON, ILL.
DEPT. 10-1

unless they are brought forcibly to attention. In a normal living room, Weinrich's records will sound steam-callope-ish, with too much hiss and edge and mechanics, not enough sense of spatial realism. In a live room, the sound is clear and natural, the room liveness compensating for the "super-hi-fi" dryness of the original mixing.

This disc, as you'll note, has a group of Bach king p.n. pieces on it: if the complete works are to be issued, Westminster had better space out these well known items to butter up the hundreds of less-well-known ones! It's always a problem how to issue a series of this sort. Put the big drawing cards out first, to catch the audience, then hope for a follow-up interest when the less familiar works appear on succeeding discs? A problem, any way you do it. Whatever the order of issue is, you'll find Weinrich an efficient, rather hard Bach player, who ploughs straight ahead without much poetry. For my ear, his playing is often on the mechanical side, too much of it just notes played mostly in time. On the organ, the most mechanical of all instruments, phrasing and shaping of the musical lines is all-important—if we are to hear a human being playing music by another human being.

2. CLASSICS

Franck: Symphony in D Minor. Orch. Nat. de la Radiodiffusion Francaise, Beecham. Capitol-EMI G7157

At the age of fifteen I fell for this symphony like a ton of bricks—it seemed the acme of modernity to my slightly naive ear. If I'm right, it was Stokowski's all-out schmaltz that did the trick, on one of those sensational early 78-rpm albums. Nobody in his right ears would call the music modern today and it doesn't lend itself to the all-out treatment any more either: Beecham's emphasis is on businesslike clarity, at a fairly rapid tempo throughout (especially in the middle movement, which used to move at a Romantic snail's pace).

Beecham makes a point of recording French music with a French orchestra (see also his "Fantastic Symphony" on this label) and this at least guarantees that present-day French standards of performance will apply to this very French Romantic music. I don't think the French players themselves are any closer to

this sort of expression today than, say, Sir Thomas' own home British orchestra but the characteristic French instrumental tone color is another matter: here, of course, there has been relatively little change. Slightly nasal, rather prominent woodwinds, hoarse, wobbly French horns, a generally bright, brittle sound—these are proper for Franck and evident in this recording.

Tchaikowsky: Ballet Suites (Swan Lake; Sleeping Beauty). Virtuoso Symphony of London, Winograd.

Audio Fidelity FCS 50010 stereo

Sorry, this item again rubs me somewhat the wrong way, as have its predecessors in the "First Component" series—but you may well feel differently and so I'll explain myself.

The trouble here—for me—is mainly technical. The playing is not exactly incandescent and I don't think either the instrumentalists nor the conductor felt this was an earth-shaking opportunity to overwhelm their listeners. But the music will pass—it's OK. What I don't like is simply the hi fi, because it intrudes.

The records are clearly made for maximum hi fi effect in the microphoning, and in the cutting, which covers a huge dynamic range. From an engineering viewpoint this is fine and a good accomplishment, assuming no distortion in the cut itself. But in practice, two things annoy. First, all but the fanciest systems are going to run into unnecessary trouble reproducing the extremely loud passages here. If nothing else, then sheer needle talk is likely to bother your listening in some cases, so great is the intensity. More serious tracking trouble is obviously likely on many machines. Secondly, the ultra-wide dynamic range is not a musical advantage in terms of home listening.

What? It's not an advantage because though it may come nearer to the actual dynamic range of an orchestra in a concert hall, the home living room is not a concert hall and never will be, nor is the home listening situation at all comparable to the concert situation.

Thus I found that no sooner did I turn the volume up on this record than a passage came along that blasted me out of my seat—too loud for comfort. Then when I turned the music down a bit, came a soft passage where the music—thanks to the usual incidental background noise in the normal home—just vanished into the mud. I came out running and turned it up again, only to be ploughed down by the next blast.

The plain fact is that a somewhat restricted dynamic range, as of the original, is highly desirable in a great deal of recorded music, particularly that of the 19th century with its huge dynamic contrasts. This is part of hi fi thinking and it should be a part—is a part—of any over-all plan for record production. You might as well take advantage of a "weakness" in the system when you can!

Natch, if you appreciate top-quality heavy-groove cutting and want plenty of whomp, you'll enjoy this disc and others in the series. Help yourself, by all means.

R. Strauss: Le Bourgeois Gentilhomme Suite; Intermezzo Waltz Scene. Philharmonia Orch., Sawallisch.

Angel S35646 stereo

Old Strauss's reputation is still on the move—it changes almost daily as we ourselves move away from his times. Not so far back, his very early tone poems were high-modern, his first operas were fine stuff—and everything after about 1912 was just so much bunk and repetition. (He went right on composing until the end of the Second war.) Lately, we've been discovering his very late works with surprise and quite a bit of pleasure; but the middle-period ones now seem to get more saccharine and overblown, more out of style, each year. So it is, for my current ear, with this music.

The "Bourgeois Gentilhomme" suite, after Lully of the 17th century, is less pleasant each time I hear it: the music is pseudo-classical in somewhat the manner as Kreisler's little tid-bits, but enormously bloated—an unctuous "antique" treatment, looking down on the old music as something quaint and musty, "modernizing" its style into grossly overblown Romanticism. It doesn't go down well today,



Audiotape "speaks for itself" in a spectacular recording

—available in a money-saving offer you can't afford to miss!

DETAILS OF THE PROGRAM

The program includes these colorful selections:

Tschaikowsky... Russian Dance
Sibelius..... from Finlandia
de Falla..... Dance of Terror,
Ritual Fire Dance
(El Amor Brujo)
Brahms..... from Symphony No.
4 in E Minor
Khatchaturian... Saber Dance
Stravinsky..... Infernal Dance,
Finale (Firebird
Suite)
Beethoven..... Ode to Joy
(Symphony No. 9
in D Minor)

DETAILS OF THE OFFER

This exciting recording is available in a special bonus package at all Audiotape dealers. The package contains a 1200-foot reel of standard Audiotape (on 1½-mil plastic base) and the valuable "Blood and Thunder Classics" program (professionally recorded on standard Audiotape). For the entire package, you pay only the price of two boxes of standard Audiotape, plus \$1.

HERE'S a reel of musical excitement that belongs on every tape recorder. "Blood and Thunder Classics" is a program of great passages of fine music, specially selected to show you how vibrant and colorful music can be when it is recorded on Audiotape.

"Blood and Thunder Classics" is available RIGHT NOW from Audiotape dealers everywhere. (And only from Audiotape dealers.) Ask to hear a portion of the program. Then, take your choice of a half-hour of rich stereo or a full hour of monaural sound—both at 7½ ips. Don't pass up this unusual opportunity.

audiotape TRADE MARK

AUDIO DEVICES, INC., 444 Madison Ave., N. Y. 22, N. Y.
In Hollywood: 840 N. Fairfax Ave. • In Chicago: 5428 N. Milwaukee Ave.

what with the extensive present revival of vast quantities of this older music in its own terms and with its own dignity.

Actually, the old-music kick is merely an overlay in this Strauss—it can be ignored. What remains, then, is an over-lush, self-conscious self imitation, witty music that is just too puffed up to be witty, brief music that is too bloated to be brief. Give me Ravel, Debussy, even Respighi any day in their various "little" suites—but then, they weren't German.

Later on, Strauss developed a kind of late modesty, a less self-conscious, more sincere style that is increasingly evident in his later works—though they tend to get no shorter; he wasn't modest in the time-sense. His idiom gets progressively more conservative for the casual ear; but actually, it becomes more refined, more concentrated, simpler and, in the end, more truly musical. The Last Five Songs, as they are called, from the late war years just before he died, are masterpieces of melodic and harmonic writing.

So—to end this side-ambly—you'll find this Suite perhaps too sweet, overstuffed, plastered with tek. Nice for awhile, but indigestible. The waltz, from an opera of the twenties, "Intermezzo", is still in somewhat the same idiom, though the absence here of the vocal parts does Strauss an injustice—his operatic voice lines are the crowning glory of his later work.

Æ

COMING HI-FI SHOWS

Sept. 11-13—Milwaukee, Wis., Pfister Hotel. (*Rigo*)

Sept. 11-13—Houston, Texas, Shamrock Hilton Hotel. (*Audio Industry Representatives and Distributors of the Southwest*)

Sept. 18-20—Chicago, 8th Annual High Fidelity Show and Music Festival, Palmer House. (*International Sight and Sound Exposition, Inc.*)

Sept. 18-20—Dallas, Texas, Hotel Adolphus. (*AIRDS*)

Sept. 25-27—Rochester, N. Y., Sheraton Hotel. (*Rigo*)

Oct. 5-10—New York, High Fidelity Music Show, New York Trade Show Building. Presented by the Institute of High Fidelity Manufacturers with "Decorate your home with music" as the theme. (*IHFMA*)

Oct. 15-18—Kansas City, Mo., Hotel Bellevue. (*Hi-Fi Music Guild of Greater Kansas City*)

Oct. 16-18—Detroit, Statler Hotel. (*Rigo*)

Oct. 28-31—Toronto, Ont., Canada, Park Plaza Hotel. (*Dominion High Fidelity Association*)

Oct. 30-Nov. 1—Buffalo, N. Y., Statler Hotel. (*Rigo*)

Nov. 6-8—Seattle, Wash., New Washington Hotel. (*Rigo*)

Nov. 13-15—Portland, Ore., New Heathman Hotel. (*Rigo*)

Nov. 20-22—Philadelphia, Pa., Benjamin Franklin Hotel. (*Rigo*)

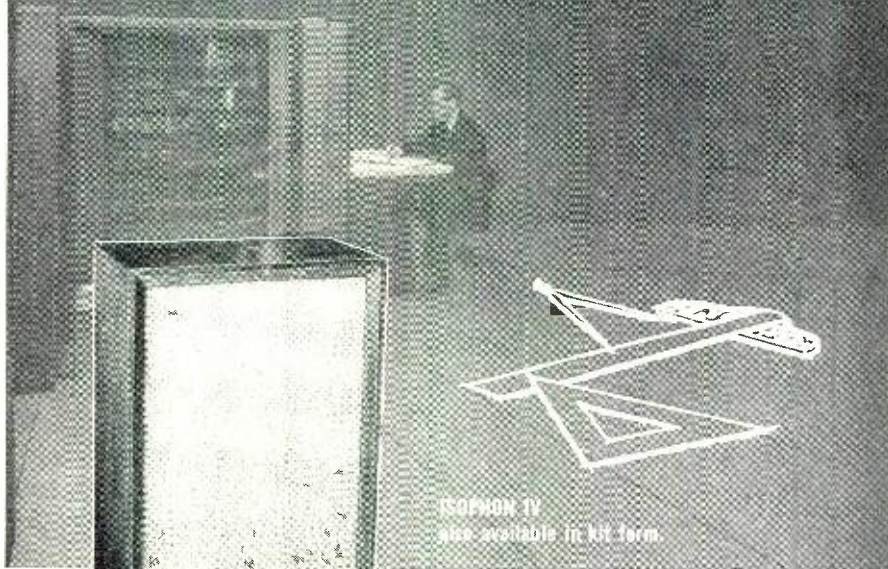
Dec. 4-6—Minneapolis, Minn., Hotel Leamington. (*Audio Div., Paul Bunyon Chapter, ERA*)

Jan. 27-31—San Francisco, Brooks Hall. (*IHFMA*)

Jan. 27-30—Vancouver, B. C., Canada, Hotel Georgia. (*DIFFA*)

Feb. 10-14—Los Angeles, Shrine Exposition Hall. (*IHFMA*)

THE NEW ISOPHON SPEAKER SYSTEM ADDS THE 4TH DIMENSION TO HIGH FIDELITY



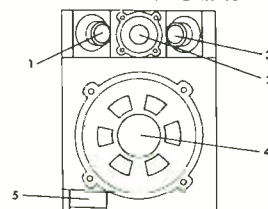
ISOPHON IV also available in KIT form.

Computer by I.B.M./4-way speaker system by Isophon

If your ear is tuned toward perfection... you'll recognize it instantly when you hear the Isophon 4-way speaker system... the first to add this new dimension—created by Europe's largest speaker manufacturer in the finest tradition of world-famous West German craftsmanship—yet available at no more than the cost of a top-quality 2-way speaker system. When Isophon adds a 4th speaker... it truly adds a fourth dimension to your listening experience either monaurally or stereophonically. The new sound it produces is so complete, achieves such fulfillment as only a 4-way speaker system can, that you can actually "see" Isophon sound in your mind's eye... "see" it when you glance at the exterior design which describes itself more adequately than any adjective... and most of all, you'll "see" the new dimension the moment the first notes from Isophon's 4-way speaker system reach your ear.

Write for complete information and list of high-fidelity dealers in your area.

FAMOUS ISOPHON ENGINEER-DESIGNED 4-WAY SPEAKER SCHEMATIC



- 1 High frequency tweeter: HM 10/16.
- 2 Midrange folded horn compression speaker DKT 6.
- 3 High frequency tweeter: HM 10/16.
- 4 Woofer P 37 (25 watt) or Woofer P 30 (20 watt).
- 5 Universal transformer and built-in cross over network for wide range of impedance matching.

ISOPHON SPEAKER DIVISION, ARNHOLD CERAMICS, INC., Dept. A-9
1 East 57th St., New York 22, N. Y. CANADA: 629 DENMAN ST., VANCOUVER 5, B. C.

ISOPHON SPEAKER DIVISION, ARNHOLD CERAMICS, INC., Dept. A-9

1 East 57th Street, New York 22, N. Y.

Gentlemen:

Please send me the following information:

- Complete performance data, specifications and price list of the Isophon 4-way speaker systems.
 Name and address of my nearest Isophon dealer.
 Complete information on the entire line of Isophon high-fidelity and extension speakers.

Name _____

Address _____

City _____

Zone _____ State _____

GRADO

... takes pride in announcing a new Custom Series Stereo Cartridge. The Grado "Custom" was designed for the selective audiophile who desires excellent reproduction at a moderate cost. With its excellent tracking ability and extremely low distortion, the new Custom Stereo Cartridge becomes a perfect companion to the widely acclaimed Grado "Master" Stereo Cartridge. Because of small moving masses and low tracking forces, stylus wear is virtually nonexistent. Grado Laboratories now guarantees all of the stereo diamond stylus for a period of 5 years from date of manufacture.

A greatly improved Grado Tone Arm is now available. It is dynamically balanced and features a new micrometer tracking force adjustment. Stylus force accuracy of tenths of grams may now be achieved with complete simplicity. Also new is a stainless steel arm rest lock. All present Grado Tone Arms can be modified.

Master Stereo Cartridge . . . \$49.50
Custom Stereo Cartridge . . . \$32.50
Micrometer Stereo Tone Arm \$29.95

For further details write to:

GRADO LABORATORIES, INC.

4614 7th Avenue Brooklyn 20, New York
Export-Simonrice, 25 Warren St., N.Y.C.

Audio Engineering Society

ELEVENTH ANNUAL CONVENTION

Following is a complete list of papers to be presented at the fourteen technical sessions.

Monday, October 5.

9:30 a.m. STUDIO AND SPEECH INPUT SYSTEMS

- Philip C. Erhorn, Audiofax, Inc., Chairman.
A Modern Stereo Recording Console.
William Putnam, United Recording Corp.
A Flexible Combination 3-Channel Stereo Microphone and Re-recording Console.
Philip C. Erhorn, Audiofax, Inc.
A New Cardioid-Line Microphone.
Robert C. Ramsey, Electro-Voice, Inc.
The Design and Use of a Double Cardioid Stereophonic Microphone.
A. Jamroz, Northern Electric Co., Ltd.
Modular Design Techniques Applied to a Multi-Channel Recording Room Rack Facility.
John H. Beaumont and Jack A. Bryant, Vanguard Recording Society, Inc.

1:30 p.m. THE TRANSISTOR IN AUDIO CIRCUIT APPLICATIONS

- Paul A. Grace, Raytheon Manufacturing Co., Chairman.
A Signal-Biasing Output-Transformerless Transistor Power Amplifier.
Richard C. Heyser, California Institute of Technology.
Transistor A.C. Amplifier with High Input Impedance: A Survey.
John A. Ekiss, Lansdale Tube Co., Div. of Philco Corp.
Practical Transformerless Complementary-Symmetry Audio Output Amplifiers.
W. F. Palmer and W. Fineault, Sylvia Electric Products Co., Inc.
The Design of a Power Amplifier Employing Diffused Alloy Power Transistors.
Hyman Newman, Bendix Aviation Corp.
Cascade Complementary Amplifier.
H. C. Lin and B. H. White, CBS Electronics.
Transistor Noise at Low Frequencies.
Herbert F. Starke and John S. MacDougall, Raytheon Company.

7:30 p.m. MUSIC AND ELECTRONICS

- Prof. Vladimir Ussachevsky, Columbia University, Chairman.
The Problem of Sound Shaping.
Dr. Hugh Le Caine, National Research Council of Canada.
The Computer as a Musical Instrument.
Dr. John Pierce, Bell Telephone Laboratories.
Some of the Specialized Equipment Developed in Electronic Music Studios.
Prof. Vladimir Ussachevsky, Columbia University.
Electronic Non-Music—Problems of an Orphan Art.
Louis and Bebbe Barron.

Tuesday, October 6.

9:30 a.m. MEASUREMENTS AND STANDARDS IN AUDIO

- Sheldon I. Wilpon, N. Y. Naval Shipyards, Chairman.
New Concepts in Audio Testing and Evaluation.
Felix R. Breyer, American Audio Institute.
The Effect of A. C. Bias Waveform on Harmonic Distortion in Magnetic Tape Recording.
Robert P. Schroeder, American Bosch Arma Corp.
Audio Frequency Measurements in the Missile Age.
C. E. White, AVCO.
A Suggested Method for Measuring Tape Modulation Noise.
James J. Davidson, RCA Radio & Victrola Div.
Fine Resolution Simultaneous Panoramic Analysis.
Robert I. Bernstein, Columbia University and Reinhold Vogel, Federal Scientific Corp.

1:30 p.m. DISC RECORDING AND REPRODUCTION (I)

- Benjamin B. Bauer, CBS Laboratories, Chairman.
Effects of Stylus Size and Record Cleaning Techniques on Phonograph Records.
John H. McConnell, Electro-Sonic Laboratories.
The Talking Book System for the Blind.
Dr. Peter C. Goldmark, CBS Laboratories.
A Pickup for Strictly Compatible Stereo and Monophonic Performance.
Rene Sneyvangers, Fairchild Recording Equipment, Corp.
A Single Element Ceramic Stereo Pickup.
P. E. Sterner, R. B. Gray, and R. Luzar, Erie Resistor Corp.
Practical Aspects of High Fidelity Disc Recording.
Carlos E. R. A. Moura.

7:30 p.m. AUDIO APPLICATIONS (I)

- Rein Narma, Fairchild Recording Equipment Corp., Chairman.
A Survey of Some New Tubes for Audio Output Applications.
R. E. Moe, General Electric Co.
Instant Audio.
Louis G. MacKenzie, Mackenzie Electronics.
Equalized Stereo Preamplifier for Professional Use.
Erling P. Skov, Fairchild Recording Equipment Corp.
A Unique Push-Pull Stereo Magnetic Pickup.
E. R. Madson, Bang & Olufson, Denmark.
The VU Meter—Victory Over the Uninformed.
Oliver Berliner, UltrAudio Div., Oberline, Inc.
High Performance All-Transistor Stereo Preamplifier.
George Young and Sol Heyton, Transistronics, Inc.
A Compatible Monophonic-Stereophonic Phonograph System.
Walter L. Welch, New York College of Forestry.

Wednesday, October 7.

- J. M. Hollywood, CBS Laboratories, Chairman.

9:30 a.m. REVERBERATION

- Reverberation Facilities at CBS Radio.**
Henry Korke, CBS Radio.
Synthetic Reverberation.
Harry F. Olson and John C. Bleazey, RCA Laboratories.
Architectural Acoustics and Recording.
Russell J. Tinkham, Ampex Corp.
Acoustics of Sound Reproduction in the Home.
Harry F. Olson and Herbert Belar, RCA Laboratories.
Room Acoustics and Sound System Design.
David L. Klepper, Bolt, Beranek, and Newman, Inc.

1:30 p.m. MAGNETIC RECORDING AND REPRODUCTION (I)

- Walter H. Erikson, RCA Laboratories, Chairman.
Properties of Base Materials Used for the Manufacture of Magnetic Recording Tape.
Edward Schmidt, Reeves Soundcraft Corp.
Quality Control in Magnetic Tape Manufacturing.
Robert D. Browning, Orradio, Inc.
The Place of Magnetic Tape in the Recorder System.
William Pink, Orradio, Inc.
The Tape-Head Relationship in Multi-Track Recording.
Frazer E. Leslie, Ampex Corp.
The 120 ips Tape Duplicator for Four-Track Commercial Stereo Tapes.
R. A. Isberg, Ampex Corp.

7:30 p.m. MAGNETIC RECORDING AND REPRODUCTION (II)

- Walter H. Erikson, RCA Laboratories, Chairman.
- A Full-Track Stereophonic Magnetic Record-Reproduce Head.**
William S. Latham, USN Underwater Sound Laboratory.
- The Use of 35-mm Sprocket-Type Magnetic Film in Recording Phonograph Masters.**
John G. Frayne and J. W. Stafford, Westrex Corp.
- Some New Data on Frequency Response of Magnetic Recorders for Audio.**
John McKnight, Ampex Corp.
- A New Equalization Characteristic for Master Tape Recording.**
A. A. Goldberg and Emil L. Torick, CBS Laboratories.
- Visible Magnetic Recordings.**
W. P. Guckenberger, CBS Laboratories.
- Magnetic Characteristics of Recording Tapes and the Mechanism of the Recording Process.**
J. G. Woodward and E. Dealla Torre, RCA Laboratories.

Thursday, October 8.

9:30 a.m. STEREO (I)

- R. C. Moyer, RCA Victor Record Div., Chairman.
- Why Stereo? The Philosophy of Multi-Channel Recording of Music.**
John G. McKnight, Ampex Corp.
- Status Report of National Stereophonic Radio Committee.**
Charles J. Hirsch, Hazeltine Corp.
- Stereophonic A.M. Broadcast Transmission.**
J. M. Hollywood and M. K. Kronenberg, CBS Laboratories.
- Stereophonic Display Patterns.**
Benjamin B. Bauer and G. W. Sioles, CBS Laboratories.
- Signal Mutuality and Cross Talk in Two- and Three-Track Three-Channel Stereo Systems.**
Paul W. Klipsch, Klipsch & Associates.

1:30 to 4:00 p.m. only. STEREO (II)

- R. C. Moyer, RCA Victor Record Div., Chairman.
- The Subjective System Approach to High-Quality Home Music and Vocal Reproduction.**
H. R. Finney, Radio Frequency Laboratories, Inc.
- Perception of the Stereophonic Effect as a Function of Frequency.**
W. H. Beaubien, General Electric Co.
- Is Standardization of Stereo Recording Procedures Possible?**
Dr. Fritz A. Kutner, Musurgia Records.

6:00 p.m. ELEVENTH ANNUAL BANQUET

Friday, October 9.

9:30 a.m. AUDIO APPLICATIONS (II)

- S. Edward Sorensen, Columbia Records, Chairman.
- A Variable Transmission Network for Audio Signals.**
Jacob Klapper and Cyril M. Harris, Electronic Research Laboratories.
- Photo-Sensitive Resistor in an Overload-Preventing Arrangement.**
J. Rodrigues de Miranda, N. V. Philips Gloeilampenfabrieken, Eindhoven, Nederland.
- Techniques in Audio Transformer Design.**
W. H. Lawall, Essex Wire Corp.
- Design & Development of an Engineering Report.**
George P. Goodall, Ampex Corp.

1:30 p.m. LOUDSPEAKERS

- Abraham B. Cohen, Advanced Acoustics Company, Chairman.
- An Unusual Application of a High-Frequency Unit.**
Charles D. Lindridge.
- A Modulated Compressed-Air Loudspeaker for the Reproduction of High-Level Speech or Noise.**
A. L. Witchey, Radio Corporation of America.
- A New High-Frequency Speaker for High-Fidelity Systems.**
Earl Matsuoka, University Loudspeakers, Inc.
- A Five and One Half Octave Complementary Driver-Network System for Reproduction of High Frequencies.**
William H. Thomas, James B. Lansing Sound, Inc.
- New Stereophonic Projection Console.**
Benjamin B. Bauer and G. W. Sioles, CBS Laboratories.

7:30 p.m. Symposium on Techniques in Production of Stereo Tape and Discs.

**11th ANNUAL
CONVENTION AND EXHIBITS
OF THE
AUDIO
ENGINEERING
SOCIETY**

Showing Professional Audio Equipment for Studio
and Laboratory

OCTOBER 5th THROUGH 9th

AT THE HOTEL NEW YORKER, 34TH STREET AND
EIGHTH AVENUE, NEW YORK CITY, NEW YORK

SEVENTY PAPERS • Studio and Speech Input Systems • Transistor in Audio Circuit Applications • Music and Electronics • Measurements and Standards in Audio • Disc Recording and Reproduction • Reverberation • Magnetic Recording and Reproduction • Stereo • Audio Applications • Loudspeakers • Symposium on Techniques in Production of Stereo Tape and Discs.

SESSIONS 9:30 a.m. and 1:30 p.m. daily, also 7:30 p.m. Mon.,
Tues., Wed., Fri. Annual Award Banquet Thurs. evening.
EXHIBITION noon to 6:45 p.m. Mon. through Fri.

(Runs concurrently with IHFM High Fidelity Show)

Program available from

AUDIO ENGINEERING SOCIETY

P.O. Box 12, Old Chelsea Station, New York 11, New York



Now, because of direct factory representation, it no longer pays to buy anything but the best...Neumann.

Effective September 1, 1959

U-47 U-48 - S365 KM-54a - S435 KM-56 - S465
 KM-53a - S415 SM-2 - S815

Of course, unconditionally guaranteed for 1 year.



Gotham Audio Sales Co., Inc.
 2 West 46 St. • N. Y. 36, N. Y.

Circle 86A

AMPLIFIER

(from page 46)

erally have no advantages while the potentials of noise introduction are increased. In the schematic, Fig. 2, such a circuit is employed; in one channel being variable with six equalizer positions for use with monophonic records, and although at least theoretically it should be duplicated in the other channel (and may be) for use when the "compatible" stereo cartridge is employed with monophonic discs, the simple equalizer network for the RIAA curve between the stages of the second channel preamp, in practice, was acceptable. Figure 3 is the basic arrangement of the equalizer network of this between-the-stages type, with a table of components to permit construction of the various equalizer networks required by one for his particular library of records.

While wirewound resistors are specified at all places where their use will contribute to lowering the noise-occasioned by the use of a.e. for filament heating, their values and the values of the bypass capacitors, more importantly, have been chosen to provide a very rapid attenuation of all signal below 30 cps without noticeable effect upon the audio spectrum. Two-watt, or larger, low-noise carbon resistors may be substituted with reasonably satisfactory results if the specified wirewound resistors are unavailable.

The original "expression" circuit designed by Johnson, employed a metal

Coral

**EXCELLENT!
 LOW COST!
 RAPID DELIVERY!
 VARIOUS KINDS!**

HORN TYPE TWEETER

SQUAWKER for MIDDLE RANGE (6 1/2")

DIVIDING NETWORK for 3 WAYS

MOST POWERFUL WOOFER (15")

High Quality Better than European Products

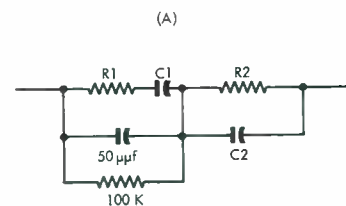
From 2 1/4" (small size) to 15" (large size) all Hi-Fi Speakers are ready for delivery.

Catalogues & Explanation Sheets Free

FUKUYO SOUND CO., LTD.

25-2 Horifune, Kita-ku, Tokyo
 Cable: CORALFUKUYO

Circle 86B



(B)

CURVE	C1	R1	C2	R2
RIAA	.001	0	.002	OPEN
NARTB	.001	0	.003	OPEN
LON FFRR	.0002	47 K	.004	OPEN
LON FFSS	.001	47 K	.002	OPEN
AES	.0005	0	.004	OPEN
RCA ORTHO	.00075	0.5 M	.0032	1 Meg.
COL 33 1/3	.001	0	.003	820 K
COL 78	.001	0	.005	OPEN
RCA 78, 45	.0005	60 K	.003	OPEN

Fig. 3. (A) Basic equalizer network, and (B) component values for various equalization curves.

pentode, 6SG7, for the amplifier stage of the "side" circuit to provide sufficient gain for bias control of the next tube, after rectification; and a 6SK7 as the tube for bias control, corresponding to V_3 in the schematic. In selecting this tube, 6SK7, although very little gain was needed and the original circuit showed it to be triode connected, he felt that the variable μ characteristic of the 6SK7, due to the peculiar grid construction, was of advantage for this specific use. In exploring the potentials of Johnson's circuit, and in experimenting for the adaptation of his basic principles to problem of balancing the dynamic range in stereo reproduction, it was found that the use of a single triode stage in place of his 6SG7 would, with other changes in the component values, result in sufficient gain to provide enough rectified bias-control voltage for such requirements, especially since not only does the circuit provide controllable amounts of volume expansion, but also controllable amounts of volume compression—this compression potential being important for, strangely, occasionally the disparate erosion of the two stereo sound producing parts of the recording groove *seems* to result in a slight increase in the dynamic range of one channel and a loss in the other. (This phenomenon occurred in the recordings of only one manufacturer of the several tested.)

Likewise, for this particular adaptation of the principles of Johnson's "expression" circuit, it was found that a single triode, such as one section of the 6SL7, having a fixed negative bias of one volt, was eminently suitable to replace the 6SK7 of his circuit. But for those who desire greater efficiency from the bias-control circuit than that afforded by the triode arrangement in the schematic, it is feasible to employ two 6F7 tubes in place of the twin triodes, V_3 and V_5 , arranged so as to use the pentode sections for the amplifier in the bias-control circuit, and the triode sections for the stage for bias control, Fig. 4, with the 6H6's interposed between the two sections of the 6F7. 6U8's by reason of their cathode-bias characteristic are not suitable for this function, despite the fact that they consist of a pentode and a triode in the same envelope.

Generally, however, the use of 6SL7's for both the side amplifier in the bias-control circuit and for the immediately following stage, will provide sufficient range of volume expansion and volume compression for the most exacting needs of dynamic range balancing, of restoring dynamic range to monophonic discs, and of correcting dynamic range inequalities. Nevertheless, some who listened critically to the "panphonic" control amplifier, during the developmental

STEREO ON DISPLAY

in your city...

HIGH FIDELITY



SHOWS

with the newest and latest in stereo high fidelity
from leading high fidelity manufacturers

Don't miss these public showings of hi-fi equipment . . . from the most economical units for the budget-minded to spectacular home music theaters . . . compare and enjoy them all.

• Complete Stereo and Monophonic High Fidelity Systems

• Amplifiers — Pre-Amplifiers — FM-AM Tuners — Turntables — Record Changers — Phono Cartridges — Microphones — Music Control Centers — Speakers — Speaker Enclosures — Equipment Cabinets — Finished and Assembled or Do-It-Yourself Kits

THREE FULL DAYS OF CONTINUOUS DEMONSTRATIONS

FRIDAY, SATURDAY, AND SUNDAY

FROM 1 P.M. to 10 P.M. FOR EACH SHOW

RIGO HIGH FIDELITY MUSIC SHOWS, Fall 1959

Milwaukee	September 11-12-13	Pfister Hotel
Rochester, New York	September 25-26-27	Sheraton Hotel
Buffalo, New York	October 30-31-Nov. 1	Statler Hotel
Seattle	November 6-7-8	New Washington Hotel
Portland	November 13-14-15	New Heathman Hotel
Philadelphia	November 20-21-22	Benjamin Franklin Hotel

ADMISSION 75¢

RIGO ENTERPRISES, INC. 500 N. Dearborn, Chicago 10, Ill.

**WHERE
THERE'S
A FINE
TAPE
RECORDER...**



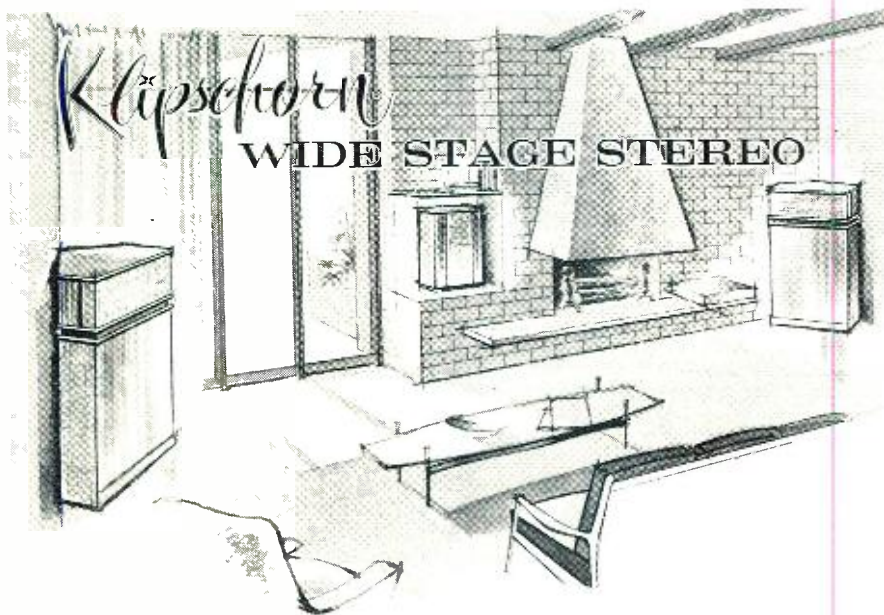
there's
irish
ferro-sheen tape

note to
PENTRON owners

To insure optimum recording quality with your machine, the recommended tape is **irish** Long Play #602. Send for technical bulletin.

**ORR INDUSTRIES
INC**
Opelika, Alabama

EXP: 458 B'way, N. Y. C. CAN: 50 Wingold Ave., Tor.
Circle 88A



Klipschorn
WIDE STAGE STEREO

REAFFIRMED... at the Brussels Exposition... the American Exhibition in Moscow... and two request performances for Bell Telephone Laboratory personnel... the superiority of KLIPSCH derived three channel stereo and KLIPSCH speakers in *faithful tonality, solidity of sound curtain, and accurate geometry.*

Write for information.

Klipsch and Associates, Inc.
HOPE, ARKANSAS

Circle 88B

work, felt that the use of a 6NS7, despite its high fixed grid bias, for V_3 produced greater realism and was less critical in operation. Should this tube be preferred in future construction, the values of R_{17} and R_{25} should be changed to 470 ohms. If miniature tubes are preferred, 12AX7's and 12AU7's can be substituted for the 6SL7's and 6SN7 respectively without change in component values.

As stated above, the RC values in the "expression" circuit are such that the grid bias voltage of V_3 follows, more or less, the average audio levels rather than the audio itself, but in the "panphonic" control amplifier the time constants are less critical than in the original design. However, even though the RC values given (for R_{41} , R_{50} , C_{30} , C_{31} , C_{25} , C_{26} , C_{28} and C_{29}) have proven suitable for most program material, and since the usual 10 per cent commercial components were used, the actual selection of these RC values should be determined by critical listening. R_{41} - C_{30} and R_{50} - C_{31} largely determine the attack time of a musical note, and C_{25} - C_{26} and C_{28} - C_{29} in ratio with the center-tapped pots affect the fall-off time (and hence is variable, within limits, as opposed to the fixed attack time); their proper value determination, therefore, although not critical is nonetheless important, and errors in the direction of prolonging the fall-off time may result in "cloudied" reproduction, especially of recordings of large orchestrals, chorals, and so forth, where there must be a "clean" blending of instruments or voices. Similarly, errors in the direction of prolonging the attack time will distort such instruments as the piano, and other "plucked-string" instruments, as well as those of the percussion group.

Operation

While this control unit may seem to be rather elaborate when compared to the preamp-control units in most commercially built stereo rigs, its superiority is ample justification for its construction and use; and even though its control-panel may resemble, in complexity, that of a broadcast studio, in actual operation it is fairly simple since, in usual use, only those controls are employed that are necessary to the operation of any good quality stereo rig: selection of the proper equalizer position, adjustment of the loudness and of the treble and bass controls to the acoustics of the room and to listener preferences. The expansion-compression controls present no great difficulty, since their adjustment is dependent upon the degree of expansion or compression needed or desired, to enhance the "presence" and realism of spread-sound reproduction of monophonic program material or to balance inequalities in dynamic range

in stereo reproduction. But it must be borne in mind that too much volume expansion will produce sharp distortions of the sound peaks, and similarly too great a degree of compression will, even when indicated, obliterate the fidelity of the recording. Properly and judiciously used, however, in combination, the expansion-compression functions of the unit will effectively restore the dynamic range balance with minimum loss of fidelity, although with very old stereo discs such must be a compromise.

The inclusion of pot, R_{12} , to vary the input resistance load, is of course optional, but the author has found that some means of simple design for varying the loading of magnetic cartridges is desirable, since a reduction of the resistance load lowers the rolloff, before preamplification, thus reducing surface noise—at the expense, of course, of fidelity—of old records, of which there are many that are still worth listening to. Hence the inclusion of this pot in the design of the preamp stages is a practical device for making usable many pre-hi-fi recordings that are too noisy for playing on the ultra sensitive equipment of most home music systems.

As designed, this panphonic control stereo amplifier, while elaborate, will nevertheless, provide such greatly increased realism to monophonic program materials and aid in preventing the destruction of presence and realism in stereo discs as they age with use, by providing a means of maintaining the dynamic range balance of the two channels.

AE

PARTS LIST

- C_{11}, C_{23}, C_{65} 25 μf , 25 v, electrolytic
- C_{14}, C_{16}, C_{18} .05 μf , 400 v, paper
- C_{21}, C_{23}
- C_{31}, C_{35}, C_{109}
- $C_{111}, C_{121}, C_{151}$
- C_{17}, C_{19}, C_{213}
- C_{27}, C_{39}, C_{31} 0.1 μf , 400 v, paper
- C_{7}, C_{21}, C_{22}
- C_{33}, C_{37}, C_{47} .001 μf , 400 v, paper
- C_{8}, C_{20}, C_{25}
- C_{26}, C_{28}, C_{29} .01 μf , 400 v, paper
- C_{9}, C_{13}, C_{37} .02 μf , 400 v, paper
- C_{38} 470 μf , ceramic
- C_{33}, C_{44} .002 μf , ceramic
- C_{35}, C_{36} 760 μf , ceramic
- C_{38} 600 μf , ceramic
- $C_{39}, C_{40}, C_{41}, C_{45}$ 10 μf , 450 v, electrolytic
- $C_{16}, C_{38}, C_{39}, C_{50}$ 50 μf , ceramic
- C_{43} Phono jacks
- J_1 to J_7 Clocked circuit phone jacks (optional, see text)
- J_8, J_9
- R_1, R_2, R_{23}, R_{25} 100 k ohms, 1 watt
- R_{11}, R_{19}, R_{60} 220 k ohms, 1/2 watt
- $R_2, R_{29}, R_{61}, R_{62}$ 33,000 ohms, 1 watt
- R_4, R_{13}
- $R_5, R_{15}, R_{20}, R_{21}$ 47,000 ohms, 1 watt
- R_{31}, R_{30}, R_{33} 27,000 ohms, 1/2 watt
- R_6, R_{36} 22,000 ohms, 1 watt, matched
- R_7, R_{18} potentiometer, 500 k ohms, linear taper
- R_8, R_9, R_{21}, R_{23} ganged potentiometers, 1 meg, audio taper
- R_{10}, R_{21} potentiometer, 50,000 ohms, audio taper (or 100 k ohms, linear taper, with 100 k resistor 1/2-watt between end taps)
- R_{12} 3900 ohms, 1/2 watt
- R_{13} 470 ohms, 2 watts, wirewound
- R_{14}, R_{26} 470 ohms, 1/2 watt
- $R_{15}, R_{27}, R_{27}, R_{39}$ 1000 ohms, 1 watt, wirewound
- R_{16}, R_{28}, R_{38}

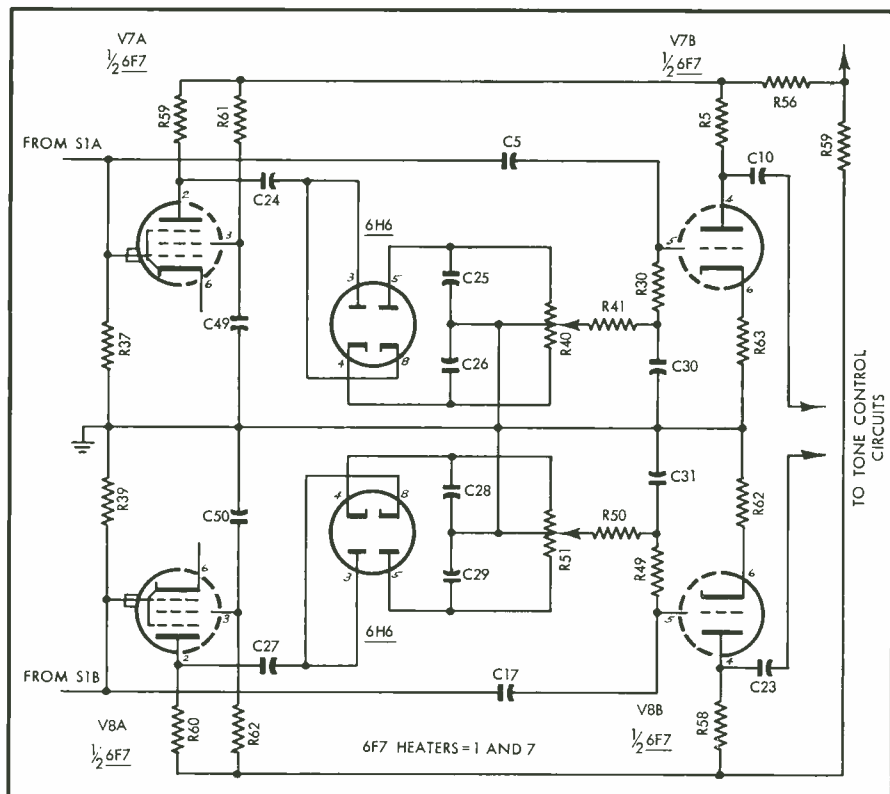


Fig. 4. Modified expression circuit giving slightly different performance.

DYNACO B&O

STEREODYNE II PHONO PICKUP



New, hum free push pull magnetic stereo pickup of superb characteristics. True stereo reproduction because of wide channel separation. Smooth response and light tracking combine to give clean natural sound from both stereo and monophonic recordings. Mounts in all standard arms. With replaceable diamond stylus—\$29.95* net.

B&O TONE ARM



MODEL TA-12

Integrated Arm and Cartridge

Combined arm and Stereodyne II Cartridge for optimum results. Dynamically balanced, gimbal-pivoted arm permits 2 gram tracking. Simple to mount, handsome appearance, and outstanding in performance. Only \$49.95* net.

*Slightly higher in the West

Available from leading high fidelity dealers everywhere

DYNACO, INC.

3914 Powelton Ave., Phila. 4, Pa.
Cable address: Dynaco, Phila., Pa., U.S.A.

New PROFESSIONAL 55

the Ultimate
STEREO CARTRIDGE

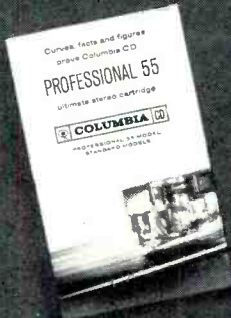


COLUMBIA 

Professional 55 . . .
Cost \$28.95

This new transparent cartridge is the professional's version of the popular Columbia CD. A high-compliance model with excellent transient response, it uses a .5-mil diamond stylus and is designed for transcription turntables. Comes complete with 4 miniaturized plug-in equalizing networks for low- and high-level inputs.

CURVES, FACTS AND FIGURES PROVE IT



Ask for Bulletin E-331. Check the Professional 55's superiority in: linearity . . . separation . . . needle point impedance . . . low mass . . . freedom from hum and distortion . . . output level . . . and ruggedness.

YOUR OWN EARS PROVE IT

Better still. Your own ears will convince you the Professional 55 is your best investment. Ask to see and hear it at your distributor's today!

CBS ELECTRONICS

A Division of
Columbia Broadcasting System, Inc.
Danvers, Massachusetts
Distributed in Canada by
CANADIAN GENERAL ELECTRIC CO., LTD., TORONTO

R_{17}, R_{23}	1800 ohms, 1 watt. wirewound	R_{17}	1 megohm, 1/2 watt
R_{19}, R_{25}	22,000 ohms, 1 watt. matched	R_{23}, R_{25}, R_{26}	22,000 ohms, 1 watt
R_{11}, R_{13}, R_{14}		R_{26}, R_{27}	10,000 ohms, 1 watt
R_{15}, R_{18}	4.7 meg, 1/2 watt	R_{27}	68 ohms, 1/2 watt
R_{22}	100 k, 1/2 watt	S_1, S_2	2-pole, 6 position switch, (Mallory 3126J)
R_{20}, R_{16}, R_{19}	510 k ohms, 1/2 watt	V_{13}, V_{14}	6U8
R_{10}, R_{21}	potentiometer, 500 k ohms, linear taper centertapped (may be 1 megohm, see text)	V_{15}, V_{16}	6SL7 (or 12AX7)
		V_{17}	6SN7 (or 12AU7)
		V_{18}, V_{19}	6H6

TEN-WATT AMPLIFIER

(from page 42)

The low-frequency power handling capacity shows up when sharp drum beats or bass violin pizzicati are passed without amplifier breakup. The high damping factor, Fig. 5, controls any unwanted cone movement. Some modern speakers, however, require lower damping factors for optimum results. If you are interested in lowering the damping factor of the amplifier, remove the connection from the "O" output terminal (see Fig. 7) to the common secondary lead (which is left connected to the ground bus) and ground it through a resistor of no more

than 1 ohm. The voltage feedback should now be decreased, by increasing the value of R_1 and decreasing the value of C_{11} , keeping the product of the two constant. You will have to experiment with different ratios of current and voltage feedback to get the required value of internal resistance. In any case, don't use more than 1 ohm for the current feedback resistor, or too much power will be dissipated in it. Use a two-watt or larger resistor.

Figure 6 shows the underside of the amplifier. We used an 8" x 12" x 3"

Fig. 5. Curve of damping factor vs. frequency.

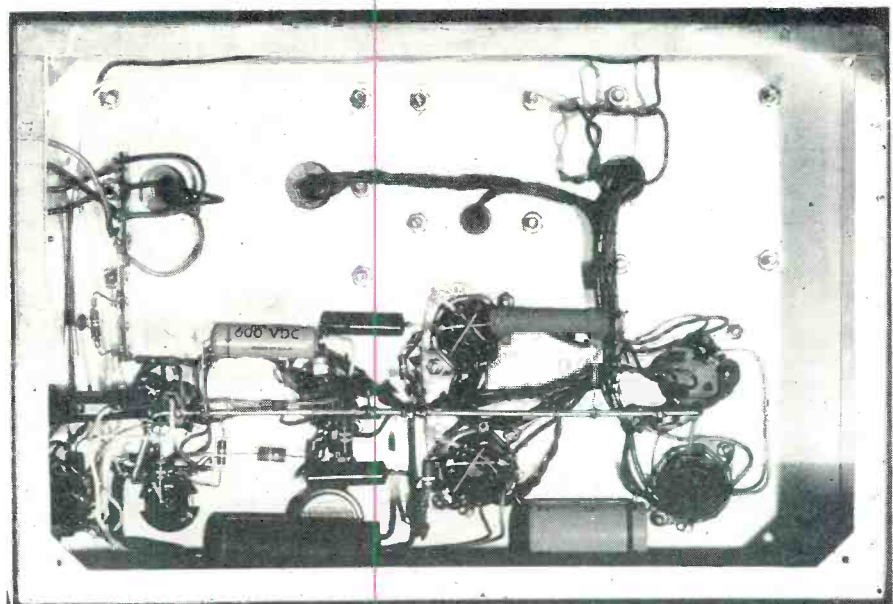
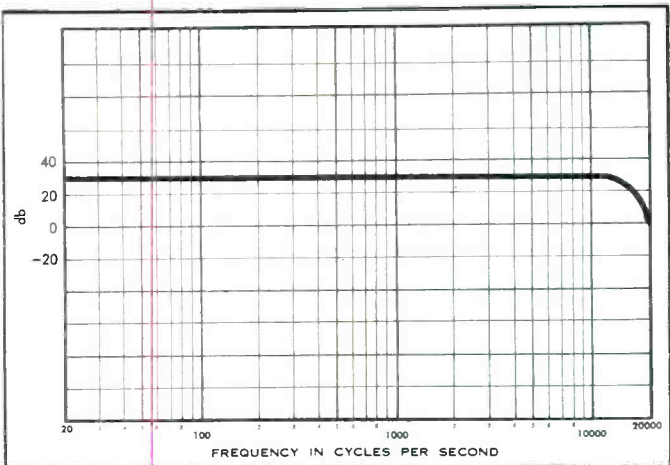


Fig. 6. Under-chassis view of the amplifier to show placement of parts.

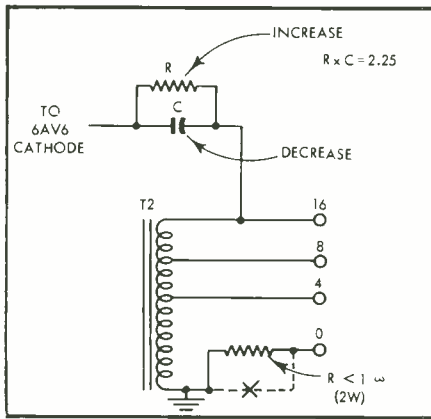


Fig. 7. Detail of changes to output circuit to lower damping factor.

chassis, and there is plenty of room underneath it. The balance control is a locking type, to eliminate tampering after it has been set. The only precaution to observe in wiring is to keep heater leads twisted away from low level audio circuits to eliminate hum. Use direct point-to-point wiring throughout, and follow our layout (Fig. 1) for easiest construction as well as nice overall appearance. The output tubes are being operated at very near maximum ratings, so give the amplifier plenty of room to breathe.

Remember when you use it that this is a 10-watt amplifier, and, although it will outperform many higher powered amplifiers, it won't drive low-efficiency loudspeakers in a 20' x 30' living room. For efficient speakers, however, it can't be beat. Æ

PARTS LIST

- C_1 33 μ f, ceramic
- C_2, C_3 .02 μ f, 600 v, paper
- C_4 250 μ f, 50 v, electrolytic
- C_5, C_6, C_7 20-40-30 μ f, 450 v, electrolytic
- C_8 20 μ f, 450 v, electrolytic
- C_9 .05 μ f, 400 v, paper
- J_1 Phono jack
- J_2 Octal socket
- L_1 6-H, 160-ma filter choke (Triad C-12A)
- R_1 68,000 ohms, 1/2 watt, 5%
- R_2 2700 ohms, 1/2 watt, 5%
- R_3 470k ohms, 1/2 watt, 5%
- R_4 10,000 ohms, 1/2 watt, 5%
- R_5 470k ohms, 1 w, deposited carbon
- R_6 1.0 meg, 1/2 watt, 5%
- R_7, R_8, R_9 18,000 ohms, 1 watt, 5%
- R_{10} 20,000-ohm linear potentiometer, (locking, see text)
- R_{11}, R_{12}, R_{13} 220k ohms, 1/2 watt, 5%
- R_{14}, R_{15} 22,000 ohms, 1/2 watt, 5%
- R_{16} 250 ohms, 5 w, wirewound
- R_{17} 10,000 ohms, 1 w, 5%
- R_{18} 5600 ohms, 1 watt, 5%
- T_1 Power transformer, 550 v, c.t., 110 ma; 5 v at 2 a; 6.13 v, c.t., 5 a. (Triad R-12A)
- T_2 Output transformer. Acrosound TO-250
- V_1 6AV6
- V_2 6CG7
- V_3, V_4 6BX7GT
- V_5 GZ34

An Invitation
to selected audiophiles demanding the ultimate in stereo reproduction*

The new **Connoisseur** internationally honored as the finest turntable in the world, has now been modified to fulfill the exacting requirements of stereo reproduction.

We cordially invite you to visit your dealer and observe the remarkably silent precision operation of the Connoisseur as it plays your favorite selection in stereo... with intense and majestic depth.

*Obviously... meets all demands for non-stereo record reproduction.

CONNOISSEUR MODEL B
TRANSCRIPTION TURNTABLE
MADE IN ENGLAND

Be sure and see (and hear) the new Connoisseur Stereo Arm and Pickup with sensational features. One demonstration and you will be convinced.

ERCONA CORPORATION
(Electronic Division)
16 W. 46 Street, Dept. 44 New York 36, N. Y.

Circle 91A

**JUST WHAT IT TAKES
TO MAKE THE SHOW...**

**THE EASY TO READ — EASY TO OPERATE
STUDIOSOUND S-301-R PROGRAM EQUALIZER**

Assure the success of your shows or recording sessions with the always dependable S-301-R... check these top performance StudioSound specifications:

- LOW-FREQUENCY EQUALIZATION: 12 db in 2 db steps at 100 cps & 40 cps (shelving characteristic).
- HIGH-FREQUENCY EQUALIZATION: 12 db in 2 db steps at 3, 5, 7, 10 and 15 kc. (shelving characteristic).
- HIGH AND LOW FREQUENCY ATTENUATION: 16 db in 2 db steps.

This star performer has built-in flexibility, it's available complete on one panel or in money saving kit form.

Other fine StudioSound components vital to a good show are: StudioSound Filters, Pads and Networks. Special components made to order. For further information contact:

STUDIO SUPPLY CO.
711 So. Victory Blvd. Burbank, California Box Z-9-59

Circle 91B

NOW...enjoy your HI-FI OUTDOORS
 PATIO, GARDEN, TERRACE, PORCH



with the new **WT-6**
ATLAS HI-FI
COAX-PROJECTOR

all-weather construction...install it, forget it!...
 or take it with you wherever you listen.

True HIGH FIDELITY TWO-WAY system —not just a "compromise" of two horns coupled to a single diaphragm. The WT-6 comprises a weather-proof cone type driver (with 6-inch throat) coupled to its individual woofer horn; a separate pressure-type driver loaded to its separate tweeter horn. The built-in crossover electronic filter supplements the electro-mechanical frequency-limiting characteristics of the 2 individual reproducers — providing for smooth frequency division as each speaker functions within its engineered range of frequencies.

All-weather . . . high efficiency . . . compact . . . for all indoor and outdoor uses . . . universally adjustable "U"-type rugged steel mounting . . . finished in high temperature baked modern beige enamel.

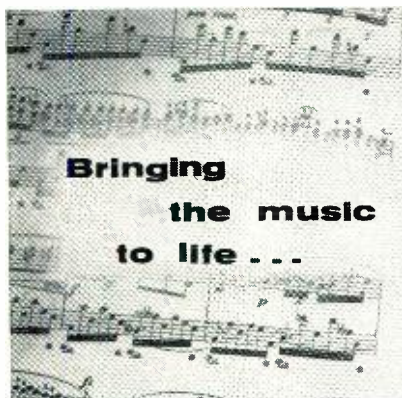
POWER RATING 15 watts continuous
FREQ. RESP. 140-15,000 cps
IMPEDANCE 8 ohms. **DISPERSION** 120°
DIMENSIONS bell opening 15", overall depth 12"

See the WT-6 at your local distributor. Send for catalog A-9

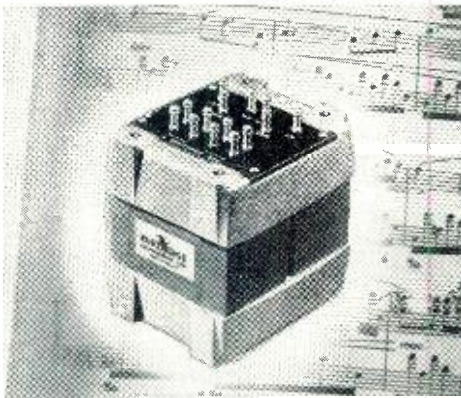
ATLAS SOUND CORP.
 1449 39th St., Brooklyn 18, N. Y.



Circle 92A



Bringing
the music
to life . . .



BRITISH PRECISION WORKMANSHIP

Guarantees Finest Hi-Fi Reproduction

The secondary is brought out as four separate sections which may be connected in series or parallel to match speaker impedances of 0.95, 3.8, 8.5 and 15 ohms by this arrangement.

- Each half primary is brought out to terminals as separate windings and is tapped for distributed load performance.
- Latest grain orientated cores. Fully interleaved.

5200 Series — for use in 20 or 35 watt amplifiers with distortion less than 1%. Available in 4 models

Model	Plate to Plate Load	Tapped at	
P5201	9 — 12K ohms	43%	\$25.00 NET
P5202	7 — 9K ohms	43%	
P5203	5 — 7K ohms	43%	
P5204	3 — 5K ohms	20%	

5300 Series — for use in 35 to 50 watt amplifiers with distortion less than 1%.

Model	Plate to Plate Load	Tapped at	
P5351	9 — 12K ohms	43%	\$30.00 NET
P5352	7 — 9K ohms	43%	
P5353	5 — 7K ohms	43%	
P5354	3 — 5K ohms	20%	

Partridge
TRANSFORMERS

Write for Free Brochure and
 Name of Nearest Dealer

Sole U.S. Rep. **M. SWEDGAL** 258 Broadway, New York 7, N.Y.
 Circle 92B

92

AUDIO TECHNIQUES

(from page 6)

the center winding form, as shown in Fig. 3. This will produce fifteen slits in each side of the winding form.

Take a ¼-inch machine bolt 4 inches long and slip the three pieces of the winding form onto the bolt. Put strong glue on the contacting surfaces and then tighten the nut on the bolt until most of the glue has oozed out. Wipe away any excess and let the form rest for 24 hours. (Actually, this resting time will depend upon the type of glue used. There are some excellent glues available today which will set in 20 minutes.)

An improvised crank or winding handle is screwed on temporarily to one of the unslitted sides. Then the nut is removed from the bolt and the threaded end of the bolt is clamped securely in a vise, the body of the bolt acting as an axle for the winding form.

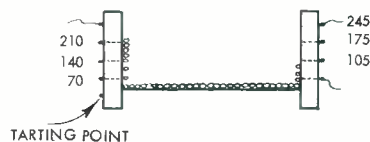


Fig. 4

Winding: (Fig. 4). Pull a ¾-inch length of the No. 16 enamelled wire through one of the slits so that it points outward from the form and label it "starting point". Start to wind slowly and evenly, meanwhile counting every turn of the crank handle, until two layers of 35 turns each have been completed. At the 70th turn pull the wire to the outside of the form and slip it through one of the slits and return it to the central core through the next slit. Mark "70" close to the wire on the outside of the form to know that the exposed piece of wire is the 70th turn. After another layer of winding again pull the wire through a slit and return it to the core via the next slit. Label close to the wire as "105"; wind another layer of 35 turns, pull through a slit and label as 140—and so on, on both sides of the form, until 525 turns have been completed and properly labeled.



Fig. 5

When 525 turns have been wound on the form, wind a few layers of cellulose tape over the coil, followed by a few layers of electrical tape. This will afford ample protection to the coil.

STEREO ON DISPLAY

at the
Detroit Third Annual

HIGH FIDELITY SHOW

THREE FULL DAYS
OF CONTINUOUS
DEMONSTRATIONS

STATLER HOTEL

FRIDAY, SATURDAY,
AND SUNDAY,
OCTOBER 16-17-18

FROM 1 P.M. to 10 P.M.

ADMISSION 75¢

the newest and latest in stereo
high fidelity from leading
high fidelity manufacturers

Don't miss this exhibit of hi-fi equipment . . . from the most economical units for the budget-minded to spectacular home music theaters . . . compare and enjoy them all.

- Complete Stereo and Monophonic High Fidelity Systems
- Amplifiers — Pre-Amplifiers — FM-AM Tuners — Turntables — Record Changers — Phono Cartridges — Microphones — Music Control Centers — Speakers — Speaker Enclosures — Equipment Cabinets — Finished and Assembled or Do-It-Yourself Kits

Remove the crank handle from the form and discard the bolt. Using a file or sandpaper, remove the enamel from the exposed lengths of wire on the sides of the form, taking care not to remove the numbers written on the form.

Mount the coil to a suitable base with the unslitted sides screwed to it.

Solder a piece of wire to each of these fifteen taps and connect them to the multi-contact switch and label every contact position with the number of turns it represents.

Testing. The variable inductance thus made must be manipulated from the outside of the loudspeaker enclosure. The connecting lampcord is passed through the cabinet back and the back screwed on, with no screws left out. A suitable bank of capacitors which can be varied from 1 to 50 μ f (surplus bathtubs) are introduced into the circuit if the network calls for them. Then the testing continues along conventional lines with audio generator, etc., but plain aural judging is also a lot of fun and highly illuminating. Once a proper value of inductance determined by the number of turns, is ascertained a new and smaller coil can be wound and put permanently into the enclosure or better still, fastened to the back of the cabinet.

I matched a motley crew of nine speakers: three 15-inch woofers, two 10-inch middlers, four 4-inch tweeters—to two homemade cabinets, using this variable inductance and a number of capacitors in a quarter section network, with very gratifying results.

APPROXIMATE INDUCTANCE VALUES

Turns	Inductance	Turns	Inductance
70	0.1 Mh.	315	1.8 Mh.
105	0.2	350	2.3
140	0.3	385	2.9
175	0.5	420	3.4
210	0.7	455	4.5
245	1.0	490	5.4
280	1.4	525	6.2

This material was submitted by Dr. Louis Julius Côté, Ottawa, Canada. Æ

Who's the first AUDIOMAN?

See the October issue

PATENTS

(from page 24)

plemented with, "The sale of a component of a patented machine, etc., must constitute a material part of the invention and must be known to be especially made or especially adapted for use in the infringement before there can be contributory infringement. And likewise the sale of staple articles of commerce suitable for noninfringing use,

ARE YOU SOUND HAPPY?

To achieve superlative sound reproduction, there must be a reason. Such results cannot be obtained from cheap materials, slipshod workmanship, expedient design, or other cost-cutting devices to make a big, wide profit.

The Bakers Ultra 12 Loudspeaker and the Bradford Patented Baffle reproduce ultimate facsimile for an inevitable reason. The reason is in the specs.

BAKERS ULTRA 12

20 to 25,000 cycles from a single, exponential 12" cone; 20 cycle cone resonance; 18,000 gauss; 200,000 maxwells; plastic foam surround; aluminum voice coil on aluminum former; heavy cast aluminum frame; 20 watts; no distortion crossovers.



For these reasons, the Bakers Ultra 12 is extremely sensitive, and therefore provides a smoothness, clarity and transient response . . . a true naturalness . . . not found in any other speaker regardless of price. Pride of possession is only 85 bucks.

BRADFORD PATENTED Baffle

Stereo, or monaural, the trend is toward compactness; 12" x 12" x 9" for 8s and 10s; 17" x 17" x 14" for 12s and 15s. Because of the patented (No. 2,854,423) pressure relief valve, this enclosure is equivalent in results to a 20 cubic foot infinite baffle. The Bradford Patented Baffle provides the only true acoustic suspension principle for the pressure relief valve automatically regulates the acoustic tension or spring of the air within the enclosure to the excursion characteristics of the Bakers, or any other, speaker. Because of this patented principle, there is absolutely no boom, cabinet resonance or listening fatigue.



The Bradford Patented Baffle is recommended by renowned audio authorities, and sold throughout the world because of its outstanding merit and adherence to claims.

Mahogany, walnut and unfinished birch; selected, grain-matched, 3/4" plywood veneer; rugged construction; hot lacquer finish . . . hand-rubbed, \$34.50 to \$49.50.

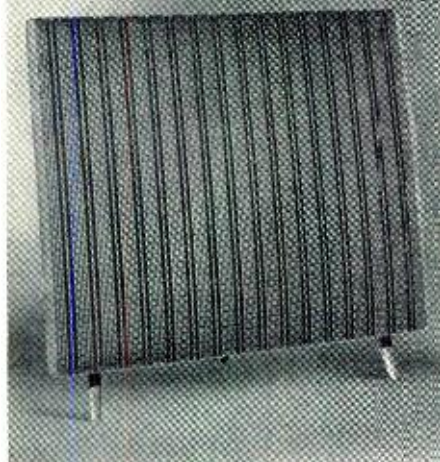
Speakers and baffles sold separately. In combination, we guaranty these units to be superior in true realism to any other system regardless of price.

write for literature

BRADFORD AUDIO CORP.

27 East 38th St., New York 16, N. Y.
Telephone: OXford 7-0523

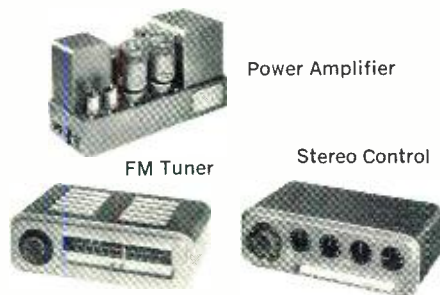
the new shape of music



The QUAD full range electrostatic loudspeaker (World's First) "offers a purity of sound that comes to the ears as a completely fresh experience... and sharpens the senses with an appreciation of just how good electronically reproduced music can be." You are invited to audition a QUAD music system at any one of our carefully selected franchised dealers. For particulars, write to personal attention of Mr. I. M. Fried.*

Quotes from the article "Walker's Little Wonder," by Robert Charles Marsh, High Fidelity Magazine

QUAD



* Electronics of City Line Center, 7644 City Line Ave., Philadelphia 31, Pa. (Exclusive U.S. agents for the Acoustical Manufacturing Co. Ltd., Great Britain). In Canada: J. B. Smyth Co., 380 Craig St. W., Montreal.

does not constitute contributory infringement."⁵

Shortly after this statute became effective a suit was brought against the Union Carbide and Carbon Corporation, the Radio Corporation of America, and others. There it was charged that "Union Carbide and Carbon Corporation, intending to bring about infringement of plaintiff's patent, secured from plaintiff and passed on to the other defendants confidential information making infringement possible."⁶

The Union Carbide Corporation contended that there was no ground for the charge of contributory infringement, since under this statute it is required now that there be a sale of a component part of the patented device to constitute a violation of the patent law.

In its consideration of the requirements of the present statute the Federal court said that it included in its definition of an infringer, "A person who does that which the courts had previously held to be contributory infringement wherein there was an intent to infringe, but not necessarily the sale of a component part of a combination patent. It protects against one who aids and abets the direct infringer."

Then of the law as it had been interpreted before the passage of this present statute the court added, "Prior to the enactment of this statute the courts had recognized as contributory infringers those who knowingly committed an act without which infringement would not have occurred though they did not sell a component part of the invention.

"This included the architect who planned and supervised the construction of the infringing machine, the salesman who solicited orders for the infringing device, and a person who used trade secrets to construct an infringing machine for the direct infringer."

Intent is Essential

In a decision rendered a few months later added clarity was given this interpretation by the Federal District Court in Maryland. There intent and knowledge of the purpose of the acts were emphasized as essential features of the offense.

"To constitute contributory infringement," said that court, the device or material capable of infringing use must be sold with the intent that it shall be so used. When a manufacturer makes, uses, or sells an unpatented element, he becomes a contributory infringer only when the element is knowingly made, sold, or to be used as a part of the patentable combination.

⁵ Freedman v. Friedman, 142 F.S. 426, Maryland, June 20, 1956.

⁶ Jones v. Radio Corp. of America, et al., 131 F.S. 82, April 26, 1955.

"By furnishing parts it makes it possible for others to assemble and use the combination, and when a manufacturer by so manufacturing and advising points out the way in which this can be done, and thus, intentionally so acting, promotes infringements of a patentee's rights, he becomes a contributory infringer.

"In the last analysis the fundamental thought is that before one may be held for contributory infringement, it must be shown that he had knowingly done some act without which the infringement would not have occurred."

By a Supreme Court decision rendered over a century ago, has been established the boundaries of this law and the distinction between replacement or repairs and reconstruction or infringement. A mill owner in Louisiana had purchased a patented planing machine. After some years the purchaser replaced the wornout knives and for so doing was sued by the manufacturer for the infringement of this patent.

Ultimately the action came before the United States Supreme Court for review. That court holding that the mere repair or replacement of these wornout knives was not infringement, summarized the law, and the statement made at that time has remained the rule.

"The right of the purchaser to replace the cutter knives is not because they are of perishable materials but because the inventor of the machine has so arranged them as part of its combination that the machine could not be continued in use without a succession of knives at short intervals. Unless they were replaced the invention would have been of but little use to the inventor or to others.

"The other constituent parts of this invention, though liable to be worn out, are not made with any reference to the use of them that will require replacement. These without having a definite duration, are contemplated by the inventor to last so long as the materials of which they are formed can hold together in use in such a combination. So it is understood by a purchaser and beyond the duration of them, a purchaser of the machine has not a longer use.

"But if another constituent part of the combination is meant to be only temporary in the use of the whole, and to be subsequently replaced, because it will not last as long as the other parts of the combination, its inventor cannot complain if he sells the use of his machine, that the purchaser uses it in the way the inventor meant it to be used and in the only way in which the machine can be used."⁷

Æ

⁷ Wilson v. Simpson, 50 U. S. 108, January, 1850.

AUDIOCLINIC

(from page 4)

is one of the advantages of the system, for using it enables us to run very long lines indeed. Because the impedance is quite high, the wiring need not be heavy with regard to wire size. Because the voltage is even lower than that provided by the a.c. supply line, the insulation around the wire carrying the 70-volt signal need not be heavy either. It is a bad system at least so far as high fidelity applications are concerned, because the amplifier must be run at its maximum power in order to get the full 70 volts. Also, the transformers needed between the speaker and the amplifier are usually none too good. Hence, some sacrifice of quality would be noted. The transformer should be connected between the amplifier's 70-volt point and the speaker or crossover network.

In installations where the amplifiers serve many speakers, such a system is a good one.

Now that I have discussed the merits and demerits of the system in terms of what we come to think of as good sound reproduction, I'd better explain just what the system is electrically. It is a system similar to the 117-volt a.c. distribution system with which most of us are familiar (220-volt systems are in use in European countries and elsewhere.) With this system, the output voltage of the amplifier remains substantially constant, regardless of load. The matching transformer used between this circuit and the loudspeaker or speakers are tapped—not in terms of impedance, but rather, in terms of the wattage to be supplied to the speaker.

FM Tuners

Q. My FM tuner worked fine for over a year. Now some trouble has developed. Up here in Ithaca, I can get three strong stations. When I tune to any one of them, I get a very high hum level which can be removed only by attenuating the bass on my preamplifier. Between stations I get no noticeable hum, even when the volume control on the preamplifier is turned above normal level. This would appear to be contrary to the usual situation in which hum

is always audible, but can be overridden by the station being received. Can you supply an explanation for this problem? Thomas W. Weber, Ithaca, N. Y.

A. The trouble you are experiencing with your tuner may be the result of several things: 1) The filters in the power supply circuit may be losing capacitance, and therefore, their filtering efficiency is impaired. 2) There may be a heater-cathode leak in the oscillator tube. If this is the case, the hum appearing in the output of the detector will be 60-cps hum, corresponding to the frequency of the filament supply. 3) The filament bypass for the oscillator may have opened.

In any event, the hum you notice is caused by a small deviation in oscillator frequency in accordance with the line frequency or power-supply ripple frequency.

"But," you ask, "if the oscillator is shifting, why doesn't that cause a constant hum, regardless of signal strength?" The answer is this: In order for an FM detector to produce a signal, there must be sufficient voltage fed to it. The oscillator voltage alone cannot be detected because it operates on a frequency different from that of the i.f. system of the tuner, and hence it cannot pass through the i.f. strip and therefore, of course, cannot reach the detector. When a signal is tuned in, the oscillator beats with it and enables the beat-frequency band thus produced to pass through the i.f. stages of the tuner. In your case you have two separate means by which the i.f. signal is frequency modulated. One is that of the carrier's intentional deviation—the desired program information—and the other is that of the oscillator's deviation—the unwanted. Obviously, the oscillator should be a steady frequency.

All of the foregoing assumes that the tuner does not employ a.f.c. This circuit is connected across the oscillator tank circuit in some tuners, and if the parameters connected with this a.f.c. circuit vary in accordance with a filament or B supply variation, the tendency of this deviation will be to cause the oscillator to deviate in accordance with it. Æ

ALL FOR ONCE, ONCE FOR ALL

(from page 23)

instrumentation was most compatible with the Hall.

The story of the Crucifixion was recited by the narrator in a special script: simply, it told of the immediate events leading up to Christ before the Cross, as depicted in the Styka painting. At an appropriately dramatic point, the huge curtains, weighing two-and-a-half tons, were slowly withdrawn. It took a full two-and-a-half minutes, during

which time the audio men began to scramble to adjust for the complete change in acoustics within the auditorium. Exposing 11,775 square feet of resonant canvas where a minute before had hung a sound-deadening curtain was like slowly turning up the treble control while you upped the base control twice as fast.

Knob turning and level checking was

AUDIO • SEPTEMBER, 1959

AUDIO • SEPTEMBER, 1959

BEYOND COMPARE



marantz Stereo console

Consumer Net \$249

Cabinet 24

Slightly higher in West

In pre-amplifiers and power amplifiers, Marantz has set today's highest standard of quality.

Consider the Marantz Stereo Console. Here is the essence of uncomplicated, beautiful styling. So simple to use, even the most non-technical person can easily achieve matchless reproduction quality. Yet, this fine instrument offers an order of versatility that pleases the most discriminating professional users. Carefully planned circuitry and wiring layout result in unsurpassed freedom from distortion, hum and noise.

Dedication to quality in every detail is the reason why the Marantz 30-watt power amplifier, too, is in a class by itself. The Marantz circuit permits this superb amplifier to recover instantaneously from sharp, musical transients — to effortlessly drive loudspeakers of all types — to consistently outperform amplifiers of considerably higher ratings.

For both stereophonic and monophonic programs, Marantz is your assurance of long, carefree operation and unprecedented performance.



30-WATT AMPLIFIER

Net \$147

Grill 7.50

Slightly higher in West

★ Selected for demonstration at the American Natl. Exhibition in Moscow

marantz

C O M P A N Y

25-14 BROADWAY, LONG ISLAND CITY 6, N. Y.

95

97

SAVE 25%

This is our

GROUP SUBSCRIPTION PLAN

Now you, your friends and co-workers can save \$1.00 on each subscription to **AUDIO**. If you send 6 or more subscriptions for the U.S., Possessions and Canada, they will cost each subscriber \$3.00 each, 1/4 less than the regular one year subscription price. Present subscriptions may be renewed or extended as part of a group. Remittance to accompany orders.

AUDIO is still the only publication devoted entirely to

- Audio
- Broadcasting equipment
- Acoustics
- Home music systems
- Recording
- PA systems
- Record Reviews

(Please print)

Name

Address

New Renewal

Name

Address

New Renewal

Name

Address

New Renewal

Name

Address

New Renewal

Name

Address

New Renewal

Name

Address

New Renewal

U. S., Possessions, and Canada only

RADIO MAGAZINES, INC.
P. O. Box 629, Mineola, N. Y.

LETTERS

(from page 10)

3. British Broadcasting Co., Engineering Training Manual, *Studio Engineering for Sound Broadcasting*, Iliffe and Sons, London, 1955. Chapter 3, "Acoustics and microphone placing," discusses studio techniques with illustrations.

4. A. C. Davis and P. C. Erhorn, *Microphones and Their Placement*, Audio Engineering Society, Fourth Lecture Series, 1957-1958. Motion picture technique is discussed in Lecture 4.

5. J. G. Frayne and H. Wolfe, *Elements of Sound Recording*, Wiley, New York, 1949. Chapter 3, "Microphones and Their Uses" and Chapter 31, "Acoustics of stages and Theatres" are particularly helpful. Motion picture technique is emphasized.

6. H. M. Gurin, "Broadcasting studio pick-up technique," **AUDIO ENGINEERING**, February, 1948, p. 9. Miking of orchestral groups is emphasized and bidirectional microphones are favored. Even though the ribbon microphone has its faults and may seem passé, it is still, today, the old reliable with many sound pick-up engineers.

7. J. P. Maxfield, "Liveness in broadcasting," *Western Electric Oscillator*, January, 1947; also J. P. Maxfield and W. J. Albersheim, "An acoustic constant of enclosed spaces correlateable with their apparent liveness," *J. Acoustical Society of America*, January, 1949, p. 71. These papers provide the theoretical basis for the single microphone technique of miking. With judicious use of spotlight microphones, cracked just a bit to sweeten the sound, and with recognition of the Haas or precedence effect, these papers should enable the engineer to make a reasonable first choice for microphone positions.

8. R. S. Oringel, *Audio Control Handbook*. Hastings House, New York, 1956. Chapter 3, "Microphone use techniques," provides some extra data on studio practice.

9. M. Rettinger, *Practical Electroacoustics*. Chemical Publishing Co., New York, 1955. Pages 46-58, on microphone techniques, summarize studio practice.

For my purposes, reference 1 is a required text, with 7 adding useful backup in theory. References 3 and 6 are also helpful for illustrating situations often met in practice. I should emphasize again that these are for monophonic, not stereo pick-up.

VINCENT SALMON
765 Hobart Street
Menlo Park, Calif.

ERRATA

As it does occasionally to all printed matter, some errors crept into the article on "FM-Band Reception in Fringe Areas," by W. N. Coffey. The diagram for Fig. 3 on page 20 was apparently over etched, causing the complete elimination of some of the lines, as well as the tube-element designations. The tube type, 6922, is shown in its proper position above and between the two sections, and two curved lines should extend from the number to the arrows on the tube symbols. The left triode

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.

TRADE UP TO STEREO: Largest selection of new, used Hi-Fi components. Professional service facilities available. Write Audio Exchange, Dept. AE, for trading information. 153-21 Hillside Ave., Jamaica 32, N. Y. Branches in Brooklyn, White Plains, Manhattan.

HIGH FIDELITY SPEAKERS REPAIRED
Amprite Speaker Service
70 Vesey St. New York 7, N. Y. BA 7-2580

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. EVergreen 4-6071.

WRITE for confidential money-saving prices on your Hi-Fidelity amplifiers, tuners, speakers, tape recorders. Individual quotations only: no catalogs. Classified Hi-Fi Exchange, AR, 2375 East 65th St., Brooklyn 34, N. Y.

INDUCTORS for crossover networks. 118 types in stock. Send for brochure. C. & M. Coils, 3016 Holmes Ave., N. W., Huntsville, Ala.

UNUSUAL VALUES. Hi-Fi components, tapes, and tape recorders. Send for package quotations. Stereo Center, 18 W. 37th St., N. Y. C.

FINEST QUALITY recording tape — 7" reels. 30-15,000 cps guaranteed.
1200' Acetate. 3/\$4.05—6/\$8.00
1800' Acetate. 3/\$5.10—6/\$10.00
1200' Mylar. 3/\$4.80—6/\$9.00
1800' Mylar. 3/\$6.60—6/\$13.00
2400' Mylar. 3/\$9.60—6/\$19.00
Add \$.15 PP and handling. FOTO-SOUND, 88 Harbor Road, Port Washington, N. Y.

SELL: IBM electric typewriter, \$75; Acrosound Ultra-Linear amplifier, \$50; Belt-driven professional turntable, synchronous motor, B-J Arm, \$35; Approved A-800 preamplifier, \$15. "Ted" Hein, 418 Gregory, Rockford, Illinois.

RENT STEREO TAPES—over 800 different—all major labels—free catalog. Stereo Part. 1608-H Centinela Ave., Inglewood 3, California.

SCOTCH recording tape at "Profit-sharing" prices—send for catalog—you'll be glad you did! Tapeco, Dept. H, P. O. Box 4353, Inglewood 3, California.

SALE: 78 rpm recordings, 1900-1950. Free lists. Collections bought. P. O. Box 155 (AU), Verona, N. J.

CROSSOVER NETWORK KITS. Custom and contract coil winding. Write Watson Industries, 110 Mildred, Venice, California.

SELL: Pentron CA-13 tape record/play preamp, \$37. Robert Stafford, 1044 Glendale Ave., Columbus 12, Ohio.

SELL: 50 LP's. 10 LP albums. monophonic, played very little—\$90. Electro-Voice T250 driver. 6HD horn. X6 network. AT37 level—\$100. Jim Lansing 375 driver. N500 network. 537-509 horn lens—\$280. University C15W woofer—\$60. Excellent condition. Prepaid. John Haner, 683 Locust, Galesburg, Ill.

REPLACEMENT 12" record album envelopes with built-in cellophane liners. State color. 12 for \$2.00. Prepaid. Neilson Enterprises, 120 Henry St., South Amboy, N. J.

HI-FI DOCTOR—Will solve your hi-fi problems on-the-spot. Acoustic audio, radio engineer. Stereo designing. Professional visits, day, evening, New York area. William Bohn, Plaza 7-8569, weekdays.

SELL: New Wharfedale moving-coil speaker, W/FS 15-inch—\$60. O. Heim, 131 Thompson St., New York 12, N. Y. SPring 7-7937.

**MORE CLASSIFIED ADS ON
PAGE 99**

PROFESSIONAL DIRECTORY

Fastest, Easiest Way To Learn All About Audio
NEW Rider "Picture-Book" Course

BASIC AUDIO

by Norman H. Crowhurst

The Rider "picture-book" approach has made many technical subjects understandable to many hundreds of thousands of people. Now, everything about sound and audio reproduction is made crystal-clear. If hi-fi is your interest—or if you work with tape recorders—or the broad subject of sound reproduction interests you,—or if you assemble your hi-fi equipment or buy a complete "package"—you must read BASIC AUDIO.

If you already own sound reproducing equipment—this "picture-book" course will give you an all-around background on all the important details of sound reproduction. It will enable you to get the most from your equipment.

You can learn easily, rapidly at very low cost. You build your knowledge step-by-step. There's one idea and one specially prepared illustration per page. More than 400 illustrations for maximum understanding.

Beyond a knowledge of electricity at the basic level, no previous electronic experience is needed to get the maximum from this course. Whatever electronics circuit theory is required to make the entire panorama of sound reproduction and recording visible to you is provided.

This Rider "picture-book" audio course is completely different from anything that has ever been presented. We guarantee your satisfaction.

#201, 3 vols., soft covers . . . \$8.70 per set

At your jobber or book store, or order direct at
John F. Rider Publisher, Inc., 116 W. 14th St., N. Y. 11
In Canada: Charles W. Pointon, 6 Alcina Ave., Toronto

Circle 99C

special recording tape \$1.19

1200 ft.; 7" —guaranteed splice-free
1800 ft.; 7" . . . \$1.89. Enclose 10¢ for each reel to cover postage and handling.

kierulff
SOUND CORPORATION
820 W. OLYMPIC BLVD., LOS ANGELES 15, CALIF.

Circle 99D



ANTENNAE

Get more FM stations with the world's most powerful FM Yagi Antenna systems.



Send 25¢ for booklet "Theme And Variations" containing FM Station Directory.

APPARATUS DEVELOPMENT CO.

Wethersfield 9, Connecticut

Circle 99E

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 99F

section should have been numbered 1 for plate, 2 for grid, and 3 for cathode; the right triode section should have been numbered 6 for plate, 7 for grid, and 8 for cathode. Heater terminals are 4 and 5, and the wiring data shown adjacent to the transformer secondary should read "To pin 5 of 6922; Ground pins 4 & 9."

We trust this has not inconvenienced anyone who has tried to construct it.

Industry People...

Allan W. Greene has been appointed president of the **Heath Company**, Benton Harbor, Michigan, according to Thomas Roy Jones, president of Daystrom, Incorporated, of which Heath is one of ten operating divisions. Mr. Greene was general manager of Moto-Mower, Inc., Richmond, Indiana, and a vice-president of Detroit Harvester Company, of which Moto-Mower is a subsidiary.

Herb Horowitz, occasional contributor to these pages, has been appointed director of **Audio Empire**, high fidelity product arm of Dyna-Empire, Inc., Garden City, N. Y. Before joining Dyna-Empire, Mr. Horowitz spent many years as chief engineer of Electro-Sonic Laboratories and chief of audio products for CBS Columbia, during which time he was responsible for a number of outstanding advances in the design of high fidelity components. Duties will include marketing and promotion as well as engineering supervision.

Newark Electric Company, headquartered at 223 W. Madison St., Chicago 6, Ill., has purchased additional land for their West Coast branch at 4747 W. Century Blvd., Inglewood, California, with the area to be devoted to customer parking until further expansion requires larger building area.

ADDITIONAL CLASSIFIED ADS

WANTED: MICROPHONE DESIGN AND DEVELOPMENT ENGINEER

Electrical and acoustical design and development of crystal, ceramic, and dynamic microphones for quality manufacture. Analysis and solution of problems encountered in the production of various types of microphones and associated products. Experience in the use of piezoelectric materials for audio applications, magnetic structures and microphone design desirable. Salary to \$10,000, depending on experience. Interview expense paid. Fee and relocation negotiable. Submit resume in confidence to Lee Employment Service, 1940 East 6th St., Cleveland 14, Ohio.

MAJOR BRAND RECORDING TAPE. Manufactured and nationally advertised by one of the four major U. S. companies. 1500 ft. genuine DuPont Mylar. First quality, no splices, brand new. Full refund if unsatisfied. Not to be confused with inferior tapes. \$1.89 each, 10 for \$18.00, 100 for \$170.00 include postage. S & F Electronics, 7959 Melrose Ave., Los Angeles 46, California.

BEST IN HI-FI VALUES!

NO DELAY SERVICE

All orders rushed to you in factory-sealed cartons.

Write for free catalog.

audion

25-A Oxford Road
Massapequa, New York

Circle 99G

LOOK

no further . . . If you're searching for hi-fi savings Write us your requirements now.

Key Electronics Company
120 E. Hurty St., N. Y. & N. Y.
EV 4-6071

Circle 99H

TODAY'S BEST QUALITY BUY

AWARD WINNING

arkay KITS and WIRED

HI-FI STEREO

LONG AWAITED . . . NOW HERE AT LAST!

the Arkay/Harting MS-5
STEREO Record Playback
TAPE DECK
Professional quality at a popular price . . .
only \$129.95

A supreme achievement in tape deck design and performance, the ARKAY/HARTING records your favorite music with the same superb performance of tape recorders costing many times more. No other tape deck — regardless of price — offers so many important features. Here's just a few:

- Dual-track combination head for two speeds
- 30-16,100 cps ± 2 db.
- Flatter and wow: 1% of 1%
- Free-button operation
- — 55 db. S/N
- All-metal tape filters, drop-in loading
- All-metal tape everts
- Large (1 1/2" diam.) constant
- Size: 12 1/2" x 14 1/2" x 6 1/2" deep.

The ARKAY/HARTING will be at your dealer's soon, also a stereo record and playback pre-amplifier, in kit of pre-wired form, specially designed for the ARKAY/HARTING.



ARKAY CS-28
STEREO AMP/PRE-AMP
COMPLETE
CONTROL CENTER

Full 28 watts stereo or monaural, 60 watts peak • 14 watts each channel • reverse stereo • balance control • two-channel gain control • full range bass and treble controls • IM distortion, 4 to 1 • harmonic distortion, 1% 30-20,000 cps • dual pre-amp 2V output jacks • speaker outputs, 4, 8, 16, 32 ohms • response, 20-20,000 cps • push-pull EL84 Williamson circuit.

Wired and tested \$99.95 Easy-to-build kit \$64.95

Write today for complete, detailed illustrated literature and specifications.

See and hear ARKAY Kits at your dealer.

FREE! Stereo booklet and catalog. Write Dept. A.

arkay All prices 5% higher west of Mississippi

88-06 Van Wyck Expressway Richmond Hill 18, N. Y.

Circle 99A

WIDE LATITUDE
SONORAMIC
RECORDING TAPE

THE CASE FOR BETTER SOUND

Why settle for ordinary tape when Sonoramic gives you so many exclusive extras—brilliant reproduction, permanent plastic container, 3-way indexing system with pressure sensitive labels and V-slot self threading Selection Finder reel.

ON WALL FOR QUICK ACCESS

STORES LIKE PRECIOUS BOOKS

FREE Tape-time ruler. Gives you footage and recording time on reel. Write Dept. A5

Aero dynamics CORPORATION,
LODI, NEW JERSEY

Circle 99B

Lafayette Superior Quality Hi-Fi Kits

OUTSTANDING DESIGN — INCOMPARABLE PERFORMANCE



NEW!

KT-250 50 WATT INTEGRATED STEREO AMPLIFIER

A completely new stereo high fidelity amplifier with a high quality of reproduction, versatility of operation, and distinctive styling.

A full range of controls enables you to enjoy the utmost in listening pleasure in any situation. Deluxe features include: unique "Blend" control for continuously variable channel separation—from full monaural to full stereo, 4-position Selector, Mode, Loudness and Phase switches. Also provided are outputs for 4, 8 and 16 ohm speakers. Hum-free operation is insured by the use of DC on all preamp and tone control tubes. Harmonic distortion, less than 0.25%. IM distortion, less than 1%. Hum and noise, 74 db below full output. Designed with the kit builder in mind, assembly is simple—no special skills or tools required. Complete with deluxe cabinet and legs, all parts, tubes and detailed instruction manual. Shpg. Wt., 26 lbs.

KT-250 Stereo Amplifier Kit.....6.45 Down
Net **64.50**
LA-250 Stereo Amplifier, wired.....8.95 Down
Net **89.50**

KT-250 IN KIT FORM **64.50**
LA-250 COMPLETELY WIRED **89.50**

- 50 WATTS MONAURALLY — 25 WATTS EACH STEREO CHANNEL ● RESPONSE 17-21,000 CPS ± 1 DB (at normal listening level)
- UNIQUE "BLEND" CONTROL
- PREMIUM EL86 OUTPUT TUBES ● SEPARATE BASS AND TREBLE CONTROLS
- CLUTCH-OPERATED VOLUME CONTROL
- 3rd CHANNEL OUT



KT-500 FM-AM STEREO TUNER KIT

More than a year of research, planning and engineering went into the making of the Lafayette Stereo Tuner. FM specifications include grounded-grid triode low noise front end with triode mixer, double-tuned dual limiters with Foster-Seesley discriminator, less than 1% harmonic distortion, full 200 kc bandwidth and sensitivity of 2 microvolts for 30 db quieting with full limiting at one microvolt.

The AM and FM sections have separate 3-gang tuning condensers, separate flywheel tuning and separate volume control. Automatic frequency control "locks in" FM signal permanently. Two separate printed circuit boards make construction and wiring simple. Complete kit includes all parts and metal cover, a step-by-step instruction manual, schematic and pictorial diagrams. Size is 13 1/2" W x 10 1/2" D x 4 1/2" H. Shpg. wt., 22 lbs.

KT-500 7.45 Down Net **74.50**
LT-50. Same as above, completely factory wired and tested 12.45 Down Net **124.50**

KT-500 IN KIT FORM **74.50**
LT-50 COMPLETELY WIRED **124.50**

- Multiplex Output for New Stereo FM
- 11 Tubes (including 4 dual-purpose) + Tuning Eye + Selenium rectifier Provide 17 Tube Performance
- Tuned Cascade FM
- Dual Cathode Follower Output
- Pre-aligned IF's



KT-600 PROFESSIONAL STEREO CONTROL CENTER

Solves Every Stereo/Monaural Control Problem!

Provides such unusual features as a Bridge Control, for variable cross-channel signal feed for elimination of "ping-pong" (exaggerated separation) effects. Also has full input mixing of monaural program sources, special "null" stereo balancing and calibrating system. Also has 24 equalization positions, all-concentric controls, rumble and scratch filters, loudness switch. Clutch type volume controls for balancing or as 1 Master Volume Control. Has channel reverse, electronic phasing, input level controls. Sensitivity 2.2 millivolts for 1 volt out. Dual low-impedance outputs (plate followers), 1500 ohms. Response 5-40,000 cps ± 1 db. Less than .03% IM distortion. Uses 7 new 7025 low-noise dual triodes. Size 14" x 4 1/2" x 10 1/2". Shpg. wt., 16 lbs. Complete with printed circuit board, case, profusely illustrated instructions, all necessary parts.

LAFAYETTE KT-600—Stereo Preamplifier kit—7.95 Down Net **79.50**
LAFAYETTE LA-600—Stereo Preamplifier, Wired—13.45 Down Net **134.50**

KT-600 IN KIT FORM **79.50**
LA-600 COMPLETELY WIRED **134.50**

A REVOLUTIONARY DEVELOPMENT IN STEREO HIGH FIDELITY.

- UNIQUE STEREO & MONAURAL CONTROL FEATURES
- AMAZING NEW BRIDGE CIRCUITRY FOR VARIABLE 3d CHANNEL OUTPUT & CROSS-CHANNEL FEED
- PRECISE "NULL" BALANCING SYSTEM
- RESPONSE 5-40,000 CPS ± 1 DB

Lafayette Radio

P.O. BOX 222
JAMAICA 31, N. Y.

DEPT. AI-9

Send FREE LAFAYETTE Catalog 600

Name

Address

City..... Zone.... State.....


CUT OUT
AND
PASTE ON
POSTCARD



ADVERTISING INDEX

Acoustic Research, Inc.	37
Allied Radio Corp.	79
Altec Lansing Corporation	41
Amperex Electronics Corporation	10
Ampex Corporation	33, 34
Apparatus Development Co.	99
Arkay	99
Arnhold Ceramics, Inc.	83
Atlas Sound Corp.	92
Audax Division of the	
Rek-O-Kut Co., Inc.	47
Audio Bookshelf	96
Audio Devices, Inc.	82
Audio Empire, Div. of Dyna Empire Inc.	27
Audio Engineering Society	85
Audiogersh Corp.	39
Audio Fidelity Inc.	57
Audion	99
Bell Telephone Laboratories	18
Bogen-Presto Company	59
Bradford Audio Corp.	93
British Industries Corporation	3
CBS Electronics, A Division of	
Columbia Broadcasting System, Inc.	90
Classified	98
Connoisseur	91
Cosmos Industries, Inc.	49
Dexter Chemical Corp.	80
Dynaco, Inc.	89
EICO	13
Electrodyne Corporation	97
Electro-Sonic Laboratories, Inc.	58
Electro-Voice, Inc.	Cov. IV
Electro-Voice Sound Systems, Inc.	99
Ercona Corporation	91
Ferrodynamics Corporation	99
Fisher Radio Corporation	25, 54, 55
Fukuin Electric (Pioneer)	53
Fukuyo Sound Co., Ltd., (Coral)	86
General Electric	15
Gotham Audio Sales Co., Inc.	86
Grado Laboratories	84
Gray High Fidelity Division	51
Harman Kardon	43
Heath Company	7-9
Key Electronics	99
Kierulff Sound Corporation	99
Kingdom Products Ltd.	5
KLH Research & Development Corporation	64
Klipsch and Associates, Inc.	88
Lafayette Radio	100
Lansing, James B., Sound, Inc.	29
Lelectronics of City Line Center	94
Marantz Company	95
McIntosh Laboratory, Inc.	67, 68
ORRadio Industries, Inc.	88
Partridge Transformers	92
Pickering & Company	17
Pilot Radio Corporation	31
Professional Directory	99
Radio Corp. of America	Cov. II
Radio Shack Corporation	65
Reeves Soundcraft Corp.	97
Rider, John F., Publisher, Inc.	99
Rigo Enterprises, Inc.	87, 93
Roberts Electronics, Inc.	14
Rockbar Corporation	Cov. III
Scott, H. H., Inc.	77
Sherwood Electronics Laboratories	1
Shure Brothers, Inc.	81
Stromberg-Carlson, A Division of General Dynamics Corporation	60, 61, 62, 63
Studio Supply Co.	91
Tandberg of America, Inc.	2
Tung-Sol	6
University Loudspeakers, Inc.	45
Weathers Industries	78



our
 British
 cousins
 at 
 Collaro
 stress
 meticulous
 care and
 precision
 engineering
 in every
Collaro
 stereo
 record
 player!



The Constellation, Model TC-99—\$59.50



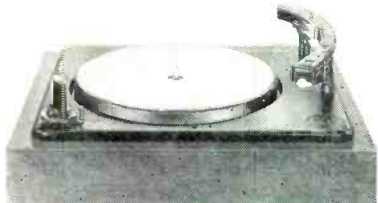
The Continental II, Model TSC-840—\$49.50



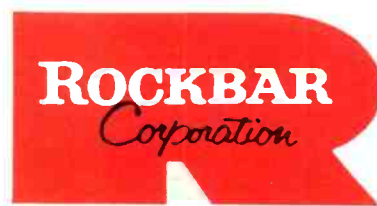
The Coronation II, Model TSC-740—\$42.50
 *The Conquest II, Model TSC-640—\$38.50



Transcription Turntable, Model 4TR-200—\$49.50



Manual Player, Model TP-59—\$29.95

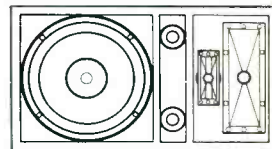


Every Collaro stereo record player is built with typical British attention to every detail. They are precision engineered and rigidly tested to give truly professional performance and the ultimate in operating convenience. Here are some of the important features that make Collaro the logical choice for stereo or monophonic records. • Performance specifications exceed NARTB standards for wow, flutter and rumble —with actual performance test reports accompanying each model TC-99. • Extra-heavy, die-cast, non-magnetic turntables (weighing up to 8½ lbs.). Extra-heavy weight is carefully distributed for flywheel effect and smooth, constant rotation. • Shielded four-pole motors are precision balanced, screened with triple interleaved shields to provide extra 25 db reduction in magnetic hum pick-up. • Detachable five-terminal plug-in head shells (on TC-99, TSC-840, TSC-740, TP-59) provide two completely independent circuits, guaranteeing ultimate in noise reduction circuitry. • Transcription-type stereo tonearms are spring-damped and dynamically counterbalanced to permit the last record on a stack to be played with virtually the same low stylus pressure as the first. • All units are handsomely styled, available with optional walnut, blond and mahogany finished bases or unfinished utility base. There's a 4-speed Collaro stereo record player for every need and budget! Prices slightly higher in the West. For free catalog on the Collaro line, write to: **Rockbar Corporation, Dept. A-9, Mamaroneck, N. Y.** (*Not shown. Similar in appearance to The Coronation.)



THE ONLY ULTRA-COMPACT
3-WAY WIDE-RANGE
 SPEAKER SYSTEM
 designed for true stereo

Electro-Voice
 HIGH FIDELITY
REGAL



Gives you bass so low you can feel it . . . bass you would expect from a conventional enclosure three times the size. Gives you balanced, full-range, flat response without attenuation or peaks.

Ideal as an economical "first" system, an "add-on" or in a pair for stereo

You need not be an acoustical engineer to understand why there is so much stereo value in this ultra-compact speaker system. The same *exclusive features* that have always made ELECTRO-VOICE systems best for monaural are an absolute necessity for true stereo . . . and you *get* these vital features in the REGAL III.

Acoustically-correct enclosure is matched to specially-designed 12-inch LF driver for *exceptional extension of bass response and unusual dynamic range* . . . without sacrificing efficiency and without the need for unusually-large amplifier power.

E-V Super Sonax VHF Compression Driver with exclusive Sonophase* throat design assures you of the *smooth, sparkling highs* so necessary for precise musical blend and balance.

E-V Diffraction, in both the Horn-Loaded Mid-Range Driver and the Super-Sonax Tweeter, gives you all-important

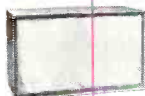
FUSION

so essential for *all-position stereo listening*. By wide-angle (180°) diffraction, the higher frequencies are completely dispersed smoothly and evenly throughout the listening area. This insures proper fusing of the significant stereo sounds from two speaker systems in controlled and varying proportions . . . gives true depth and placement to the musical instruments simultaneously, without spatial distortions . . . assures easy listening from anywhere in the room. Convenient but concealed "Presence" and "Brilliance" controls permit quick and easy musical balancing to room acoustics.

Luxurious furniture-crafted enclosure is finished on all four sides for placement anywhere on shelf or floor.

REGAL III. Complete 3-way system in enclosure, ready to use. Choice of Walnut, Mahogany or Limed Oak. Size 12½" d, 13½" h, 24" w. Net, \$147.50

ESQUIRE 200. Economical version of the Regal. Complete 3-way system in modern enclosure, with single rear-control. 12-inch bass speaker, special 8-inch cone mid-range driver, and Super-Sonax diffraction-horn compression tweeter. Choice of walnut, mahogany or limed oak. 12½" d, 13½" h, 24" w. Net, \$111



See it — Hear it — Enjoy it — on Money-Back Guarantee.
 At your E-V high-fidelity dealer or write for Catalog No. 134 to Dept. 99-A.

No Finer Choice than **Electro-Voice**®

ELECTRO-VOICE, INC., BUCHANAN, MICHIGAN

*Design Patent No. 182351

