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FEBRUARY, 1960
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 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.



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COVER PHOTO—One side of a stereo installation in the home of Dr. and Mrs. Jerome Singer, San Bernardino, California. Speaker system is 3-way Wharfedale, with a corner bass enclosure constructed of brick and reinforced concrete. Control console is located on the opposite side of the room. All architectural and audio design by William G. Dilley. Photograph by Dick Jones, San Bernardino, California.

Photograph submitted by William G. Dilley, 577 East Avery Street, San Bernardino, California.

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AUDIO clinic



JOSEPH GIOVANELLI*

Cartridges and Speakers

Q. 1. The output voltage of a cartridge is directly proportional to the stylus velocity. Yes? I decide this because one ESL ad gives the output of the ESL cartridge as 5 millivolts at 5 cm per sec; another gives it at 10 millivolts at 10 cm per sec. I now have the Norelco cartridge which puts out 35 millivolts at 10 cm per sec with a volume setting at 9-10 o'clock on the pre-amplifier to give my normal listening level. If I used the ESL, is it reasonable to assume the volume setting would have to be advanced to about 3 o'clock?

2. Is it probable that some of the noise that I call surface noise from records is caused by nonlinearity in the high-frequency response of the cartridge? Is it not linearity of response rather than merely an extended high end which helps to minimize "hash"? Could linearity in speaker response bring out more of this undesirable background "hash" noise?

I tried my amplifier with two different speakers. From one speaker the sound was almost peerless and so effortless. The sound from the other speaker was thin with a "hashy" background noise. Wilfred Bell, Rockport, Mo.

A. 1. You are correct in assuming that the output voltage is directly proportional to the stylus velocity, provided that the cartridge is a magnetic unit, and provided that frequency response is truly flat. Crystal and ceramic cartridges depend upon the variation in amplitude to bring about their voltage change, and this change is proportional to the change in amplitude.

It is not possible to determine the position of a volume control for a fixed output power vs. various input voltages because volume controls are not tapered uniformly from unit to unit, even when the units under discussion are from the same manufacturer.

2. If a cartridge is not linear, meaning that it does not have a flat response, then it may very well influence the amount of noise heard in the loudspeaker. If the cartridge has a resonant peak at about 5000 cps, you can count on lots of surface scratch, together with raspy string sound during violin passages. There are two things which can cause a reduction of needle scratch. One of these is, as you suggest, having a cartridge free from annoying peaks, especially in the lower treble section. The other is to have a cartridge

with insufficient output at the high-frequency end of the spectrum. Obviously, this latter is undesirable since it will rob the program material of much of its beauty and coloration.

Of course, nonlinearity anywhere in the system can bring about an accentuation of surface scratch especially if the nonlinearity is in the form of a tipup in the lower treble, where the ear is most sensitive. If the tweeter has a resonant peak, it will tend to exaggerate any scratch component lying within the resonant zone of the tweeter. This may very well explain the difficulty you are having with the second speaker you mentioned.

Noise in Auto Radios

Q. I own a 1957 Chevrolet with the medium-priced manual pushbutton radio, factory equipment. I bought the car new, and the radio sounds very good most of the time. The exception is that a static-like noise occurs intermittently while driving. This noise is a popping and cracking sound, unlike the steady hiss or buzz caused by high-tension lines, arc lamps, ignition, and so on, and is present only while the car is in motion. It does not appear to be a function of environment. With the car parked or in my driveway, engine running or not, the noise will not occur.

When the static does occur, the program output drops to about one half volume level and some amplitude distortion is detected if the gain is increased. One way I have found to clear up the condition is to turn the gain control all the way up, or nearly so, then the noise will stop and the output will return to normal. After this I can return the gain to listening level. At other times the condition will clear itself in a minute or two. In either case, the condition is likely to reoccur within a few minutes, especially on deceleration of the car. Changing the stations or decreasing the gain control does not seem to affect the noise.

The antenna connection is good. I have jiggled all the components within reach, checking for poor ground connections. However, I have not had the radio out of the car for a more thorough inspection. Can you suggest where my trouble might be? R. C. Leeds, Long Beach, Calif.

A. Noise in auto radio receivers can come from several sources. The first thing which comes to mind is static electricity, picked up by the air rubbing against the

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

Yes, there is a difference in Stereo Components*

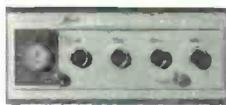


Of course you will compare components for your stereo system before buying. To help you in your selection, we present here some of the significant reasons why it will be to your advantage to carefully consider British Industries components.

Garrard —the World's Finest RECORD CHANGERS

The best in stereo STARTS with a Garrard changer... for example, the incomparable RC-88. This great changer actually outperforms most so-called "professional" turntables; combines a superb turntable with a precision, resonance-free aluminum tone arm which tracks at correct specified stylus pressure. Records can be played manually or automatically... handled even more gently than by the human hand.

The Garrard line includes changers, manual players and transcription turntables. Seven models—\$32.50 to \$89.00.



The new, beautifully styled **LEAK** Stereo Amplifiers and Preamplifiers keep distortion down to an infinitesimal 1/10 of 1% (0.1%) at full rated power... lowest ever achieved! This insures natural stereo sound enjoyed without fatigue.

The Leak Stereo Line includes two amplifiers and a preamplifier. Also available: Leak monaural power amplifiers and preamplifiers, and a brand new, matching FM Tuner, ready for both regular and multiplex reception.



Shown are the **Wharfedale** Super 12/FS/AL Speaker, the compact WS/2 and the sand-filled SFB/3 Speaker Systems. Designed by England's G. A. Briggs, Wharfedale speakers are preferred for their natural, non-strident reproduction, undistorted by electronic, mechanical or acoustical coloration.

The Wharfedale line includes full range, bass and treble speakers, plus two-way and three-way speaker systems



R-J speaker enclosures are ideal for any stereo system, used with any speakers. Their splendid sound results from the patented R-J design principles. This means that no other small speaker enclosures can match the R-J in performance, even though they may look alike.

The R-J line includes 5 enclosures... shelf and floor models.

Other quality endorsed stereo components of **British Industries Corp.** are Genalex, the original KT-66 and KT-88 Tubes, S. G. Brown Headphones, River Edge Cabinets and Kits, Ersin Multicore 5-Core Solder.

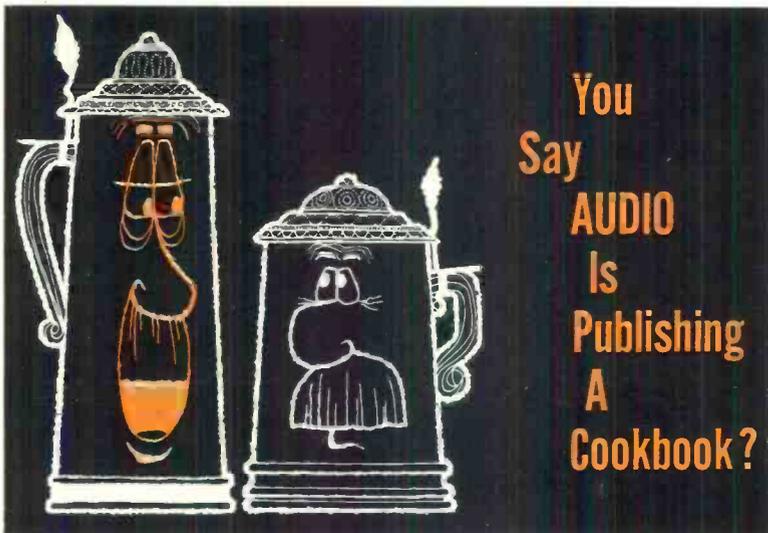
* We have prepared a series of Comparator Guides covering the various BIC product lines and will be happy to send them to you. Please mail the coupon, checking the BIC products which interest you, to Dept. AB-10,

BRITISH INDUSTRIES CORPORATION
PORT WASHINGTON, N. Y.

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You Say
AUDIO
Is
Publishing
A
Cookbook?

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 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 ½ 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
½ tsp. grated nutmeg	pastry
½ c. orange juice	
½ 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.



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RADIO MAGAZINES, INC., Dept. L99
P.O. Box 629,
Mineola, New York

body of the car, or by the motion of the tires on the road. A cure for it is often effected by placing powdered graphite in the inner tubes, although static eliminators are often used in the wheels, which are partially insulated by the lubrication.

When you state that the receiver loses volume during the static, the first cause is automatically eliminated. The second and more logical cause is a dirty volume control whose poor contact is joggled around by the movement of the car. It is possible to verify this without taking the set out of the car simply by turning the volume control at a reasonable speed and listening for any additional crackling. If any is heard, you will know that the control is dirty or perhaps even worn out, in which event it will have to be replaced. A third possible cause of your trouble, and a more likely one still, is that the diode coupling capacitor might be leaky, and this condition becomes aggravated by the motion of the car. It is also possible that a tube is either defective, perhaps on the verge of shorting, or loose in its socket.

The solution of this problem must ultimately be based on the good old trial and error method, although it's good to have at least an educated guess before looking into the set. This, I have found, is especially true with automobile radios because they are hard to take out, and often are difficult to operate once they have been removed from the car.

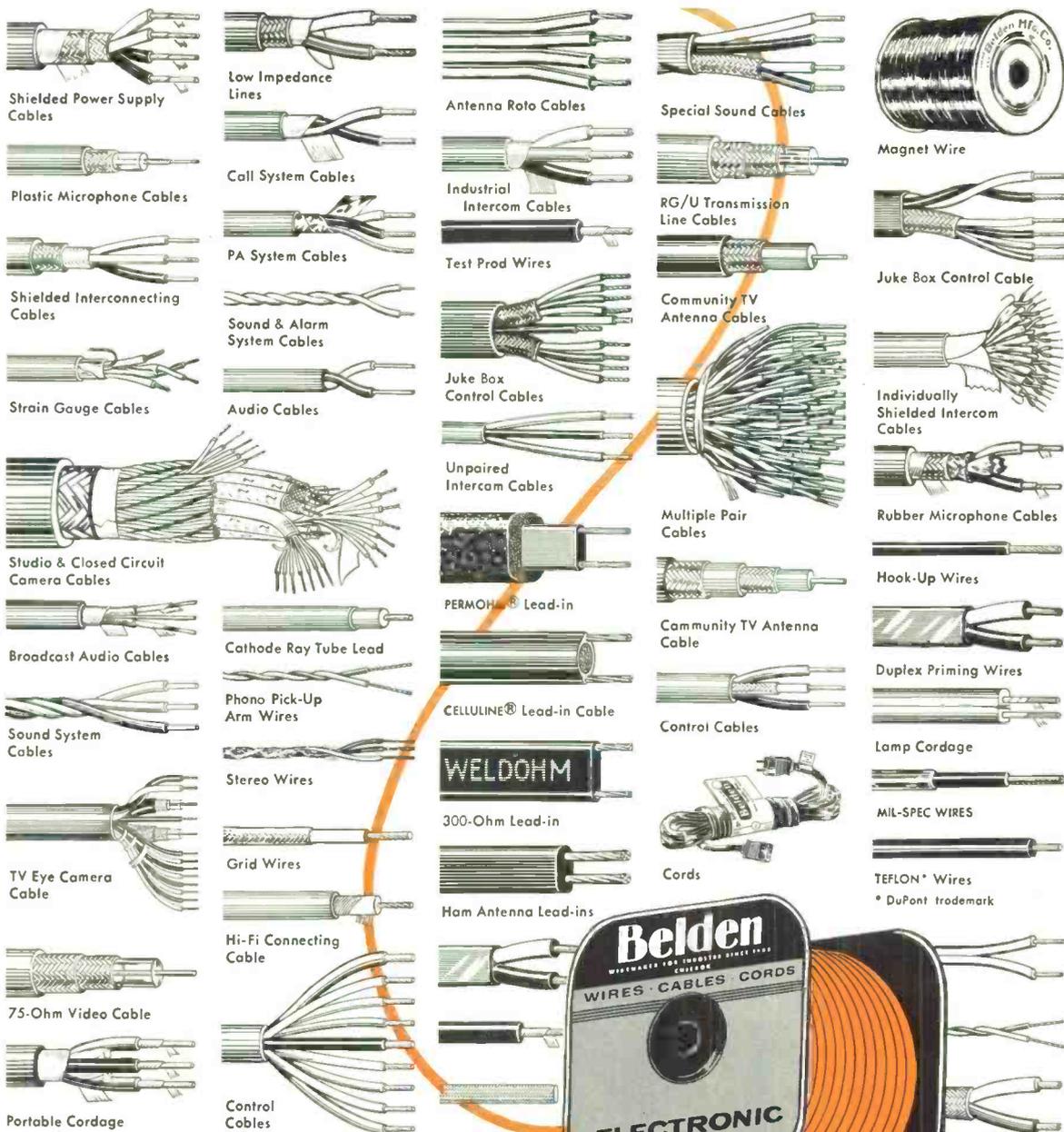
Output Stage Bias

Q. I assembled a basic amplifier using the Eico HF60 diagram. When I connect a voltmeter between the two cathodes of the KT88 output tubes and adjust the balance pot so the meter reads zero (which, in my opinion, means that the output tubes are balanced), the bias measurement on the grids of the tubes will not be the same for each one. That is, the bias of one tube is higher than that of the other. When I adjust the bias to read -48 volts for both tubes, the balance measurement will not read zero. What are the reasons for these situations? Which is more important, the same bias voltage on both tubes or the balance of said tubes? Fernando Sim, Manila, Philippines.

A. The answer to your problem is quite simple. In fact, you really do not have a problem. It is normal operation that, in order to obtain a similar current from each tube, a different bias voltage may be needed. The reason this is normal is simply that tubes differ somewhat in their characteristics, especially with regard to their amplification factor. When this amplification factor is different for each of the two output tubes, a different bias voltage will be required to determine a particular plate current. Unless the differences between output tubes are really large (more than 10 per cent), no harmful results, either electrical or aural, will be noted.

The best means for balancing such a circuit is to adjust for zero volts between the two cathodes because, under these conditions, equal amounts of plate current will flow through the output transformer (in opposite directions) and saturation will be held to a minimum.

(Continued on page 86)



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LETTERS

Frequency Response of Controls

SIR:

In your letters column for December, 1959, Mr. Davison states that frequency response as a function of the volume-control setting is not part of the published IHFM Standards.

To correct his impression, here are the applicable sections of the tuner standard in full:

6.03.07. third paragraph, and 7.05.05, fourth paragraph:

"If the frequency response changes with the volume control setting, this (frequency response) test should be repeated at selected attenuations differing in steps of 10 db from the position of maximum output."

I believe this will answer his questions. D. R. VON RECKLINGHAUSEN, Chairman, IHFM Tuner Standards Committee, c/o H. H. Scott, Inc., 111 Powder Mill Road, Maynard, Mass.

SIR:

In his letter of December 15 (preceding) Mr. von Recklinghausen misquotes my letter in the December issue. Paragraphs he cites were referenced in my original letter. They do not define Frequency Response of Tuners, as do the IHFM Standards for amplifiers, nor state what if any presentation must be made of frequency response data for various level control settings. Further, control settings for worst frequency response are evaded by suggested measurements at "steps of 10 db from the position of maximum output." This dis-

crepancy is cumulative where the circuit includes more than one level control.

The IHFM Standards are being mentioned increasingly in hi-fi advertising. Because of omissions and vagueness concerning frequency response degradation at normal level control settings, the Standards favor the inferior products and fail to ensure reliable information for the consumer.

The general excellence of the IHFM Standards was not disputed.

HAL M. DAVISON,
 5119 Connecticut Ave., N.W.,
 Washington 8, D. C.

Speaker vs. Loudspeaker

SIR:

I note in your magazine and certain others frequent use by authors of the word "speaker" in place of the correct word "loudspeaker." While the former word is frequently used in off-hand discussions, particularly by the trade, as slang, it is by no means a substitute for the word "loudspeaker"; in fact, as we all know, it refers to a person who is talking. Consequently, I feel that both authors and editors are remiss in permitting this slang contraction to be used in print, in spite of whether or not most people might know to what it refers.

OLIVER BERLINER,
 Beverly Hills, Calif.

(What difference does it make? And suppose it happened to be playing softly—must we then say "soft-speaker"? We'll probably continue to vacillate between one and the other. Ed.)

NEW LITERATURE

The Bogen-Presto Company, Box 500, Paramus, N. J., has just issued Catalog 512, encompassing the entire new line of Bogen high-fidelity components, both stereo and monophonic. The book also includes current models of Bogen-Presto turntables and Bogen Challenger components. A photograph of each piece of equipment is included, with a non-technical description followed by a technical analysis. Retail prices are shown. Catalog 512 is available free at all Bogen-Presto dealers, or may be obtained by writing direct to the address shown above. **B-15**

Blonder-Tongue Laboratories, Inc., 9 Alling St., Newark, N. J., performs an excellent service in the issuance of a complete guide to the nation's FM and FM-AM radio stations. The listings are arranged alphabetically by states and cities for ready reference. The new guide serves as a station finder with its detailed listings of call letters and frequencies for more than 600 FM broadcasters. Your copy of this fine publication will be mailed free. Just write to the address shown above, and ask for Bulletin FMS-10-129. **B-16**

Minnesota Mining and Manufacturing Company, Dept. E9-520, 900 Bush Ave., St. Paul, Minn., has just published a brochure titled "99 Tape Recording Terms" which will be of untold value to home users of tape recorders. Numerous words added to the English language as a result of magnetic tape's widespread acceptance in the recording industry prompted the compilation of the glossary. Although the 4-page brochure is intended primarily for the amateur in the home, church, business, and school applications, many professional recordists will find the list a valuable reference. It will be mailed free upon written request. **B-17**

Allied Radio Corporation, 100 N. Western Ave., Chicago 80, Ill., announces the

release of a new "Allied Connector Directory." Containing comprehensive listings of the most widely used electronic connectors, this 16-page directory is offered as a convenient buyer's guide for manufacturers, research labs, engineers and designers. Alphabetically arranged by manufacturers, Amphenol, Cannon, Cinch-Jones, Harvey Hubbel, and Hart & Hegeman, connectors are listed in numerical order for easy reference. Units are offered in quantity breakdown at OEM direct-factory prices. Price categories range from single lots to quantities as high as 999—depending on connector type and manufacturer. **B-18**

James B. Lansing Sound, Inc., 3249 Castus Ave., Los Angeles 39, Calif., illustrates and describes its newest and smallest linear-efficiency cone speaker, an 8-in. extended range unit designated JBL-LE8, in a new data sheet. In addition, the sheet also shows the Model C49 (The Dale) bookshelf enclosure. Requests for copies should specify Bulletin SB1016. **B-19**

Cinema Engineering Division, 1100 Chestnut St., Burbank, Calif., has available Bulletin No. LC1066, which illustrates and describes the new Cinema wire-wound micro-miniature and printed-circuit resistors. The wire-wound resistors are of the axial type, and the printed-circuit units replace the former Cinema PW series. The two general styles of resistors are available immediately. **B-20**

McMurry Audio-Electronics, Inc., Box 179, Culver City, Calif., has available for interested individuals a reprint of a published article which explains, in easy steps, how to synchronize sound with a home movie. The reprint, completely illustrated with photographs of actual editing and synchronizing processes, will be mailed free upon written request. **B-21**

New Amplifiers & Tuners

*MORE OF THE BEST
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Heathkit, first in performance, quality and dependability, proudly presents a host of new, outstanding do-it-yourself projects designed, as always, to bring you the finest in kit-form electronics.

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14/14 WATT STEREO AMPLIFIER KIT (SA-2)

A complete dual channel amplifier/preamplifier combination, the new Heathkit SA-2, in one compact, handsomely styled unit provides every modern feature required for superb stereo reproduction . . . yet is priced well within your budget.

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Other features include a speaker phasing switch, two AC outlets for accessory equipment and hum balance controls in each channel. As beautiful as it is functional, the SA-2 will be a proud addition to your stereo sound system. Shpg. Wt. 23 lbs.

SPECIFICATIONS—Power output: 14 watts per channel, "hi-fi"; 12 watts per channel, "professional"; 16 watts per channel, "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. **Controls:** dual clutched volume; ganged bass, ganged treble; 4-position selector; speaker phasing switch. **Inputs:** 4 stereo or 8 monophonic. **Outputs:** 4, 8 and 16 ohms. **Dimensions:** 4 $\frac{1}{2}$ " H. x 15" W. x 8" D.

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ECONOMY STEREO AMPLIFIER (SA-3)

This amazing performer delivers more than enough power for pure, undistorted room-filling stereophonic sound at the lowest possible cost. Featuring 3 watts per stereo channel and 6 watts as a monophonic amplifier, the SA-3 has been proven by exhaustive tests to be more than adequate in volume for every listening taste. A tremendous buy at this low Heathkit price. Shpg. Wt. 13 lbs.

SPECIFICATIONS—Power output: 3 watts per channel. **Power response:** ± 1 db from 50 cps, 20 kc at 3 watts out. **Total harmonic distortion:** less than 3%. 60 cps, 20 kc. **Intermodulation distortion:** less than 2% @ 3 watts output using 60 cycle & 6 kc signal mixed 4:1. **Hum and noise:** 65 db below full output. **Controls:** dual clutched volume; ganged treble, ganged bass; 7-position selector; speaker phasing switch; on-off switch. **Inputs (each channel):** tuner, crystal or ceramic phono. **Outputs (each channel):** 4, 8, 16 ohms. **Finish:** black with gold trim. **Dimensions:** 12 $\frac{1}{2}$ " W. x 6 $\frac{1}{2}$ " D. x 3 $\frac{1}{4}$ " H.

MORE STATIONS AND TRUE FM QUALITY ARE YOURS WITH THIS FINE TUNER KIT HIGH FIDELITY FM TUNER KIT (FM-4)

This handsomely styled FM tuner features better than 2.5 microvolt sensitivity, automatic frequency control (AFC) with on-off switch, and prewired, prealigned and pretested tuning unit. Clean chassis layout, prealigned intermediate stage transformers and assembled tuning unit makes construction simple—guarantees top performance. Flywheel tuning and new soft, evenly-lighted dial scale provide smooth, effortless operation. Vinyl-clad case has black, simulated-leather texture with gold design and trim. Multiplex adapter output also provided. Shpg. Wt. 8 lbs.

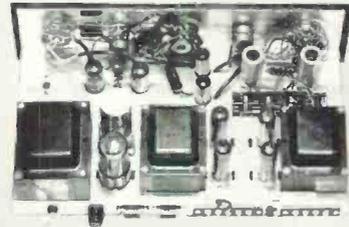
SPECIFICATIONS—Tuning range: 88 to 108 mc. **Quieting sensitivity:** 2.5 uv for 20 db of quieting. **IF frequency:** 10.7 mc. **Image ratio:** 45 db. **AFC correction factor:** 75 kc per volt. **AM suppression:** 25 db. **Frequency response:** ± 2 db 20 to 20,000 cps. **Harmonic distortion:** less than 1.5%. 1100 uv, 400 cycles 100% modulation. **Intermodulation distortion:** less than 1%. 60 cycles and 6 kc mixed 4:1 1100 uv, 30% modulation. **Antenna:** 300 ohms. **Output impedance:** 600 ohms (cathode follower). **Output voltage:** nominal .5 volt (with 30% modulation, 20 uv signal). **Overall dimensions:** 4 $\frac{1}{4}$ " H. x 13 $\frac{1}{2}$ " W. x 5 $\frac{1}{2}$ " D.



New



HEATHKIT SA-2
\$52⁹⁵



New



HEATHKIT SA-3
\$29⁹⁵

New

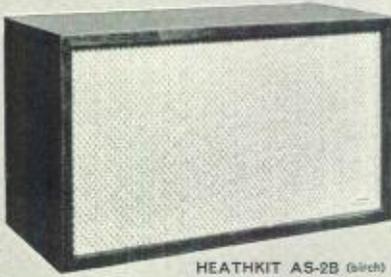


HEATHKIT FM-4
\$34⁹⁵

HEATH COMPANY / Benton Harbor, Michigan

 a subsidiary of Daystrom, Inc.

New



HEATHKIT AS-2B (birch)
HEATHKIT AS-2M (mahogany)
\$79⁹⁵
each
HEATHKIT AS-2U \$69.⁹⁵
(unfinished)

**NOW—FOR THE FIRST TIME—EXCLUSIVELY FROM HEATH
ACOUSTIC SUSPENSION
HI-FI SPEAKER SYSTEM KIT (AS-2)**

A revolutionary principle in speaker design, the Acoustic Research speaker has been universally accepted as one of the most praiseworthy speaker systems in the world of high fidelity sound reproduction. Heathkit is proud to be the sole kit licensee of this Acoustic Suspension principle from AR, Inc., and now offers for the first time this remarkable speaker system in money-saving, easy-to-build kit form.

The 10" Acoustic Suspension woofer delivers clean, clear extended-range bass response and outstanding high frequency distribution is provided by the specially designed "cross-fired" two-speaker tweeter assembly.

Another first in the Heathkit line is the availability of preassembled and prefinished cabinets. Cabinets are available in prefinished birch (blond) or mahogany, or in unfinished birch suitable for the finish of your choice. Kit assembly consists merely of mounting the speakers, wiring the simple crossover network and filling the cabinet with the fiberglass included. Recommended amplifier W-7A. Shpg. Wt. 32 lbs.

SPECIFICATIONS—Frequency response (at 10 watts input)*: ± 5 db, 42 to 14,000 cps; 10 db down at 30 and 16,000 cps; **Harmonic distortion:** below 2% down to 90 cps, below 3% down to 40 cps at 10 watts input in smaller room location; **Impedance:** 8 ohms; **Suggested damping factor:** high (5:1 or greater); **Efficiency:** about 75%; **Distribution angle:** 90° in horizontal plane; **Dimensions:** 20" W. x 12 $\frac{1}{2}$ " H. x 11 $\frac{1}{2}$ " D.
*Power input required for average listening level will not exceed 10 watts.

New



HEATHKIT W-7A
\$54⁹⁵

**THE WORLD'S BIGGEST BARGAIN IN A HI-FI AMPLIFIER
55 WATT HI-FI AMPLIFIER KIT (W-7A)**

Utilizing advanced design in components and tubes to achieve unprecedented performance with fewer parts, Heathkit has produced the world's first and only "dollar-a-watt" genuine high fidelity amplifier. Meeting full 55 watt hi-fi rating and 55 watt professional standards, the new improved W-7A provides a comfortable margin of distortion-free power for any high fidelity application.

The sleek, modern styling of this unit allows unobtrusive installation anywhere in the home. The clean, open layout of chassis and precut, cabled wiring harness makes the W-7A extremely easy to assemble. Shpg. Wt. 28 lbs.

SPECIFICATIONS—Power output: Hi-fi rating, 55 watts; Professional rating, 55 watts. **Power response:** ± 1 db from 20 cps to 20 kc at 55 watts output. **Total harmonic distortion:** less than 2% from 30 cps to 15 kc at 55 watts output. **Intermodulation distortion:** less than 1% at 62 watts output using 60 cps and 6 kc signal mixed 4:1. **Hum and noise:** 80 db below 55 watts, unweighted. **Damping factor:** Switch on front panel for selecting either maximum (20:1) or unity (1:1). **Output impedances:** 4, 8 and 16 ohms and 70 volt line. **Power requirements:** 117 volts, 50/60 cycles, 90-160 watts. **Dimensions:** 8 $\frac{1}{2}$ " D. x 6 $\frac{1}{4}$ " H. x 15" W.



HEATHKIT EA-3
\$29⁹⁵

**A NEW AMPLIFIER AND PREAMP UNIT PRICED WELL WITHIN
ANY BUDGET**

14 WATT HI-FI AMPLIFIER KIT (EA-3)

Delivers a full 14 watts of hi-fi rated power and easily meets professional standards as a 12-watt amplifier.

Rich, full range sound reproduction and low noise and distortion are achieved through careful design using the latest audio developments. Miniature tubes are used throughout, including EL-84 output tubes in a push-pull output circuit with a special-design output transformer. The built-in preamplifier has three separate switch-selected inputs for magnetic phono, crystal phono or tape, and AM-FM tuner. RIAA equalization is featured on the magnetic phono input. Shpg. Wt. 15 lbs.

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. **Output impedances:** 4, 8 and 16 ohms.



HEATHKIT UA-2
\$22⁹⁵

"UNIVERSAL" 14 WATT HI-FI AMPLIFIER KIT (UA-2)

Meeting 14-watt "hi-fi" and 12-watt "professional" standards, the UA-2 lives up to its title "universal" performing with equal brilliance in the most demanding monophonic or stereophonic high fidelity systems. Its high quality, remarkable economy and ease of assembly make it one of the finest values in high fidelity equipment. Buy two for stereo. Shpg. Wt. 13 lbs.

SPECIFICATIONS—Power output: Hi-fi rating, 14 watts; Professional rating, 12 watts. **Power response:** ± 1 db from 20 cps to 20 kc at 17 watts output. **Total harmonic distortion:** less than 2% from 20 cps to 20 kc at 14 watts output. **Intermodulation distortion:** less than 1% at 14 watts output using 60 cps and 6 kc signal mixed 4:1. **Hum and noise:** 73 db below 14 watts. **Output impedances:** 4, 8 and 16 ohms. **Damping factor:** switched for unity or maximum (15:1). **Input voltage for 14 watt output:** .7 volts. **Dimensions:** 10" W. x 6 $\frac{1}{4}$ " D. x 4 $\frac{1}{2}$ " H.

HEATHKIT SP-2A
\$56⁹⁵

(two-channel stereo).
Shpg. Wt. 15 lbs.

HEATHKIT SP-1A \$37.⁹⁵
(single-channel monophonic),
Shpg. Wt. 13 lbs.



HEATHKIT C-SP-1A \$21.⁹⁵
(converts SP-1A to SP-2A).
Shpg. Wt. 4 lbs.

STEREO-MONO PREAMP KIT (SP-2A, SP-1A)

Available in two outstanding versions! SP-2A (stereo) and SP-1A (monophonic). SP-1A convertible to stereo with conversion kit C-SP-1A. Use as the control center of your entire high fidelity system. Six inputs in each channel accommodate most any program source. Switch selection of NARTB or RIAA, LP and 78 rpm record compensation.

New Tape Recorders



PROFESSIONAL QUALITY TAPE RECORDER KITS (TR-1 series)

These outstanding tape recorder kits offer a combination of features found only in higher priced professional equipment selling for \$350 to \$400. The precision tape mechanism is supplied completely assembled and tested, you build only the tape amplifiers. Two circuit boards are used for easy assembly and high stability. Separate record and playback heads and amplifiers allow monitoring while recording. Features include professional-type db sound level meter, counter, pause control, record interlock, 2 (switch-selected) speeds 3¼ and 7½ IPS. Frequency response: ±2.5 db 30 to 12,000 cps at 7½ IPS. NARTB equalization. Provision for mike or line inputs. Shpg. Wt. 30 lbs.

MODEL TR-1E: 4-track stereo playback, monophonic record & play. **\$169⁹⁵**
\$17.00 DN., \$14.00 MO.

MODEL TR-1D: 2-track stereo playback, monophonic record & play. **\$169⁹⁵**
\$17.00 DN., \$14.00 MO.

MODEL TR-1C: monophonic record & playback. **\$159⁹⁵**
\$16.00 DN., \$14.00 MO.

MODEL C-TR-1D: Converts TR-1D to TR-1E. 2 lbs. **\$14.95**

MODEL C-TR-1C: Converts TR-1C to TR-1D. 2 lbs. **\$19.95**

MODEL C-TR-1CQ: Converts TR-1C to TR-1E. 2 lbs. **\$19.95**

STEREO-MONO TAPE RECORDER KIT (TR-1A series)

Our most versatile tape recorder kit, you can buy the new two-track (TR-1AH) or four-track (TR-1AQ) versions which record and playback both Stereo and Monophonic programming or the two-track Monophonic record-playback version (TR-1A). Precision bearings and close machining tolerances hold flutter and wow to less than 0.35%. NARTB equalization, separate record and playback gain controls and a safety interlock. Provision for mike or line inputs with 6E5 "magic eye" tube as sound level indicator. Two circuit boards for easy assembly.

MODEL TR-1A: Monophonic two-track record/playback with fast forward and rewind functions. Includes one TE-4 Tape Electronics kit. Shpg. Wt. 24 lbs. **\$99⁹⁵**
\$10.00 DN., \$9.00 MO.

TR-1A Specifications—Frequency response: 7.5 IPS ±3 db 50 to 12,000 cps; 3.75 IPS ±3 db 50 to 7,000 cps. **Signal-to-noise ratio:** better than 45 db below full output of 1.25 volts/channel. **Harmonic distortion:** less than 2% at full output. **Bias erase frequency:** 60 kc (push-pull oscillator).

MODEL TR-1AH: Two-track monophonic and stereo record/playback with fast forward and rewind functions. Two TE-4 Tape Electronics kits. Shpg. Wt. 36 lbs. **\$149⁹⁵**
\$15.00 DN., \$13.00 MO.

TR-1AH Specifications—Frequency response: 7.5 IPS ±3 db 40 to 15,000 cps; 3.75 IPS ±3 db 40 to 10,000 cps. **Signal-to-noise ratio:** 45 db below full output of 1 volt/channel. **Harmonic distortion:** less than 2% at full output. **Bias erase frequency:** 60 kc (push-pull oscillator).

MODEL TR-1AQ: Four-track monophonic and stereo record/playback with fast forward and rewind functions. Two TE-4 Tape Electronics kits. Shpg. Wt. 36 lbs. **\$149⁹⁵**
\$15.00 DN., \$13.00 MO.

TR-1AQ Specifications—Frequency response: 7.5 IPS ±3 db 40 to 15,000 cps; 3.75 IPS ±3 db 40 to 10,000 cps. **Signal-to-noise ratio:** 40 db below full output of .75 volts/channel. **Harmonic distortion:** less than 2% at full output. **Bias erase:** 60 kc (push-pull oscillator).



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QUANTITY	ITEM	MODEL NO.	PRICE

AUDIOMAN NO. 5

Robert Austin, assistant purchasing director and resident of New York City, becomes fifth Audioman of the Month. Combines usual hobbies of audio and photography, but also likes swimming and weight lifting.

A HOBBYIST SINCE 1947, Robert Austin has employed considerable thought to get just the right equipment for his particular requirements, and then mounted them in a way which best suits his listening habits. His system now consists of a Thorens CD43 record changer, two stereo cartridges—Fairchild and Shure M7D—a Fairchild 245 stereo preamplifier and two Fairchild Model 255A 30-watt power amplifiers, two Altec Ionic speakers, two Shure 330 microphones, and an Ampex 960—an assembly of components that practically anyone would enjoy.

His speakers are mounted on cabinets which accommodate tape reels in the lower section, and each unit is mounted on casters to facilitate moving to the optimum location in the room. For radio reception, Mr. Austin uses a Scott AM-FM Stereo tuner. His system is wired up so that the power switch on the preamp controls everything else. The equipment is located in another cabinet which mounts the record player and preamplifier in conventional positions, and has space for the Ampex on a lower shelf so he can take it out for "location" recording when he wishes. Lamps which serve to light the recorder compartment are so connected that one is on when the phono changer is turned on and the other is lighted when the tape recorder is switched on, so now when he closes the cabinet doors without turning off everything, the lights still remind him of the omission.

Mr. Austin uses the Ampex to copy tapes,

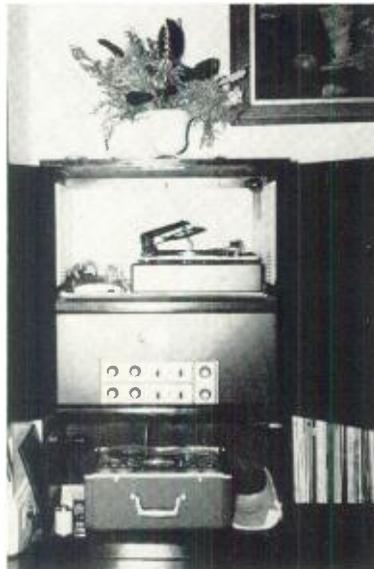


to record live stereo both at home and away, and for the original recording of sound effects and narration for his magnetically striped 16-mm films. And since he plays the piano, he often plays the first piano part and records it so he can play the second piano part of a duet with the Ampex—a big saving if he otherwise had to hire another pianist. His collection of recordings includes some 400 LP's, 20 stereo discs, a smattering of 45's and 78's, and some 100 tapes. He dubs his good 78's on to tape and stores the discs.

Like most Audiomen of the Month, Mr. Austin is often called on to offer opinions and help in choosing and installing systems for friends and neighbors, and he has helped plan and install 29 installations already, in addition to offering guidance to four times that many novice audiofans.

Since a long-time hobbyist like Mr. Austin often has useful ideas and suggestions, we endeavored to learn a few of them. One of his best suggestions is that recorded tapes be provided with Mylar leaders so that valuable tape will not be lost in threading and the end will not be broken off at the end of the rewind cycle as it flaps wildly around the reel. He also believes that all recorded tapes should be complete on one side as far as possible, even if it cost somewhat more, so as to eliminate the need for the "flip" in the middle of a selection. Another thing he wants is a second "auxiliary" input on preamps, and he would also like to see more a.c. receptacles on preamps so a single switch could control everything. Let us all hope he gets his wishes.

Best idea of all seems to be the preparation of 2400-ft. reels of music recorded at 3 3/4 ips to provide four hours of music-to-drink-by—so handy, says Mr. Austin, when you have to mix the drinks yourself. And to this let us say "Skol." **AE**



Located at a handy operating point across the room from the speakers, this control center provides all the source material needed.



If having faith in one's product is old-fashioned, we're guilty. So much so, in fact, that we back it with this unprecedented satisfaction guarantee: If the quality of Triton Tape is deficient for any reason whatsoever, we will replace it with whatever brand you prefer. A qualifying Guarantee Certificate is included with every reel you buy.



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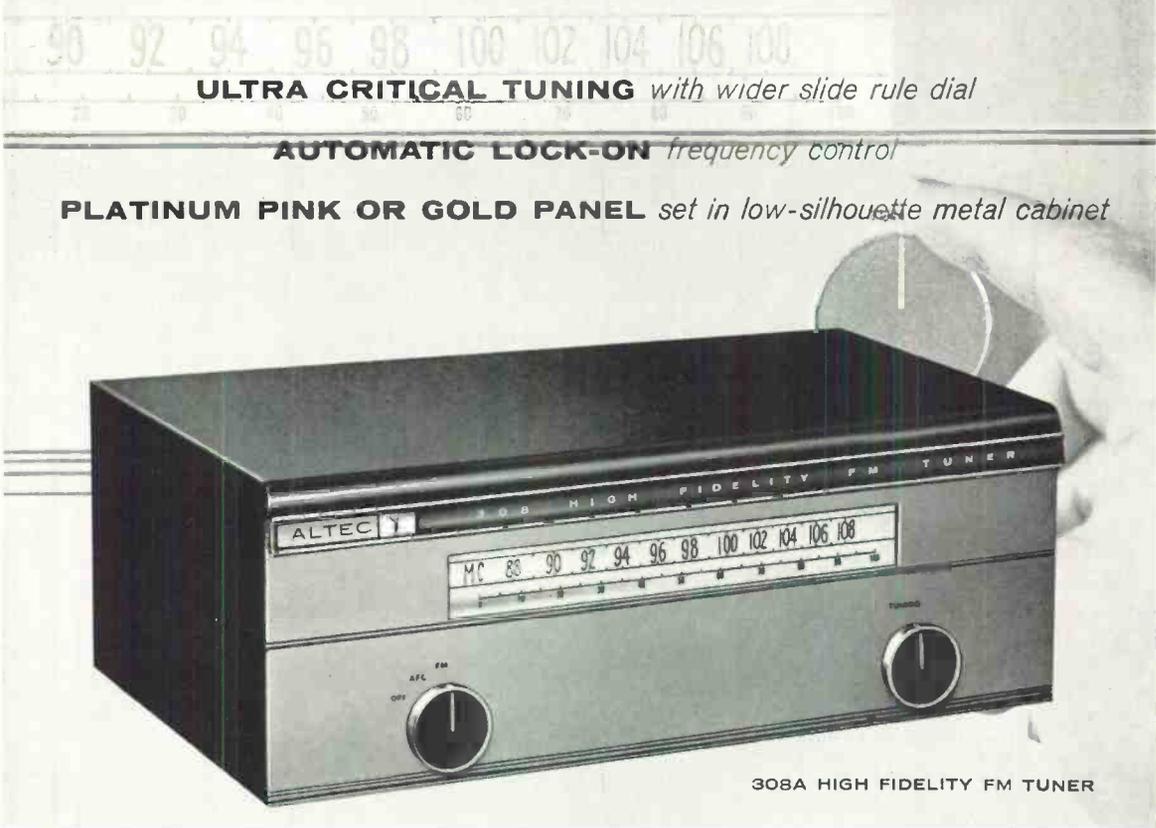
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NEW ALTEC ADVANCES IN FM TUNING



ULTRA CRITICAL TUNING with wider slide rule dial

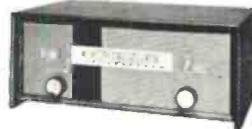
AUTOMATIC LOCK-ON frequency control

PLATINUM PINK OR GOLD PANEL set in low-silhouette metal cabinet

308A HIGH FIDELITY FM TUNER

ULTRA CRITICAL TUNING is now at your fingertips with the new wider slide rule dial of the Altec 308A. Automatic frequency control *locks-on* exact station. New low-silhouette metal cabinet with platinum pink or gold panel (matching the Altec 353A Amplifier), encases 3 IF stages, permitting clear separation of weak stations from strong. Between-station silencing; output for stereo multiplex adaptor; and FCC radiation certi-

fication — all are features of the new 308A. Today's most advanced FM Tuner sells at \$120 complete. **307A HIGH FIDELITY FM TUNER** Companion to the 308A, ALTEC's model 307A embodies similar advanced features. New ultra-critical tuning combined with ALTEC's finer quality and sophistication are yours in the 307A at the modest cost of: \$99 (less cabinet).



306A HIGH FIDELITY AM-FM TUNER "...the most sensitive tuner ever tested"*



Choice of two cabinet types are available for both the 306A and 307A: Hand-rubbed hardwood in Walnut, Blond, or Mahogany..... \$19.95 and low-silhouette metal..... \$9.00

Infinitely greater selectivity of this finest of AM-FM tuners is achieved through ALTEC's meticulous combination of design advances: a larger six gang tuning condenser; a dry rectifier for long, stable life; complete isolation between transformers and power mains; and a unique chassis layout that easily meets FCC radiation requirements.

Drift-free and interference-free, the FM section features a Foster-Seeley (Armstrong) detector, a "Cascode" low noise RF stage, a triode low noise mixer stage, Automatic Frequency Control, and two limiter stages. The AM section features three IF transformers with optimized coupling for flat pass band; supreme noise suppression; sharpest skirt attenuation for maximum fidelity. The price, unequalled for this quality, \$199.50 (less cabinet).

*According to leading testing laboratories.

Compare ALTEC ADVANCES and the superior tuning specifications at your ALTEC DEALER'S. ALTEC offers you the most complete line of quality stereo and mono high fidelity components and systems in the world. *Please write for descriptive brochure.*

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AUDIO ETC.

Edward Tatnall Canby

1. SAME ONLY DIFFERENT

If you read this department in December and again in January, you may have thought you found a slight contradiction. In a way, I guess, you did. If you followed me in January, and will look at the same month, 1959, you will probably suggest that I repeated myself. In a way, definitely, I did, as I've just discovered. I'm not particularly surprised and, indeed, I think this is just as it should be. Some ideas need contradicting. Some subjects need repeating.

The thing about a department of this sort, in a monthly magazine, is that unlike a book or a technical article it is a continuing set of observations, never entirely complete, always en route, forever reinterpreting, reassessing—a sort of monthly diary of comment and observation on things as they seem at the moment. What counts (and it always counts in our hectic civilization) is the *thinking right then and there*, as of such-and-such a date and year. We writers of my sort do not try very hard to produce for eternity!

To be sure, a never-ending preoccupation with all of us—and with whom not?—is the enigmatic, intangible future. The best columnist is the man who gets there fastest, etcetera. Yes, over the long stretch of twelve years (so far) I've hit a few nails on the head and I'm the first to enjoy the private fruits thereof—reading back columns (though sometimes in our indexless maze I spend hours trying to locate some great prophesy I just *know* I wrote—let's see now, was it Jan. '48 or maybe June '52f).

Awhile back, we were even thinking about printing up some of my back columns in the form of a real, honest-to-goodness book. (First thought for a title: "Could be Canby"). But a few closer looks into the past have made me put the project off—for virtually every worthwhile observation or discussion that I could find was of the sort that would have to be placed in context—into the time it was written—before it could make sense, as of now. That, alas, might take more print than the material itself.

To state solemnly, for instance, that the plastic record is here to stay, that Leonard Bernstein is very good at explaining music to the general public, that small speaker enclosures are a safe bet would sound pretty silly now, without some sort of explanation. "Mind you, *this was written in 1949*, believe it or not." Probably true, but a few pages of that sort of thing and you'd toss Prophet Canby into a nearby wastebasket. Canby just couldn't be.

Thus, you see (and to return to my opening), I most assuredly did suggest in the December issue that I wasn't likely to be using three AR-3's because I didn't expect to fall for this "three-channel" stuff (see below). And lo, in January I stated that I did plan to use three speakers on a semipermanent basis in my city apartment. The difference was a matter of living and learning—two different months and a bit more of audio's ever-new first-hand experience.

By golly, I feel lucky when I *don't* have to contradict myself, from month to month.

As for those two January issues, '59 and '60, I was mildly astonished myself to discover that I had covered the same subject in both issues (bet the editor didn't notice)—namely, that peculiar brand of home stereo where the two speakers are placed so close together that they practically touch. Sure I repeated myself—and so did the trouble. After a solid year of stereo "progress" it was worse than ever for 1960. Talk about contexts! This context hasn't changed a bit, alas.

As long as stereo speakers continue to be squeezed together in outrageous proximity, so to speak, I'll be continually moved to a feeling of outrage and will probably sound off, every now and then, just to keep myself warmed up. And so with other matters, plus or minus. *Plus ça change . . .* I can't remember the rest of the French but, anyway, the more things change the more they stay the same. Almost the same, but not quite. In fact, very different. That's what this column is all about.

Super Ultramono

The boss (editor) has pointed out to you folks that the term "three-channel," which I had innocently used in several back issues of this magazine, has now become notorious in the public prints and is the subject of formal complaints on the part of the Better Business Bureau for misrepresentation of the stereo facts.

This magazine (and this department) therefore adopts a firm policy that considers three-channel stereo as a system which is three-way from start to finish, from mikes to triple recording to triple amplifier and three speakers, three completely separate and simultaneous sound-chains.

Three-channel stereo of this sort exists, decidedly. Most of our larger recording companies play it out loud every day, hour after hour, from three-channel tape recordings, or straight from the triple array

mikes. But there is no commercial three-channel recording available that I know of and I doubt if you can buy a true three-channel reproducing system for the average home, though to build one is no great problem.

The loudly advertised "three-channel" stereo systems that we are now hearing about are, of course, not three-channel at all in this basic sense. They start, every one of them, with the standard two sound sources of stereo recordings on disc and on tape. A third signal is derived from these two and fed to a third speaker. As per my description in December, these are either "one-woof" or "three-tweet." Some, in other words, use a single bass speaker in the center (better put "bass" in quotes) plus tweeters for channels A and B. Others derive a complete center signal from the main pair and project it full-range, *via* the third speaker.

There are two questions involved here. First is a matter of definition—what, exactly, is a channel? Second is a matter of ethics: what is the truth?

As to the first, I think that those of us in the know who have loosely used "three-channel" have not been either confused or deceived, but perhaps we would have been wiser to be more specific. I'm thinking of a channel in terms of water and I can see that the term means a passage that goes *all the way through*. The English Channel is a complete passageway.

Now I suppose we could envisage two water channels that merged and split into three, the whole system interconnected and continuous, like a piece of the Mississippi delta, or the Tigris and Euphrates. But nevertheless, a plain, simple, honest channel is a throughway, minus branches, and that is that. So—three-channel stereo must and should be stereo that is three-way from start to finish. Let it so be, and amen.

As for the question of ethics and what is honest, we run into real problems. The trouble is that the stereo home "hi-fi" people are trying to outcompete each other and sell their phonographs to a slightly jaded public, whereas you and I are trying to make sensible definitions.

I feel that those of us who have used "three-channel" in good faith to indicate one of the various added-signal systems, are actually within reasonable limits. There is no confusion, as I say, among us. But to use "three-channel" deliberately as a means to indicate to an uninformed public that a mere "two-channel" stereo system is not good enough, is plain dishonesty.

As a matter of fact, I was misled in all good faith myself by several of the new 1960 full-page ads for "three-channel" stereo. I knew, of course, that they all used two-track sound sources. But so convincing were the "three-channel" ads that I thought at first these must be true center-speaker systems, with three full-range outputs. The fact that, instead, they had only one bass outlet, only two treble outlets, was cleverly concealed—I can use no other term.

I think we must do a bit of further evaluating here. There is the terminology and there is the thing itself.

The terminology "three-channel" is dishonest *when used misleadingly*. Since this is now clearly the case, I think we all must,

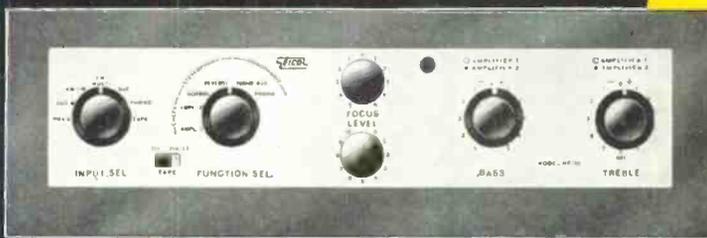
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Stereo Amplifier-Preamplifier HF81

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. IM 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 & resistor-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: Pre-wired, prealigned, temperature-compensated "front end" is drift-free. Pre-wired exclusive precision eye-tronic® 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-9kc @ -3 db) or weak-station narrow (20c-5kc @ -3db) bandpass. Tuned RF stage for high selectivity & sensitivity; precision eye-tronic® tuning. Kit \$39.95. Wired \$63.95. Incl. Cover & F.E.T. New FM/AM Tuner HFT92 combines the renowned EICO HFT90 FM Tuner with excellent AM tuning facilities. Kit \$59.95. Wired \$94.95. Includes 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-mull 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 ¾" 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, 3½" cone tweeter. 2¼ cu. ft. ducted-port enclosure. System Q of ½ for smoothest frequency & best transient response. 32-14,000 cps clean, useful response. 16 ohms impedance. HWD: 26½", 13¾", 14¾". Unfinished birch \$72.50. Walnut, mahogany or teak \$87.50.

New HFS5 2-Way Speaker System Semi-Kit complete with factory-built ¾" veneered plywood (4 sides) cabinet. Bellows-suspension, ¾" excursion



Stereo Preamplifier HF85



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



FM Tuner HFT90 FM/AM Tuner
AM Tuner HFT94 HFT92



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.) & 3½" cone tweeter. 1¼ cu. ft. ducted-port enclosure. System Q of ½ for smoothest frequency & best transient response. 45-14,000 cps clean, useful response. HWD: 24", 12½", 10½". 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.

HFS2 Omni-Directional Speaker System (not illus.) HWD: 36", 15¼", 11½". "Eminently musical" — HIGH FIDELITY. "Fine for stereo" — MODERN HI-FI. Completely factory-built. Mahogany or walnut \$139.95. Blond \$144.95.

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perforce, limit ourselves to its strictest and most honest usage, as per the above, or make ourselves liable to ethical doubts. We're always being pushed into linguistic corners like this, and it hurts everybody a bit each time, confuses basic issues a bit more, beclouds the future of good sound reproduction. Bad! I think of such words, for instance, as "coaxial," in reference to speakers, or "stereo recorder" in reference to a recording machine that does or does not record stereo...

As for the misleading systems themselves, those now advertised as "three-channel," they do have merits, which is the more unfortunate. Whatever you call them, the systems they employ are workable, if not always the ultimate. When, *when*, will American industry stop running good things into the ground via evasions, exaggerations, false and grotesque claims, where straightforwardness is entirely possible and there are perfectly good virtues to be proclaimed? We don't damn with faint praise—we obliterate with vast slimy mountains of it.

I may sound gloomy, but my fears for stereo's future are seriously renewed, this winter, in the face of these new mazes of falsity, adding more confusion to what was already pretty dimly mixed up in the public mind. Is it all just more quiz and payola stuff? It's surely related, in that people don't seem to understand the difference between honesty and evasion, even in the theatre itself, not to mention mere advertising. Is there no difference between a rigged quiz and a made-up stage play? That seems to be one argument, in the trade. Is there no difference between three-channel stereo and "three-channel"?

Well, in my mind the two problems are remarkably alike.

To go back—I think we must admit that both of the alleged "three-channel" systems now being promoted are, under certain practical conditions, reasonable. They are possible answers to the problems-of-the-moment in stereo—though I think neither would have been required if things had been presented honestly from the beginning.

The system using three equal speaker outlets ("three-tweet") has, as I've found, a great deal of merit if the speakers are spaced out at a considerable distance—ten to fifteen feet—and the center speaker can be independently controlled in volume. See last month.

The simpler, cheaper and much more loudly proclaimed system (not new by any means; only new under the "three-channel" designation) which has a single bass speaker in the center and two treble out-rigger speakers ("one-woof") is a more doubtful quantity and some people say it doesn't work, as you will know if you've read AUDIO, I say, from personal experiment, that it does "work" and can produce a quite respectable stereo effect if the tweeters—as usual—are spaced out far enough. It works perhaps better than many one-cabinet stereo systems with built-in speakers too close for stereo separation. This, I suppose, is the perfectly honest thought behind the present spurge in this particular direction. Given the facts of the last year or so, it probably is reasonable, if an all-out move, a rather desperate gambit to make stereo work and yet keep

everything as it always has been, almost.

So, you see, the "three-channel" promoters have a point. Two points. I'll grant that two rightly-spaced component speaker systems can give the very best stereo of all and better than any system with only one central bass unit. But the practical aspects of home decoration are here at stake, as always, and they are at odds with stereo's basic requirements. What to do?

What *has* been done is disastrous, for people have not even been encouraged to accept stereo for its own good values and admitted inconveniences.

The evidence is, I'd say, that the mass of our people have not accepted the basic stereo principle as a necessity, nor have they accepted stereo itself. It is not their fault.

They have been misled, of course, by a thousand-and-one crude, or ineffective and uninformed demonstrations made by salesmen who themselves haven't much idea what stereo is and can be.

But they've been much more seriously misled by the obliging phonograph manufacturers, who have consistently pounded away at the idea that one must first buy a "stereo phonograph" in one piece, then add an "extra" speaker—optionally—at extra cost.

I ask you, was this ever a part of stereo itself? Is it now? If this fine "extra" speaker is now felt to be unnecessary by most people, then I think we can put much of the blame right on the manufacturers and their advertisers, who have been too easily scared away from the honest and perfectly practical necessity of two equal speakers, well separated.

Now that we are in this fine pickle, now that people have found they can buy "stereo phonographs" and conveniently forget the "extra" speaker, how are we to promote stereo from here on out?

The single-bass (i.e., the familiar one-cabinet) system, with treble outriggers, is evidently the big 1960 all-out answer to the problem. As always, it's the trickiest, most evasive way out, but it could work. If people now won't buy an "extra" big speaker (or a speaker equal to the "main" one, at any rate), then perhaps they'll accept two smaller treble speakers, in view of that nice, big one-cabinet center-piece, just like old times.

The policy of "main-channel" stereo, then, has failed because it succeeded too well—people bought the main channel all right, but not the auxiliary. (And, of course, they rejoiced that now they could "play all records," both stereo and mono. True, but still another evasion.)

The policy of one-cabinet, two-speaker stereo is evidently in trouble too, and for the best of reasons: it doesn't work. People have bought this stereo and have heard nothing worth the extra cash.

So now we make a huge heave and hoist the single main side speaker right into the middle—we move the emphasis to dead-center. Which, surely, is a far better-balanced proposition than the one-sided stereo, the close-together mono-ized stereo, that most people know! Maybe it's a way out, after all.

It had better be. But it won't, if the ads go right on as they are. The master
(Continued on page 82)

**TRANSISTORIZED NOBLES COMPONENT UNITS FOR
QUALITY THAT**

Speaks for Itself



**TRANSISTORIZED STEREO PREAMP
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MODEL NT-108

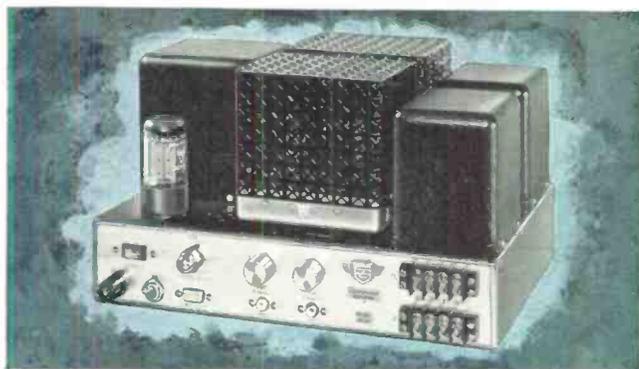
Built for the long, long life that only transistors can give, the Nobles stereo preamplifier eliminates tubes and replacements. It develops no heat; hum pickup is minimized; distortion becomes virtually non-existent. Completely individual channel control at all times for level, bass and treble, separate switch compensators for bass and treble to match all types of record pickups and tape heads, automatic compensation for standard recording curves when switched into tape and phono positions, direct-reading edge-lighted VU meters. A brilliant engineering first!



**TRANSISTORIZED AM-FM
MULTIPLEX TUNER**

MODEL NV-101

The Nobles AM-FM Multiplex Tuner will outperform any you have ever seen or heard! Completely individual tuners with separate level controls, individual meters for tuning AM and FM channels, exceptionally high sensitivity, local distance switch for AM broadcast, inter-channel noise suppression for FM broadcast. Unit plays stereo AM-FM or stereo FM and multiplex. Individual plug-in multiplex channels available. Slide-rule edge lighted dials. Here is unsurpassed quality to upgrade your system!

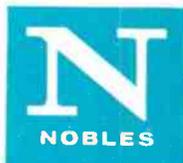


**STEREOPHONIC AMPLIFIER 30 WATT
(DUAL 15 WATT)**

MODEL NS-130

A highly compact "power package" that represents an outstanding accomplishment in design. The Nobles Stereophonic Amplifier, with plug-in amplifier units, meets the most rigid demands made by the stereo listener for honest, distortion-free high fidelity sound reproduction. Quality features include: full 15-watt power from each channel, frequency response with $\pm 1/2$ DB from 20 to 20,000 cycles, amplifier output to match, 4, 8 or 16 ohm speakers. Additional power supply outlet provides filament voltage and "B" supply voltage for tubes and 0 to 18 volts for transistors. Stereophonic Amplifier 70-watt (Dual 35), Model NS 170, also available.

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645 E. 7th Street
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EDITOR'S REVIEW

THE SHOW SITUATION

THERE HAS BEEN considerable consternation throughout the industry since the Los Angeles High Fidelity Show—and during it as well—as to where hi-fi shows were going. Some believe that there is no further reason for shows and that they have served their usefulness. Others think there will always be a place for shows. Between these two extremes there are many viewpoints.

In the first place, the physical set-up for the L. A. show was something less than ideal. Inter-booth partitions consisted of thin plywood sheets nailed onto 2×2 framing, with, apparently, no acoustic deadening between the sheets. Over the tops of the booths were placed king-sized bedsheets which draped gracefully down from the roofs. No other isolation was offered, except in a few booths where the exhibitors went to the further trouble of covering the tops with some fiber glass—which helped a little but not nearly enough.

The show, held in the Pan-Pacific Auditorium for the first time, was what is now known as an “arena” show. This name probably derives from the fact that the building is often used as a sports arena—testified to by the fact of the clock in the center of the ceiling. The ceiling, by the way, is a long arched wood structure which serves as a perfect cylindrical-concave reflector—a wonderful idea, probably, for hearing an announcer, but not entirely ideal when there are eighty or more sound sources with different program material on each. In fact, it is our opinion that any acoustics expert would have ruled out the building after one look at its geometry unless it were to be properly treated. It is to be hoped that the Cow Palace in San Francisco is lauded differently, as it must have been if the exhibitors at the 1959 show there were really as pleased with the set-up as they said.

Now we are not usually given to carping about the over-all activities of the industry—we have, in fact, supported them rather better than most independent observers. We have always felt that what happened in the industry was actually an inside activity, and not one to be discussed outside of the “family.” We did not—and do not yet—believe that an arena show can be good from the standpoint of those who pay good money to see and hear (and the “and hear” has always been an important part of any show) decently demonstrated components. It is entirely conceivable that adequate sound isolation could be provided in an arena booth, but it is likely that the cost would be prohibitive. And while the cost of exhibiting naturally increases each year, the actual cost of exhibit space is only a small part of the total cost to the manufacturer, who must transport his exhibit material and his personnel and pay the living expenses of the latter for about a week while the show is in progress, in addition to a day or so before and after. In order to get his money's worth from the show, the exhibitor *must* expose thousands of people to his equipment, and the exposure must be sufficiently effective to create enough further interest for the people to go to a dealer's for a more private demonstration and, of course, for the ultimate sale. If the show is to be a melange of noise, the visitor will get very little from it, and those who come only out of curiosity are likely to go away with less interest than when they came.

Hotel-room hi-fi shows were not ideal—there is no question about that; the New York Trade Show Building is not ideal, either, but at least it offers better sound isolation than the arena show. We believe that the answer lies in the use of silent booths where people can see the equipment and, say, ten well sound-isolated “theaters” for demonstrations, each to be shared on a time basis by the exhibitors in some mutually acceptable fashion. We believe firmly that some such method is the logical answer to the whole problem—and after all, we planned the first audio show in 1949. One thing is certain—if there are to be more shows, and successful ones, some new formula must be found.

MORE A.E.S. CO-OPERATION

Ray Pepe, newly elected NIFM vice-president and now acting president for some sixty days, has proposed a couple of new and “radical” ideas. The most radical is the idea that the *exact* and *true* attendance figures to the shows are the ones which should be given out. Anyone who has ever been in attendance throughout a show has realized that there has often been some padding, and any exhibitor knows what attendance is with relation to the literature he gives out. Therefore, says Mr. Pepe (and we agree with him) it is only the factual attendance figure that is important. Sometimes it appears that they count legs, or even fingers; we have even believed that in a series of shows where each is reported invariably as having more people than the year before that they must be giving out cumulative totals. But the true figure is the one that should be publicized—and, incidentally, the just concluded L. A. Show is said to have had 24,600 *actual* paid admissions.

The second important idea of Mr. Pepe's is that the mantle of engineering excellence implied by the close association between the NIFM and the AES should be reinstated. Everywhere except in L. A., the Society has been given a back seat, but it should be remembered that the first show was actually a Society event; later the AES only sponsored shows, and now they are just allowed to “co-operate.” Mr. Pepe—and we—think there should be much closer co-operation between the two groups.

THE BINGO CARD

The Readers' Service Card in the back of each issue—known in the trade as the Bingo card—is prepared very early in the month, and once it is completed it cannot be changed, even though some advertiser drops out or wants to come in with a new story about his equipment. This month, British Industries Corporation came up with a new item which has turned out to be real “hot,” so they wanted to tell AUDIO readers about it right off, albeit it was somewhat late in the month when they got the idea. Consequently, their insert, facing page 32, does not appear on the Bingo card. If you do wish further information about this particular item, simply write “BIC” on the card before you mail it.

And please, don't forget your name and address.

MORE!



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Here is more for the best of everything in quality record reproduction—the more that makes the difference! more output!...more channel separation!...more response...more record life! In short—more to enjoy because there's more quality for more listening pleasure. Without question, Pickering's Collectors' Series 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 radiation-proof precious mu-metal for absolutely hum-free performance in any record player regardless of type—make—model. 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. For—those who can hear the difference choose PICKERING*.

COLLECTORS' SERIES 380. Totally new and unique to high fidelity is the "Collectors' Ensemble"...a complete quality "pick-up-package" for reproduction of all records—stereo, micro-groove, 78's.

OUTPUT: 15 mv per channel. **CHANNELSEPARATION:** 30-35 db. **FREQUENCY RESPONSE:** 4-2 db 20-20,000 cycles. **SIGNAL TO NOISE RATIO:** -65 db below reference. **TRACKING FORCE:** "A" type stylus—2.5 grams; "C" type stylus—3.7 grams.

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

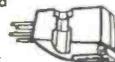


Only the Stanton Stereo FLUXVALVE features the safe, comfortable, easily replaceable stylus assembly.

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

†PICKERING AUTOMATED CRAFTSMANSHIP
 FLUXVALVE. "V-GUARD" "T-GUARD" UNIPOISE PAC (TM)

PRO-STANDARD SERIES 371. 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...an industry standard and the universal choice of professionals. Features four coil push-pull hum rejection circuit.



OUTPUT: 10 mv per channel. **CHANNEL SEPARATION:** 20-25 db. **FREQUENCY RESPONSE:** 20-15,000 cycles. **TRACKING FORCE:** "A" type stylus—2.5 grams; "C" type stylus—4.7 grams.

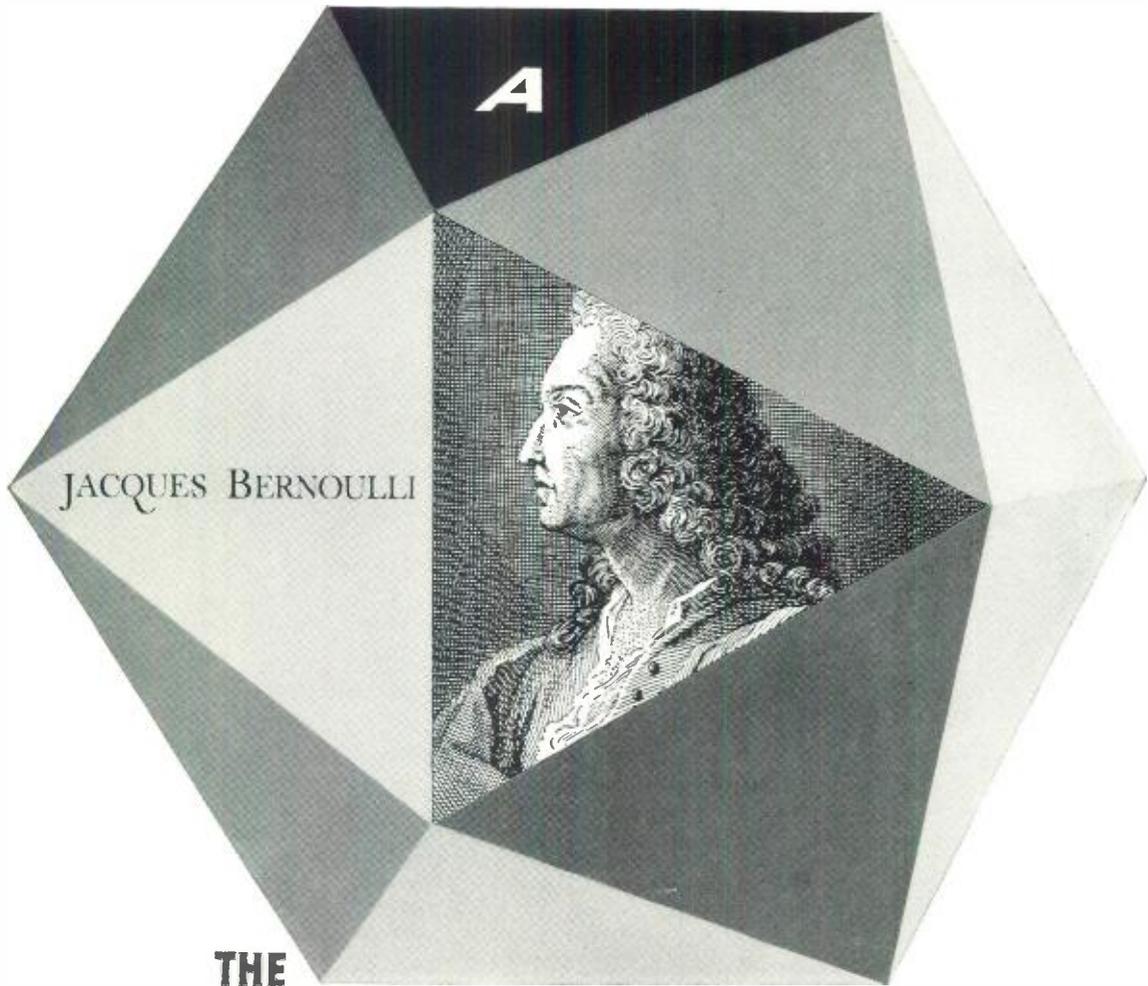
Model 371A Mk II Stanton Stereo FLUXVALVE Pickup now \$26.40
 Model 371C Mk II Stanton Stereo FLUXVALVE Pickup now \$24.00
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FOR THOSE WHO CAN HEAR THE DIFFERENCE



Pickering

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**THE
WIZARD
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ODDS**

He solved a telephone traffic problem two centuries ago

Jacques Bernoulli, the great Swiss mathematician, pondered a question early in the 18th century. Can you mathematically predict what will happen when events of chance take place, as in throwing dice?

His answer was the classical Bernoulli binomial distribution—a basic formula in the mathematics of probability (published in 1713). The laws of probability say, for instance, that if you roll 150 icosahedrons (the 20-faced solid shown above), 15 or more of them will come to rest with side “A” on top only about once in a hundred times.

Identical laws of probability govern the calls coming into your local Bell Telephone exchange. Suppose you are one of a group of 150 telephone subscribers, each of whom makes a three-minute call during the busiest hour of the day. Since three minutes is one-twentieth of an hour, the

probability that you or any other subscriber will be busy is 1 in 20, the same as the probability that side “A” of an icosahedron will be on top. The odds against 15 or more of you talking at once are again about 100 to 1. Thus it would be extravagant to supply your group with 150 trunk circuits when 15 are sufficient for good service.

Telephone engineers discovered at the turn of the century that telephone users obey Bernoulli’s formula. At Bell Telephone Laboratories, mathematicians have developed the mathematics of probability into a tool of tremendous economic value. All over the Bell System, the mathematical approach helps provide the world’s finest telephone service using the least possible equipment. The achievements of these mathematicians again illustrate how Bell Laboratories works to improve your telephone service.



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Second Thoughts About Stereo

NORMAN H. CROWHURST*

The general philosophy of stereo reproduction is still in a state of flux so that it is desirable that the entire subject be outlined once and for all, which the author does excellently, and follows with a comprehensive bibliography on stereophony.

THERE ARE SO MANY EXPOSITIONS of how stereo works, written at various levels, from the simplified approaches intended for insertion in disc covers or with packaged stereo systems, to the more sophisticated presentations written for professional society consumption, that one would imagine the subject *should* be fully covered by now. But a closer examination shows the matter to be far from clear.

A vast amount of experimental work has been done and a still larger number of conclusions have been drawn—conclusions that conflict in a number of areas. The most amazing thing is that one can hear a series of experiments described together with their results, find them quite consistent with the results of previous experiments, and yet hear completely opposing conclusions drawn from them.

One example of this was quoted in the article, "Comb Filters Anyone?"⁷⁴⁸ Sometimes tests seem to be conducted with the objective of proving that a certain principle or theory does not work or is not true; from which the conclusion is drawn that one possible alternative *must* therefore be true. The fallacy here is that there may be other alternatives that have not been considered.

However, to make this article of specific use rather than dealing in somewhat vague terms, we shall divide the discussion under three headings.

1. Physiology of Hearing

This is a large subject in itself and much has been written about it, although a very much larger amount of work still needs to be done before we can profess to know even a little about how the hearing faculty operates. Disregarding, for the purposes of this article, all the very early concepts of hearing, we will take the Helmholtz theory to represent the beginning of modern investigation.

This theory assumes that the basilar membrane or some system of resonant fibers inside the ear responds to individual frequencies in the manner of a series of Helmholtz resonators. According to this theory individual nerve fibers,

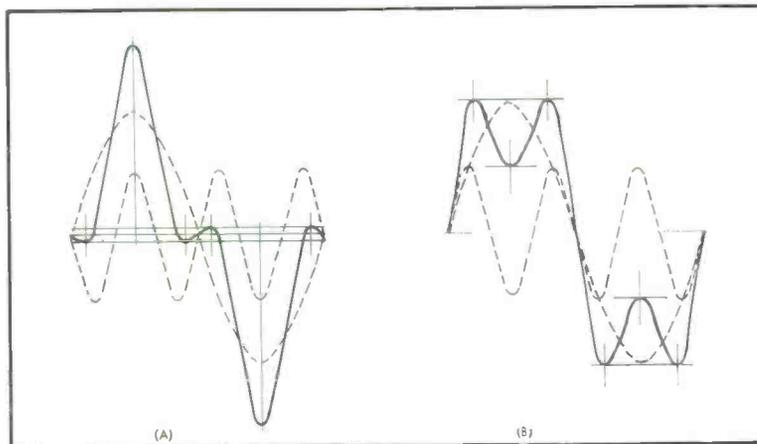


Fig. 1. Why a place form of waveform analyzer is not a logical theory: these two waveforms each contain fundamental and third harmonic, in equal proportions; phase makes a radical difference to wave shape and stationary points, but there is no audible difference.

in the composite auditory nerve, convey information about the frequency content of received sounds.

The objection raised to this theory is that a system of individual resonators could not discriminate pitch to a closer interval than a quarter of an octave. Certainly the one-twelfth octave interval represented by a semitone should be indistinguishable.

Helmholtz' theory has been classified as belonging to the place theory group. Contrasted with this is the Frequency theory, which assumes basically that the composite auditory nerve receives a single composite signal from all the nerve terminations or hair cells and transmits this signal in the form of an electrical signal, containing the actual audio frequencies, to the brain.

For this theory to be true without modification would require the auditory nerve to convey electrical impulses or signals of a character very different from any other nerve in the human body. The auditory nerve must, in fact, be a very specialized nerve fiber different from any other.

Next we come to Meyer's Hydraulic Theory of the Cochlea and Comparative Anatomy. This is an adaptation of the Frequency theory. Individual fibers of the auditory nerve carry information

about the instantaneous deviations in the basilar membrane at different points. Time and intensity relations of stationary points on the composite waveform control the signals fed to the brain. If the ear does function as Meyer suggests, as a special kind of waveform analyzer, there is one serious difficulty. The quality of a sound should be dramatically dependent upon phase relationship.

For example, a fundamental with third harmonic in one phase relationship would sound very different from that of another phase relationship (Fig. 1), because the waveform is radically different. Other research has shown such phase differences to be of no consequence, if not actually undetectable.

The more acceptable theories of hearing perception, from the mechanical viewpoint, postulate that the columns of fluid on either side of the basilar membrane, in conjunction with the particular type of tension imposed upon the individual fibers of the membrane itself, cause a resonant mode of oscillation for each individual frequency, that produces a peak vibration of one group of fibers in the membrane. This in turn activates the associated group of sensory nerves to convey an impression, corresponding to this frequency, to the brain. (Fig. 2)

* 216-18 40th Ave., Bayside 61, N. Y.

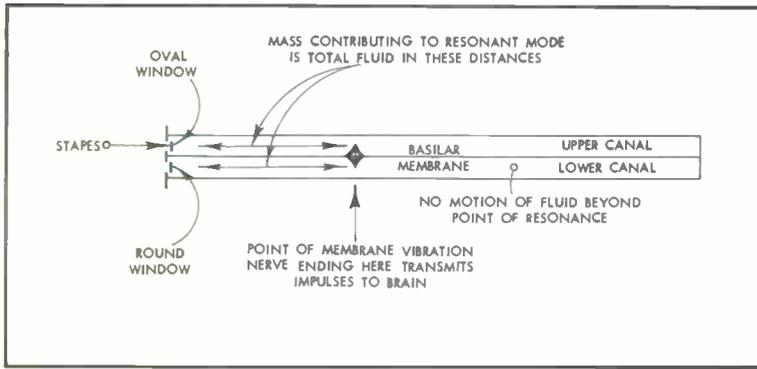


Fig. 2. A likely theory of resonance in the inner ear. Each frequency causes a different point in the basilar membrane to vibrate, in conjunction with the mass loading of the fluid that also communicates the vibration.

This theory thus appears to be a revised version of Helmholtz' theory. Rather than many separate resonators, we have a composite resonant analyzer. And, according to this theory, the arrangement of the cochlea is reversed from the Helmholtz theory, which postulated the low-frequency sensing resonators near the base of the cochlear helix with the higher frequencies up toward the apex. Now it seems the higher frequencies are sensed in the base of the coil, nearest to the communicating window, while the low frequencies are sensed nearer the apex, because this is more remote from the communicating windows and consequently requires a greater mass of fluid to achieve the resonant mode of vibration.

This theory can in turn be subdivided according to the proposed possible modes of vibration of the membrane fibers. This will vary its relative response to different frequency combinations and beat-note effects, according to the way the membrane is tensioned. This will determine whether harmonic relationships should be a property physically detected by the cochlea, or whether they are recognized solely from the familiarity pattern generated in the identifying faculty of the brain.

If we accept this last named group of theories as being the most likely, regardless of the precise manner in which the vibration localizes in the membrane for individual frequencies, the theory of hearing has one thing in common with the original Helmholtz theory, although from the mechanico-acoustic viewpoint it may be diametrically opposed: each nerve fiber of the auditory nerve is responsible for conveying information concerning one specific frequency.

Incidence of a particular frequency at the ear will quickly set up the resonant mode of vibration corresponding to it and transmit the first of a series of pulses along the appropriate nerve fiber. The delay time between the incidence of the frequency and the first transmitted pulse will be a uniformly

small delay time for all frequencies, and will be the same for both ears, from the time of arrival of that frequency at the individual ear. Successive pulses along that fiber, and possibly a small number of pulses along adjacent fibers, will convey information to the recognition faculty of the brain concerning the relative intensity of that frequency.

Without concerning ourselves for the moment with the details of the mechanical resonance of the basilar membrane, the basic theory seems reasonable on the following grounds.

1. The hearing faculty is extremely critical of frequency. Even a relatively poor musical ear can hear a difference in pitch of one semitone quite easily, which is a twelfth part of an octave.

2. On the other hand, the hearing faculty is not by any means highly critical of intensity. A change in intensity of 2 db requires very careful listening to identify.

So a frequency ratio 1/12th part on a logarithmic scale of 2 to 1 ratio can be quite readily identified, while an intensity change 2/3 of a power level ratio of 2 to 1 (or 1/3 of a pressure level ratio of 2 to 1) is barely noticeable. On the not illogical assumption that the auditory nerve conveys impulses of the same type as other nerves, this is analogous to being able to locate accurately the position at which we feel something, for example the head of a pin we may be picking up, while we may not be able to tell quite as precisely which of two pin jabs injected in different parts of the body hurts more. This brings us to our second heading.

2. The Fallacy of Phase

Most of the analyses and many of the experiments relating to investigation of the phenomenon of directional detection have been based on single continuous sine-wave frequencies. From the foregoing postulation of the most likely basic theory of hearing it is evident that a continuous tone falling on either ear will produce a succession of impulses on

certain fibers of the auditory nerve, whose rapidity is proportional, not to the frequency or phase relationships of the tone, but to the intensity of the tone falling on each ear. Thus during a sustained uniform tone arriving at the ear, according to this theory, it has no means of identifying time relationships between the waves.

This has been verified by a number of experiments, most spectacular of which, to the writer, was a passage of demonstration recording using the Perspecta system, developed for theater use. This system takes a composite audio signal, comprising the total program sound, and shifts its apparent source by varying the relative intensity delivered to three loudspeakers from instant to instant. This is achieved by means of carefully controlled sub-audio code frequencies.

By skillful control of these code frequencies a passage was presented in which the location was correct for the impact sound of piano, drums, and various other instruments, at each instant where they occurred. The amazing thing about the presentation was that it achieved separation equally as well as a full three-channel stereophonic recording of the same program material, if not a little better. The operator who had scored the code frequencies had been careful to ensure that the apparent location of the sound was exactly correct for each impact sound from the individual instruments.

The extraordinary thing, until this theory was investigated a little more in detail, was that when the drummer, for example, struck his drum a little to the right of center, and the next note was due from a piece to the extreme left, the sustained sound of the drum did not wander across to the left as the sound from the loudspeakers moved over to be ready for the next impact. To the ear the follow-through sound of the drum remained identified with the impact sound a little to the right of center. Knowing how the sound was actually being presented, the effect had to be heard to be believed. But this theory of the faculty of hearing certainly explains it.

A number of papers have been at great pains to explain that the directional faculty of hearing is *not* dependent upon transient effects or any form of time relationship; that, instead, it is entirely dependent upon the relative frequency content of sounds heard at the two ears. In support of this contention, several writers have quoted the fact that persons partially deaf in one ear have directivity perception at least almost equal with people having equal hearing in both ears.

A little more thought shows this argument to be irrelevant. On the basis of our tentative physiological conclusion,

difference in intensity arriving at the two ears will merely alter the repetition rate delivered to the auditory nerve for that ear, following through after the impact sound. Alternatively, according to where the "automatic volume control" mechanism of the hearing faculty takes place (which has not been established to date) it may well be that an adjustment is made at the ear end of the nerve to compensate for the difference in absolute sensitivity, so the impulse rate transmitted to the brain is practically the same from both ears when the sound intensity arriving at the outer ear is the same.

Whatever the correct explanation in this particular area, the difference in time of the impact sound will be independent of whether one ear is more sensitive than the other or not. Consequently, this time difference of the transient component of the wave (the "front end" of any individual sound) is equally applicable, whether a person has two ears of uniform sensitivity or with a dramatic difference in sensitivity. In fact, second thoughts here seem to support an opposite conclusion from that heretofore deduced from this evidence.

It has been suggested that localization in different directions, as opposed to just a simple left or right component, which leaves ambiguity of front or back and up or down, is due to the shadow effect of the head and the outer ear, which produces differential attenuation of the higher frequency components of a composite wave. This is highly probable and fits in quite well with the theory so far. Neither does acceptance of this probability argue against the importance of transient components, as has sometimes been implied.

The interpretive faculty of the brain receives a composite pattern of impulses along a system of nerve fibers from both ears. At the instant of impact this pattern represents the first arrival of direct sound from the source. Difference in timing may well be chiefly responsible for the critical determination of angle relative to a plane between the two ears. Then difference in the individual patterns from the ears, the relative intensity of different frequency components in the wave, may well follow through and give identification of front or back, up or down, making a "solid angle" location in space.

Before we leave this section maybe we should clarify just what we mean by a transient. A surprising number of people seem to think a transient is a square wave. It seems open to argument whether a square wave is even a transient in the true sense of the word.

As used here, a transient may be defined as the initial part of any continuing waveform. In some instances the initial part may have a different com-

position from the follow-through tone of the waveform. But regardless of whether it is just the way a sound wave starts up or whether the start has a different character from the way the wave continues, the beginning part is the essential component of a transient.

The way the wave terminates is not usually a transient in the same sense. During the initial part, reverberation is built up, which amplifies the over-all volume of sound heard during the follow-through tone. If you don't believe this happens, try listening to almost anything in an anechoic chamber, and you will soon discover how much has been lost with the reverberation.

Because reverberation reinforces in this way and has its own decay pattern, characteristic of the studio or room (or the combination of both in the case of

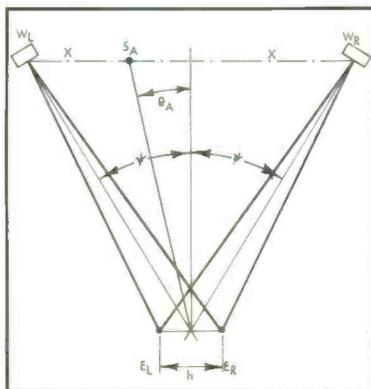


Fig. 3. Diagram used to show that an intensity difference between the radiation from W_L and W_R produces a physical time, or phase, difference at the ear locations E_L and E_R . The probability that phase itself is not significant to the hearing faculty does not invalidate the effect this principle will have on transients.

reproduced music) the decay effects are dependent far more on the reverberation, while the initial parts of the tones are dependent on the direct or individual sounds from the sources.

Several experimenters have noted the strong distinction between tests conducted with pure sine-wave tones of different frequencies and reproduced music. The argument has been put forward that this difference is because the reproduced music is a composite of many frequencies while the individual tones do not give the ear the opportunity to compare the composition in terms of frequency. But if the follow-through tones of the music possess many frequencies, so also do the transients, while continuous tones possess no transients whatever.

Thus it becomes apparent that analyses of stereophonic perception in terms of frequencies, their individual intensities and phase relationships, do not have a thoroughly valid basis. But this does not argue that all the deductions

made from such analyses are invalid. So please don't tell me "the results prove the theory is true." Results may be truly observed, but not prove the first thing apparent, any more than the magician really saw a lady in half at every performance.

For example, an analysis of a system dependent upon primarily intensity differences between sound from two loudspeakers shows that such intensity differences generate a phase difference in the locality of a pair of ears, due to synthesis of sound at each ear from that radiated by both loudspeakers (Fig. 3). Thus what starts as an intensity difference at the loudspeakers gets changed physically to a time difference at the ears.

This analysis was presented in terms of intensity and phase partly because it is simpler to do that way. But the same physical relationship exists in the initial wavefront of transients. Thus an artificial time difference will equally well be created by difference in intensity from loudspeakers in the transient components of the wave as in the follow-through components.

Similarly an analysis of reflection patterns and time differences between sounds heard at the two ears will show that sound from different sources would produce a frequency response at microphones located in the equivalent position of the two ears, resembling that produced by the comb filters discussed in an earlier article. This systematic division of frequencies between the two ears according to the location of the source of sound is what, as argued in the paper, seemed to prove that transients were not in any way responsible for identification of direction.

However, it is well known that any kind of filter introduces a time difference to the components of a transient wave just as well (if not more so) than a continuous wave. Consequently, the use of comb filters in signals fed to both ears will also modify the received transients at both ears in a very similar way to the different pattern received by the two ears in the natural course of events. Consequently, the successful use of comb filters to provide a stereo illusion does not prove that transients are not responsible. It merely shows that the results can be synthesized by a mathematical method and come out with an illusion corresponding to that achieved acoustically.

That's about covered the second heading, so we'll now pass on to the third, which carries most of the meat discussed in this article.

3. The Contribution of External Acoustics

Some presentations on the subject of stereo seem to ignore the effect of reverberation, or treat it as part of the

composite problem, merely assuming that relative differences in intensity and phase or time between all parts of the received sound at the two ears is entirely responsible for the sense of perspective.

Another group seems to adopt the assumption that the principal effect of stereophonic sound is to create an illusion of spaciousness, based entirely on reverberation or a synthetic reverberation effect. This in fact is the basis of some of the pseudo- or quasi-stereo systems, using a single-channel program "operated upon" to add an artificial effect similar to reverberation.

The true importance of reverberation seems to lie somewhere between these two extremes—or perhaps somewhere else altogether!

In two-microphone recording for two-channel stereophonic presentation, the impression of lateral placement is achieved by the intensity or time relationships between program appearing on each channel. The impression of depth, whether the sound comes from further back or nearer the front, is achieved more particularly by the relation between original and reverberant sound compared with the general average in the studio.

When the sound source comes close to the microphone the impression is of a sound up front. As the sound source recedes it gets further away and the impression is that it goes toward the rear. A person talking and at the same time walking to and fro between laterally placed microphones, when reproduced, will give the impression, not of walking from side to side, but of walking away from one loud-speaker and then coming back in the other loudspeaker. See Fig. 4.

Thus reverberation definitely contributes to a sense of location with respect to depth. But we suggest it probably also contributes to the directivity determination that has been attributed to the relative suppression of the higher-frequency components in the sound received by each ear, as discussed earlier.

Most of us have observed a blind person, whose well-developed hearing faculty serves him in place of sight in locating objects surrounding him. He has

no mystic powers granted only to persons deprived of sight. Necessity has rendered his perception more acute, using *the same basic faculty* we all possess. His faculty has become trained to use sound even in the location of objects that do not *emit* sound themselves, by careful analysis of sounds they *reflect*.

There seems to be a weakness in the theory that bases directivity solely on relative intensity of individual frequency components in the direct sound. This is the great readiness with which the hearing faculty can readjust both its absolute sensitivity and its frequency response, according to environmental conditions. If this were the only effect contributing to a determination of direction, the hearing faculty could not possibly locate sounds with the degree of precision actually achieved.

On the other hand, if the background of reverberation, using the same original sound but delayed by the reverberation effect, *provides a reference level for each ear*, against which to compare the relative intensity of individual frequencies present in the direct sound, this renders the relative-frequency-content basis a much more precise method of determination and one that is feasible.

Another important effect of reverberation, and one which is more commonly recognized, is its contribution to the "atmosphere" of recorded sound. Much work has been done, in the realm of auditorium acoustics, toward discovering the ideal reverberation characteristics for buildings of different sizes. Following this through, it is only natural that further work should be done to determine the ideal amount of reverberation to include in a recording made in a studio of any specific size.

The ideal reverberation may then be achieved, by correct microphone placement so as to pick up sound in the right proportions, or by putting the microphones close into individual sound sources to virtually exclude reverberation, and then adding reverberation by means of suitable echo chambers or from a single "distant" microphone.

While these general effects are well enough known, there is something to be learned from the way the human hearing faculty "handles" reverberation that can

tell us more about the desirable effects in reproduced sound. That is its capability of making subconscious selection of sound. Two illustrations will serve to prove that this happens.

If you have ever been in a crowded restaurant or cocktail party, conducting a conversation with one person where many other conversations are taking place at the same time, you will know that it is possible to virtually exclude the background from your mind while paying attention to what your companion is saying almost exclusively. If for a moment your attention wanders, you become conscious of the background sound of all the other conversation and realize that your companion's voice is barely audible above all the other voices.

Your hearing faculty is capable of making a selection that partially excludes the other sounds, merely acknowledging them as a background, or "atmosphere." In this way you can even hear the sound of a person's voice on the far side of the room when you would expect this voice to be masked completely by all the other voices. Careful attention to your ability to do this suggests that three separate devices are employed by the interpretive faculty of the brain to achieve such a separation or discrimination:

1. Coordination with optical impressions; you may find you can aid your hearing by lip reading under these conditions.

2. Directional perception comes into play; focusing your attention aurally in the direction from which the voice comes.

3. The recognition faculty of the brain appears to employ a "voice-characteristic" filter; merely paying attention to the peculiarities of the voice of the person to whom you are listening; whether this is male or female, or has particular accents associated with his manner of speech, Southern, Western, or North Brooklyn, for example.

The second illustration takes the form of an experiment that can be readily conducted with a home tape recorder. Make a recording of either a conversation over to one side of the room with the microphone in the center; or a piano or some other musical instrument playing at a similar distance. Sit in a position at the same distance from the source of sound as the microphone while the recording is being made. Then place the loudspeaker for playback where the original source of sound was and listen at the same place again.

The amount of reverberation on playback should not be more than twice that in the original performance, one would expect. In other words, the reverberation should be that of the room twice over. If this is what you expect you are in for a surprise. The increase in apparent reverberation is much greater than this.

The explanation appears to be that the

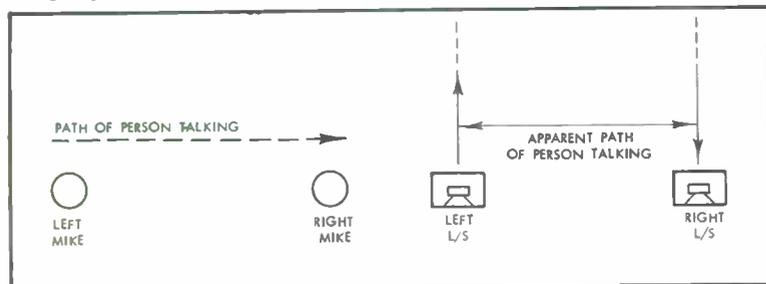


Fig. 4. How reverberation, when restricted by a two-channel stereo system, can cause a spurious sense of location in the depth sense.

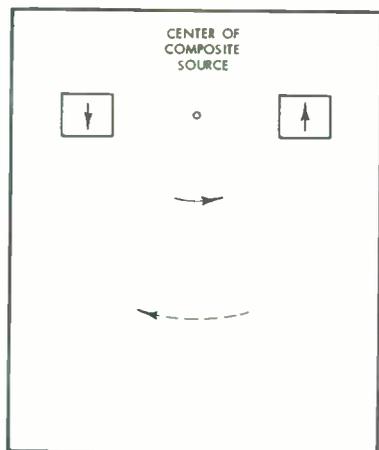


Fig. 5. How a transverse wave can be radiated by two units out of phase. Solid line shows motion at an instant. Dashed line shows particle motion due to previous motion in opposite direction.

hearing faculty subconsciously minimizes the effect of reverberation due to its capacity of separating direct sound from reverberant sound. This capacity utilizes the binaural hearing and differentiates between sounds heard by the two ears and is thus able to select original sound and to some measure reject reverberant sound to a subconscious level. This the recording microphone is unable to do. It records all the sound together and reproduces it over the loudspeaker all as a single sound source.

So now the hearing faculty can only minimize the playback reverberation, not the original-play reverberation. Consequently, the *apparent* reverberation is very much greater.

These illustrations prove that the hearing faculty, particularly in virtue of its binaural capacity, is capable of adapting its perception according to the acoustic surroundings. This is a subjective contribution based upon the acoustics of the room, both studio and listening.

There is also a purely physical difference or variation in sound radiation which links with this matter of reverberation in the optimization of stereo effects. When dimensions between sound sources are small, and difference times correspondingly short, a dual source, such as two loudspeakers, can radiate a composite wave effect. This gives rise to the radiation of transverse sound waves in addition to the more commonly recognized longitudinal ones.

These transverse waves are not self-maintaining or a basic form of radiation like the longitudinal sound wave of classical sound theory, but are a short-range effect produced by twin radiators such as two loudspeakers. The effect can be explained by Fig. 5.

When one diaphragm pushes out and the other one pulls in at the same time,

due to an out-of-phase signal, air is moved across from right to left at the front and (if the rear is open) from left to right at the back. This motion is part of a propagation of sound and will progress outwards from the two loudspeakers as a joint source.

The fact that the velocity of the air in the sound wave is transverse to the direction of the composite source means that an obstacle such as the human head can produce a precedence effect on the leading side. Thus, although there may be little time difference in the radiated wave, because the two loudspeakers are radiating principally with intensity difference and slight if any phase deviation, an apparent time difference is generated at the ears of the listener due to the transverse component of the radiated wave.

This can only occur for a very limited distance because the intensity of the transverse component of a complex wave decreases at a much more rapid rate than the normal longitudinal component. Consequently, this transverse component cannot be relied upon to produce a generated time difference at the two ears unless the listening location and the two loudspeakers are at relative distances commensurate with the wavelengths involved.

The result of this distinction is that in a small room two loudspeakers close together can radiate a composite wave that produces the necessary time and intensity differences in the vicinity of the listener's head. For this particular type of radiation phase relationship of the loudspeakers is of utmost importance. Incorrect phasing, or even phase deviation due to poor crossover design, can very considerably invalidate the stereophonic effect.

On the other hand, in a larger listening room with loudspeakers placed much further apart, time and intensity differences become more important. Phase under some circumstances may become relatively unimportant. But what estab-

lishes the stereophonic effect more specifically is in this case the precedence effect; the apparent direction is determined by which sound reaches the listener's ears first, combined with the illusion of room size conveyed subconsciously by the presence of characteristic reverberation.

Summary

We can summarize the possibilities of obtaining good stereo under different circumstances by considering certain specific combinations of reverberation and time differences.

If we make a recording in a small studio, such that the dimensions between microphones and between microphone and sound source are all commensurate with major audio frequencies, and listen to the recorded sound in a similar sized listening room, the hearing faculty does not tolerate abnormally large time differences or excessive reverberation. It is not realistic for the kind of sound to which we are listening.

Consequently, the best method of stereo recording for this particular combination utilizes directional microphones placed close together, preferably vertically in line, so as to minimize time differences and concentrate on intensity differences. This program is then reproduced over fairly directional loudspeakers also placed relatively close together and radiating outwards so as to recreate a sound wave pattern that is approximately the inverse of that received by the microphones (Fig. 6).

Then the transverse, composite wave effects can readily regenerate, at the ear of individual listeners, the necessary apparent time differences of correct magnitude to give a satisfactory stereophonic illusion at different parts of the room, and reverberation is not unnecessarily exaggerated for the desired illusion of room size as a background.

Taking the opposite extreme, a large studio such as a theater, with a large
(Continued on page 78)

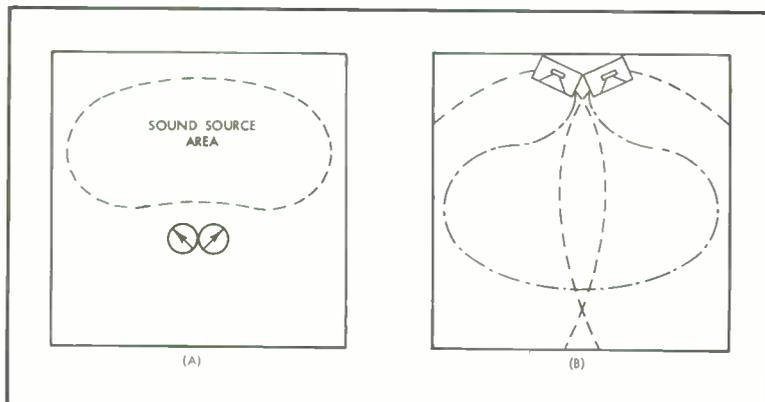


Fig. 6. Best microphone and loudspeaker arrangement for two-channel stereo, when both studio and listening room are small.

"Aural Zero Null" for Stereo Balancing

LEONARD FELDMAN*

A simple electrical means for balancing two stereo channels enables the operator to obtain exact equality of tone and level without any accessory indicators, but solely by ear.

THE PROBLEMS INTRODUCED with the advent of home stereophonic systems have been varied and not easily solved. By far the most critical requirement for true aesthetic enjoyment of stereo listening is that the two channels be precisely balanced, both with respect to level and to tonal spectrum. Little has been written about this latter requirement, for the assumption is that tone controls set to the "flat position" will inevitably result in uniform frequency response over the entire spectrum. Instrument checks taken on several stereo amplifiers of various manufacture clearly show that such is not the case. Stereo amplifiers equipped with individual tone controls for each channel were measured and in many instances (and to many frequencies) the tonal response of channel one differed by as much as three db from the tonal response of channel two. Considered singly, a shift of 3 db (usually ± 1.5 db) over the tonal spectrum of an audio amplifier about some nominal center frequency is not too serious. However, when two amplifiers are working simultaneously to produce stereo sound, $+1.5$ db at 5000 cps on one amplifier and -1.5 db on the other amplifier represents a discrepancy sufficient to "shift" the apparent location of the "first violin" section of an orchestra from its appropriate "stage left" position all the way over to "stage right"—so subtle are the manifestations of the stereo effect.

Considerably more work has been done to enable the listener to balance the channels with respect to level or volume. Devices such as built-in tone generators, magic eye level indicators, and the like have been made available either as parts in an amplifier or as separate accessories. With few exceptions, these devices, even under ideal circumstances, are only accurate within about 2 db or worse. Normally, human hearing itself is that accurate, so that the visual indicators do little more than confirm the accuracy of your own aural intuition. This inac-

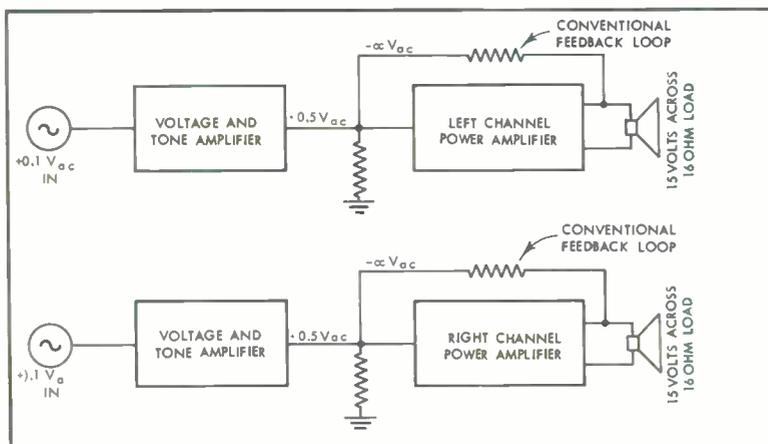


Fig. 1. Block diagram of a pair of conventional power amplifiers for stereo reproduction.

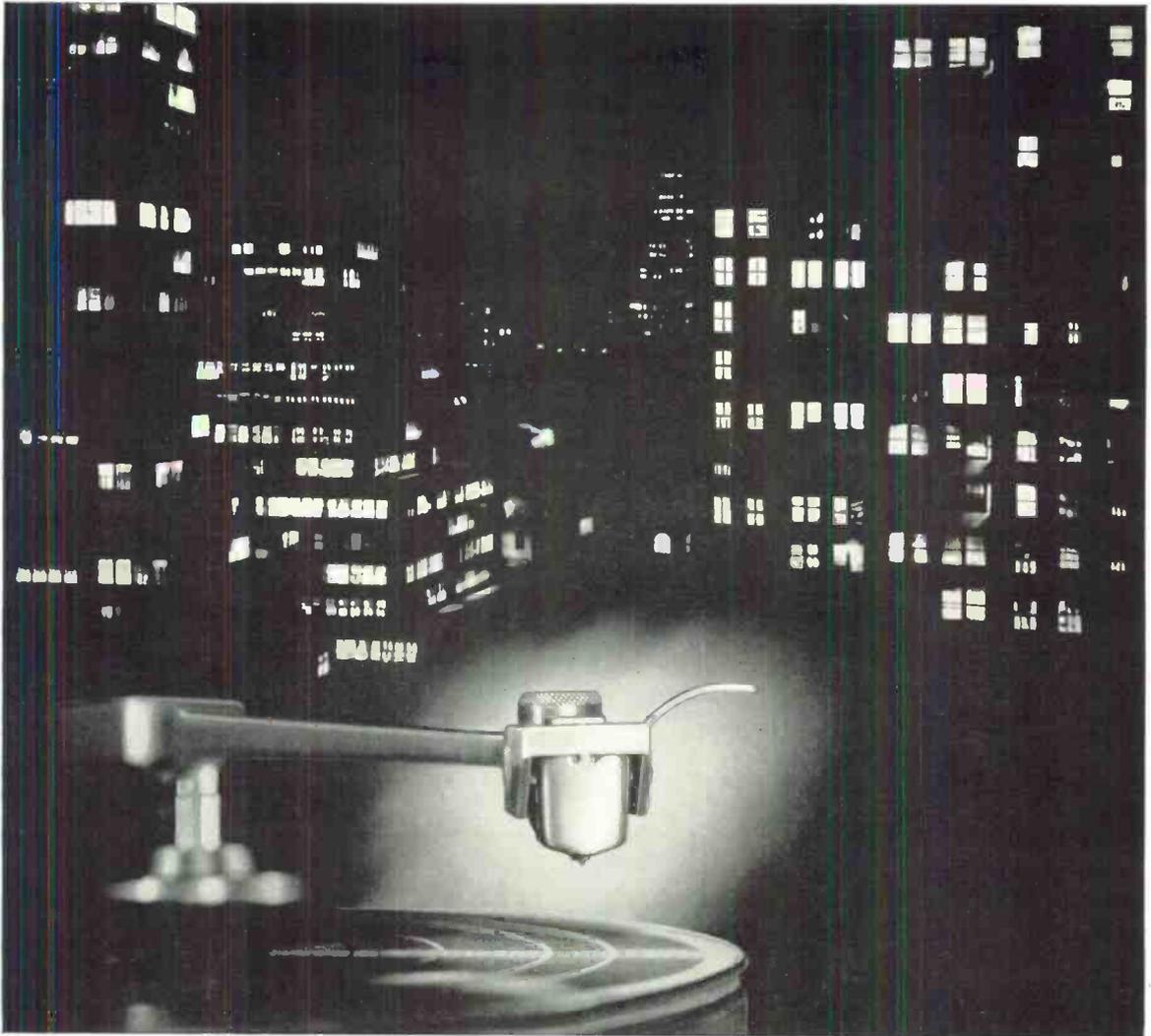
curacy is many times amplified insofar as tonal equality of channels is concerned. If a tone generator is used, balance within 2 db is obtained only at the frequency of the particular tone. At other frequencies, the error may be much greater. In the case of visual indicators, such as magic eyes and meters, these devices generally have their greatest accuracy only in the vicinity of the low and medium frequencies. Stereo perception, on the other hand, depends upon the upper middle and high frequencies and there is no reason to assume that because one band of frequencies is in balance between left and right channels that another group of frequencies will be similarly balanced. This, by the way, is one of the fundamental arguments in favor of separate bass and treble controls for each stereo channel on combined stereo amplifying or preamplifying equipment. Having separate bass and treble controls for each channel still leaves the user in doubt as to their electrically equal settings. Tone controls are not precision controls and while it is true that at SOME setting of the control, flat response will occur, this electrically "flat" setting rarely corresponds exactly with "mechanical" center of rotation of the control. Using marker indications on level controls or balance con-

trol is equally ineffective for the same reason.

Balance Error Amplification

Borrowing concepts used daily in servomechanism engineering, a special circuit has been engineered into the new Madison Fielding stereophonic preamplifier, Model 360. Starting with the premise that the two electrical signals fed to the speaker terminals of each channel must be identical in level at every frequency when the input signals are identical, it was decided that no meter movement or visual indicator could operate with a sufficiently low time-constant or with a high degree of accuracy under musical program conditions. Yet, it is under these conditions only that balance is important, for no one particularly cares whether or not two 400-cps tones are in perfect balance! Furthermore, visual indicators have proven to be somewhat inconvenient, in that the user must face the indicator rather than the loudspeakers. Since aural evaluation, at best, was previously stated to be about 2 db short of complete accuracy at mid-frequencies (and much worse with increasing frequency) it was apparent that some electronic amplification of aural perception would be neces-

* Engineering Vice-President, Crosby Electronics, Inc., 135 Eileen Way, Syosset, N.Y.



General Electric VR-22 Stereo Cartridge—Superior in the four vital areas

Stop to think for a moment of all the jobs required of a stereo cartridge: It must track, with utmost precision, in not one but two directions. It must separate the two stereo channels inscribed in a single record groove. It must perform smoothly in mid-range and at both ends of the audible frequency spectrum. And it must do all these things without producing noticeable hum or noise. Only a fantastically sensitive and precise instrument like the General Electric VR-22 can do all these jobs successfully.

General Electric's VR-22 is superior in the four vital areas of stereo cartridge performance: (1) **Compliance**—It tracks precisely, without the least trace of stiffness. (2) **Channel separation**—Up

to 28 db for maximum stereo effect. (3) **Response**—Smooth and flat for superior sound from 20 to 20,000 cycles (VR-22-5), 20 to 17,000 cycles (VR-22-7). (4) **Freedom from hum**—The VR-22 is triple-shielded against stray currents.

Money-back guarantee: General Electric believes that once you hear the all-new VR-22 in the privacy of your own home, on your own equipment, you'll want this superb instrument for your very own. That's why we are making an offer virtually without precedent in the Hi-Fi field: Try the VR-22 at home for 10 days. If you don't agree that this is the stereo cartridge for you, return it to your participating General Electric dealer and the full purchase price will be cheerfully refunded.



VR-22-5 with .5 mil diamond stylus for professional quality tone arms, \$27.95*. VR-22-7 with .7 mil diamond stylus for professional arms and record changers, \$24.95*. Both are excellent for monophonic records, too. TM-2G Tone Arm—designed for use with General Electric stereo cartridges as an integrated pickup system, \$29.95*. General Electric Co., Audio Products Section, Auburn, N. Y.

*Manufacturer's suggested resale prices.



GENERAL ELECTRIC

sary to achieve greater accuracies. In other words, the electrical "difference" in levels between left and right channels must first be amplified and then re-presented aurally to the listener for final adjustment.

Amplifying the Error

The block diagram of Fig. 1 illustrates a conventional pair of power amplifiers, which utilize loop feedback for reduction of distortion and hum. Each amplifier has a voltage gain from input to output of approximately 30 db, with feedback applied. Amount of feedback varies from amplifier to amplifier but, in general, maximum feedback possible is limited by stability criteria involving output transformer phase shift at the extreme ends of the frequency spectrum. If feedback is increased beyond safe limits, the entire amplifier will break into oscillation.

It is possible, however, to apply limitless amounts of external signal at the point of feedback application, providing the signal so applied is not part of the feedback loop of the given amplifier. This principle is illustrated in Fig. 2, wherein external "feedback" (quotation marks, because this external signal is not truly feedback in the strictest sense, since it was not derived from within its own closed loop arrangement) is made to be "infinitely negative." That is, the amplitude of the voltage signal fed externally from Channel 2 output to Channel 1 feedback-application point is arranged to be exactly equal to channel one's own signal at that point, but is opposite in polarity. The output of Channel 1 will therefore be zero.

Under the above conditions, so long as the input signals to Channel 1 and Channel 2 are identical (whether they be complex music or single tones) no sound will emanate from the Channel 1 loudspeaker. Of course, sound will still be heard from the Channel 2 loudspeaker in the normal manner. Now, should LEVEL ONE control be altered either up or down, the cancellation in Channel 1 will no longer be complete. If LEVEL ONE is too high compared to LEVEL TWO, the direct Channel 1 signal will "override" the negatively injected Channel 2 signal. Conversely, if the Channel 1 level control is set too low, the amplitude of the indirectly injected Channel 2 signal will override the Channel 1 signal, and sound will be heard in the Channel 1 loudspeaker. In this case, the sound will be Channel 2 sound, diminished by the lesser amplitude of Channel 1 signal.

Since amplifiers 1 and 2 both have a gain of 30 db (or an amplification factor of approximately 30 times) from feedback application point to output, an amplification of difference voltage is automatically created. As a numerical example, consider the situation wherein

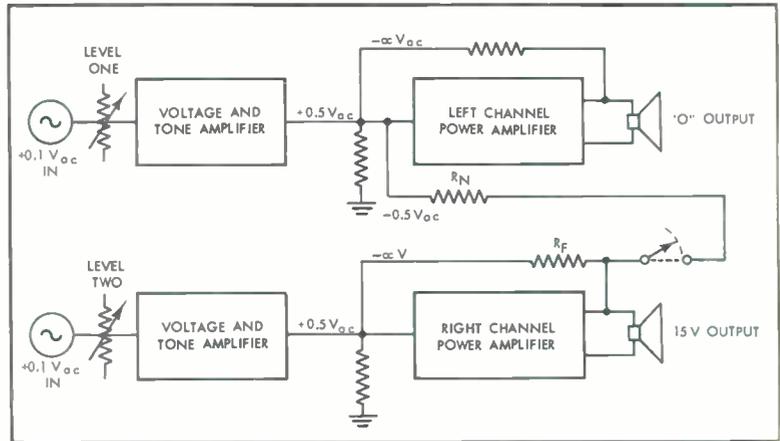


Fig. 2. Method of applying external "feedback" from one amplifier to the other to effect the Aural Zero Null method of balancing.

LEVEL ONE is adjusted so that 1 volt appears at the feedback application point of Channel 1 due to Channel 1 input signal, and presume that LEVEL TWO is mis-adjusted by 3 db, so that only 0.707 volts appears at the equivalent point in Channel 2. Since both amplifiers have equal gains of 30 db, the output of Channel 1 will be 30 volts and the output of Channel 2 will be 21.21 volts, still a difference of only 3 db. If the "nulling feedback resistor" is ap-

plied, however, a difference signal of $1 - 0.707$, or 0.293 volts will be present at the feedback point of Channel 1. This difference, amplified through the remaining circuitry will result in an output from channel one of 8.79 volts, instead of 0 volts which it would be under conditions of true balance. The error of adjustment has thus been amplified to an appreciable audible signal in the Channel 1 loudspeaker. Actually, only

(Continued on page 70)

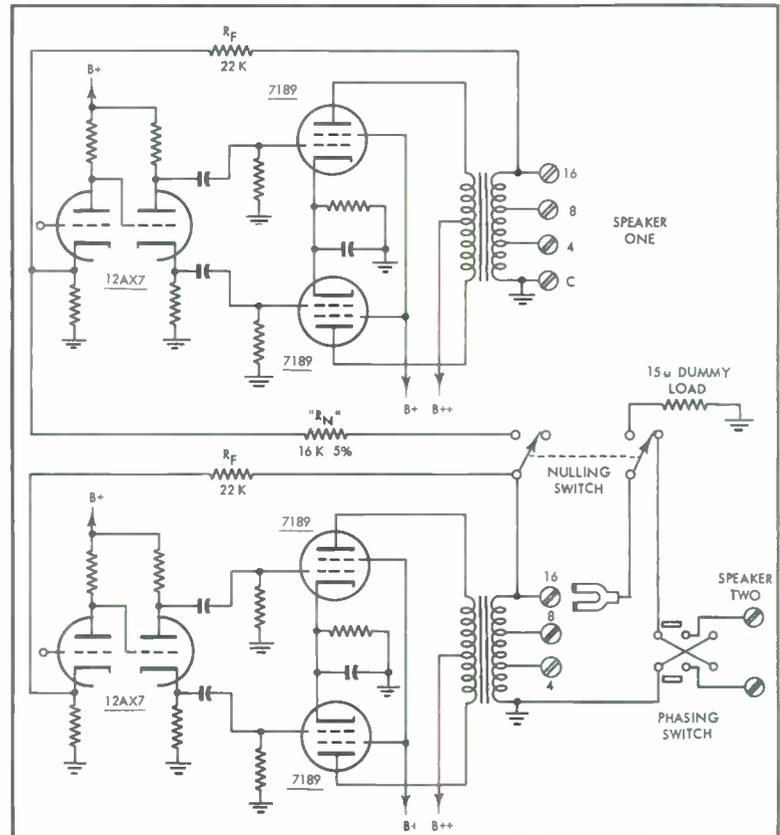


Fig. 3. Partial schematic of Madison Fielding Model 360 to show practical circuitry of the null balancing arrangement.

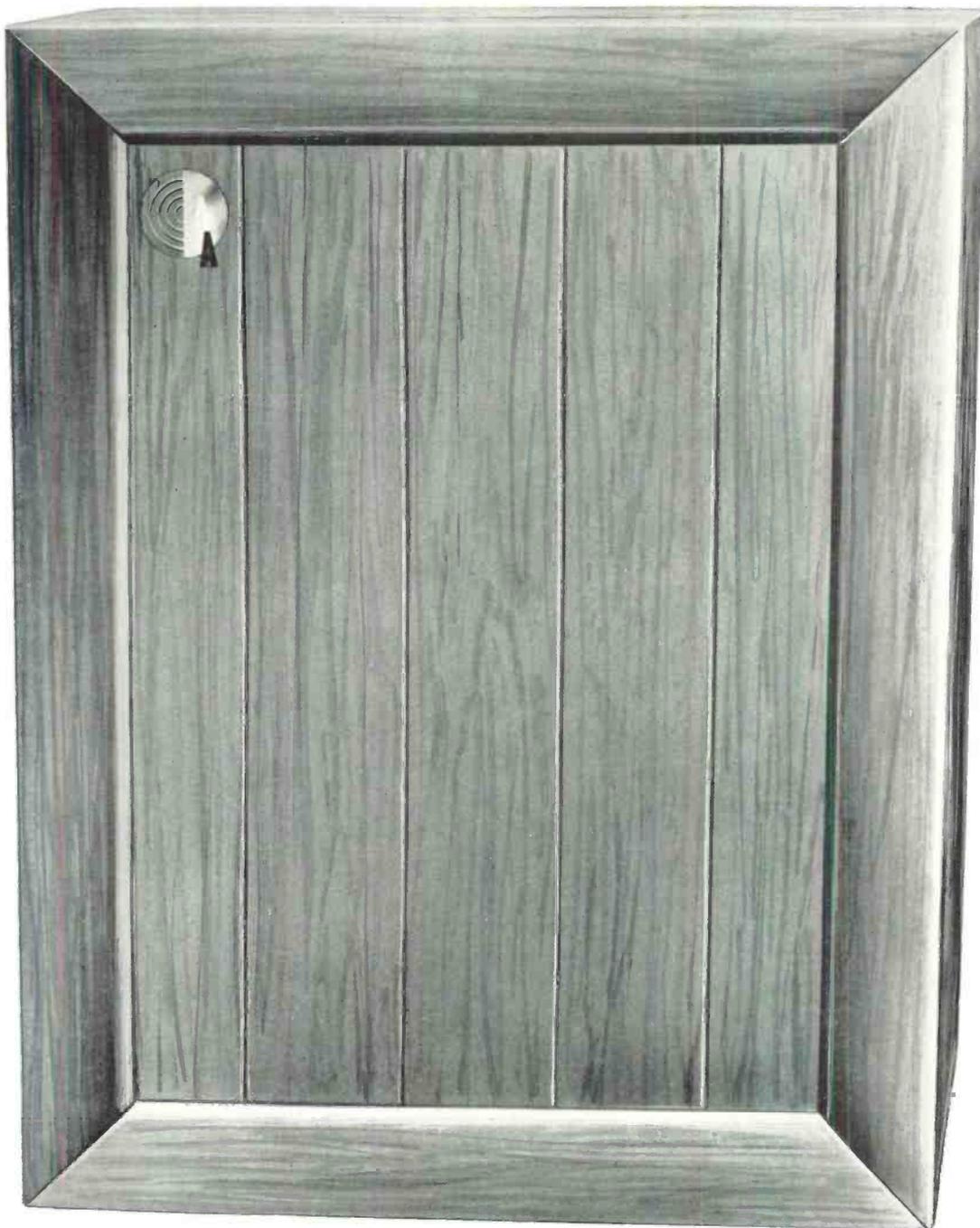
Would you believe it?

The wafer-thin "440" Bi-Phonic Coupler, a maximum range reproducer, is only 3 times the size of this photo . . . and a slim 4½" deep.

The Bi-Phonic Coupler differs radically from ordinary loudspeakers . . . the woofer has no cone . . . it requires no baffle . . . there is no grille cloth. Like in a fine bass violin . . . its wall structure is the reproducing element. Unlike boxed enclosures, the free-radiating "440" reproduces the very deepest bass notes with concert clarity and its spacious projection creates a naturalness matched only by the original performance.



Don't wait! LISTEN—to the remarkable "440" Bi-Phonic Coupler at your Hi Fi Dealer. For complete details and technical information, write for brochure B-20. A product of Advanced Acoustics, Inc., 67 East Centre Street, Nutley 10, New Jersey



Determination of Tracking Angle in Pickup-Arm Design

NIEL MALAN*

A new approach to the tracking-angle vs. overhang problem with methods outlined for determining optimum relations.

IN DESIGNING a pickup arm, the home constructor is faced with the difficulty of deciding the correct angle of offset of the head to the arm, and the correct amount of overhang of the stylus point over the center of the record. In Fig. 1, a pickup arm of length L is pivoted at O and swings in the arc indicated. At the particular position shown, the stylus is at a distance r from the center C of the record; as the arm swings in, the needle will eventually be on the line between O and C and will then overlap the center of the record by the distance d . At any spot on the record, the offset angle is b , the angle between line drawn at right angles to the radius r , and the line L between the pickup center O and the stylus.

In the triangle formed by the lines L , r , and D ,

$$D^2 = L^2 + r^2 - 2Lr \cos a \quad (1)$$

But from above,

$$D + d = L$$

and also

$$b + a = 90 \text{ deg.}$$

By juggling round with Eq. (1), we can reduce it to

$$\cos a = \frac{r^2 + 2Ld - d^2}{2Lr}$$

All that is needed now for the actual design is a knowledge of the intended length of the arm L , a set of cosine tables, and a slide rule.

Unfortunately, quite a bit of slide-rule

* A. Laliou & Co., Johannesburg, South Africa.

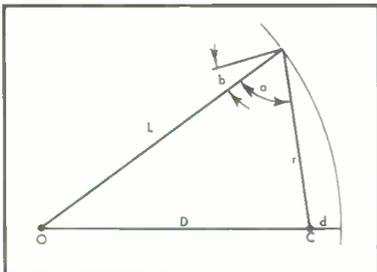
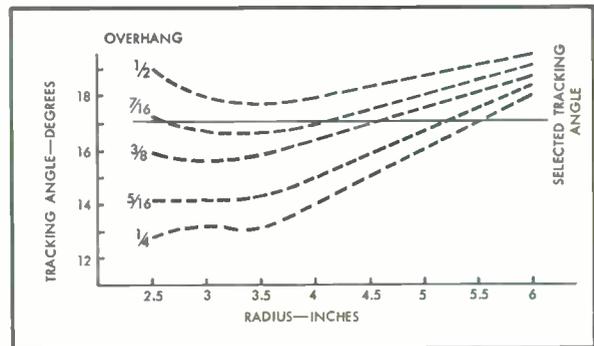


Fig. 1. Basic geometry of the phono arm.

Fig. 2. Curves of tracking angle vs. radius for a 12-in. arm with overhangs ranging from $\frac{1}{4}$ to $\frac{1}{2}$ in.



work is involved, but this is worth the trouble. The procedure is to assume a series of values for d , the overhang, between say $\frac{1}{4}$ and $\frac{1}{2}$ inch. For a typical 12-in. arm, values outside this range need not be considered. Then calculate the required values of r^2 , $2Ld$, d^2 , and $2Lr$ for values of r ranging from 2.5 to 6 in. Very few LP records are recorded to less than 2.5 in. radius; half-inch steps for r are adequate. Also, for values of overhang up to 0.375 in., the value of d^2 is so small that it may be neglected. At the most critical point on this overhang, this causes an error in calculation of only 0.1 deg., about as bad as the usual 0.5-db error in response curves.

For a 12-in. arm and an overhang of $\frac{7}{16}$ in., this gives a series of values of angle a , for half-inch steps of r from 2.5 to 6 in., of 73.8, 74.1, 74.3, 74, 73.4, 72.8, 72.1, and 71.2 deg. and by subtracting these values from the right angle mentioned earlier on, we find that the values of b , the offset angle, varies as follows:

Radius r	2.5	3	3.5	4	4.5	5	5.5	6	inches
Angle b	16.2	15.9	15.7	16	16.6	17.2	17.9	18.8	degrees

It will be noted that the angle required decreases, and then increases again. For smaller values the amount by which the angle decreases becomes less, eventually the angle increases from the word "go."

Plotting the Curves

Once the values of angle required for different values of overhang have been

calculated, they should be plotted on graph paper against the radius, as in Fig. 2. From the collection of curves obtained, it can be seen that: (1) for low values of overhang, the offset angle increases constantly; (2) for high values of overhang the offset decreases and then increases again. Since the average design is limited to one fixed angle of offset, it will be seen that if the overhang is too small, the tracking error, which is the difference between the selected and the required angle will be first negative and then positive. For higher values of overhang, the error will be positive, then negative, then positive again.

The shape of the curve also indicates where the problem of compromise becomes awkward. Using medium values of overhang, the error angle can be made as small as $\frac{1}{4}$ deg. over the range from 2.5 to 4 inches radius, but rises rapidly after this until it reaches 3.5 deg. at 6 inches radius. This would make a good arm for 7-in. records, but using a 12-in. arm for these would be rather extrava-

gant. Similarly, using a large value of overhang, the average error can be reduced to plus or minus 1.5 deg., but another consideration enters.

Is tracking error more important at small radii than at the outer edge of the record? Presuming that it is—and experience seems to indicate that this is

(Continued on page 80)

try this simple test



... proves new **EMPIRE 98**
finest for stereo

most perfectly balanced transcription arm
and monophonic records!

1. With an Empire 98 mounted on a turntable board and fitted with a cartridge, adjust counterweight until arm is balanced. 2. Dial stylus pressure desired (one gram for each marking on the built-in calibrated gram scale). 3. Place a record on turntable. Set stylus in groove. 4. Now tilt the board. 5. Note: The arm remains in balance and the stylus remains in groove at every angle, even if held upside down. In the Empire 98 arm the lateral pivot is located on the "balance axis"—in a straight line with the counterweight and cartridge. Arms which place the pivot point outside the "balance axis"—will swing with every change in angle. The Empire 98 adjusts stylus pressure without disturbing the inherent balance. Once pressure is adjusted it does not vary even with warped records. This is achieved by a tempered steel clock mainspring coiled around, and secured to the exact center of the pivot. The outside end of the spring is attached to the adjustment knob. "Dialing" stylus pressure by rotating this calibrated knob tightens the spring and exerts a torque or twisting force on the pivot shaft, increasing the vertical or stylus pressure. Arms which move the position of the counterweight to obtain stylus

pressure are inherently unbalanced because they shift the weight to the cartridge and create an inequality of mass on each side of the pivot.

WHAT ARM BALANCE MEANS TO YOU. The Empire 98 is so precisely balanced it will track a record without favoring one groove wall or the other, even on a non-level turntable. This assures equal output to both stereo channels, reduced distortion, minimum record and stylus wear. 12" arm, **\$34.50**

EMPIRE 88 STEREO/BALANCE CARTRIDGE.

Superior moving magnet design is combined with a new 4-pole, hum-balanced construction for full channel separation, balanced high output from both channels. High vertical and lateral compliance, minimum dynamic mass and low tracking pressure reduce record and stylus wear to an absolute minimum.



With diamond stylus, **\$24.50**

Dept. A-2

AUDIO EMPIRE precision products of Dyna-Empire Inc.
1075 Stewart Ave., Garden City, N. Y.



Output Transformers

An easy-to-understand discussion of the factors that affect the performance of all output transformers.

JAMES MOIR*

IN TWO PARTS—PART I

THE OUTPUT VALVES in common use in audio amplifiers requires anode loads of between about 1000 ohms and 10,000 ohms if the maximum undistorted power output is to be obtained. There are practical difficulties in winding a loudspeaker voice coil with the large number of turns of fine wire required to achieve such high load impedances directly and thus it is common practice to insert an output transformer between a speaker of low impedance and the output valves as in *Fig. 1* in order to "match" the speaker to the valves. The ensuing discussion is intended to be a simple explanation of this matching process and of all the factors that control the frequency response and the distortion introduced by an output transformer.

Loudspeaker voice coils can be wound with sufficient turns to give an impedance of 3 to 4000 ohms and, in fact, these were common in the very early days of radio. However, the difficulties of winding make the cost almost prohibitive, and such a high percentage of the limited space available is occupied with insulation between turns that the efficiency is rather low. It need hardly be stressed that the use of high-resistance wire is an inadmissible solution to the problem for this merely increases the amount of audio power that is dissipated uselessly in heating the loudspeaker voice coil. The efficiency of loudspeakers is already too low for any further loss to be tolerated.

* Technical Director, Goodmans Industries, Ltd., Wembley, Middx., England.

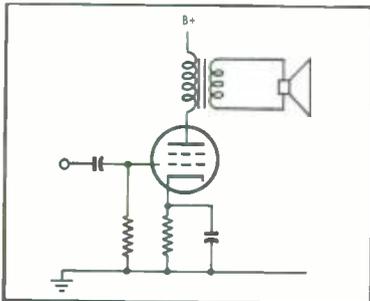


Fig. 1. Output transformer used to obtain the correct load impedance and isolate the voice-coil current from the plate supply.

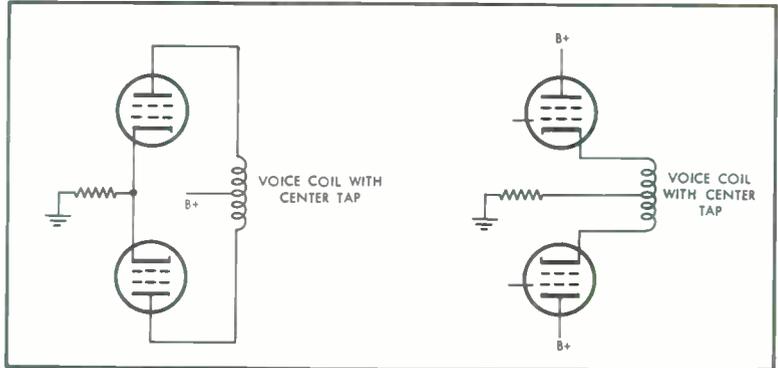


Fig. 2. Use of push-pull connection balances anode current but does not eliminate difficulties due to current in voice coil.

There are other difficulties in the way of connecting the voice coil directly in the anode circuit of a valve or valves. If used in this way the valve anode current must pass through the voice coil, increasing the amount of power that is dissipated in heating the coil and interacting with the magnetic field in the gap in such a way as to drive the coil out of the gap. This is a difficulty that is eased but not eliminated by the use of a pair of valves in push-pull as in *Fig. 2*, for while the anode current can be balanced out in the no-signal condition the balance does not hold at other signal levels, nor does it usually hold for more than a few minutes after the adjustment is made. If a transformer is not used the trouble can only be eliminated by inserting a large blocking capacitor though this would need to be of several thousand microfarads (for a 15-ohm loudspeaker) in order to maintain the response at low frequencies.

Both problems—that of removing the anode current from the coil while efficiently raising the voice coil impedance—are solved by the use of an output transformer as in *Fig. 1*. This is the solution that is commonly adopted even though it involves the addition of another relatively expensive component. Iron cored transformers have a reputation as "distortion introducers" but later in the discussion it will be shown that when properly designed, an output transformer need be no worse than most of the other components in this respect. If the amplifier design is such that the output transformer can be inserted in

the feedback loop, the extra distortion introduced is absolutely negligible by any standard.

Functioning of Transformer

First of all let us consider just how an output transformer enables a low-impedance loudspeaker to appear as a high-impedance load in the anode circuit of a valve. The basic transformer merely consists of two coils of wire wound around an iron path common to both coils as in *Fig. 3*. An alternating voltage applied to either pair of terminals results in a current flowing in the coil and the appearance of magnetic flux in the core. At any instant the flux may conventionally be thought of as emerging from the top of the coil, "flowing" around the iron circuit and re-entering the bottom of the same coil. One half cycle later the direction of flow of both current and flux will be reversed. It is important to note that *all* the flux produced by the current in one coil is guided through the second coil by the iron core.

At this point there emerges a phenomenon that is basic to all transformers; the flux produced by the voltage applied to

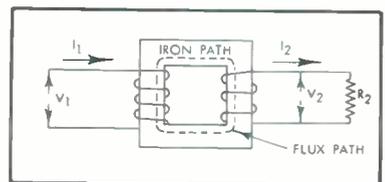


Fig. 3. Diagram of basic transformer.

G.A. Briggs

'60 is the Wharfedale year . . .
the year of the new

Wharfedale '60

by G. A. Briggs . . .
the first shelf-size speaker
system incorporating
the sand-filled principle!

A full-range speaker system
with the rich, non-strident
Wharfedale sound . . . the speakers
matched and critically tuned to a
craftsman's cabinet . . . $\frac{3}{4}$ " genuine
hardwood throughout.

Impressive sound . . .
impressive appearance . . .
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Wharfedale '60

For more information . . . please turn this page

Wharfedale '60

*makes '60 the
Wharfedale year!*

This is the Wharfedale speaker system built for today's living room!

It is handsome. It will grace its surroundings; set among the finest cabinets, bookshelves . . . standing alone, or in pairs.

It bears the unmistakable stamp of England's G. A. Briggs and performs in the Wharfedale tradition, achieving a musical quality which is truly unique.

Any demonstration, on any program material, will prove that this speaker system, among all shelf type units, best delivers the promise of genuine high fidelity . . . music reproduced naturally, without electronic, mechanical, or acoustical coloration.

Those who are familiar with Wharfedale methods will appreciate that the reasons for this performance include a highly effective combination of Wharfedale speakers designed especially for this new system; critical tuning of the speakers to the enclosure; the superb materials and construction of the cabinet; and, finally, the exclusive sand-filled panel which permits full, rich bass, without spurious resonances.

Through the Wharfedale '60, the natural beauty of the music is expressed, and the principles and artistry which G. A. Briggs incorporates into Wharfedale equipment are fully realized.

The Wharfedale '60 is available as follows:

Genuine Walnut (Oiled or Polished)	
Genuine Mahogany	
Genuine Lined Oak	\$105.00
Solid furniture grade birch, ready-to-finish (or to insert in existing cabinets)	\$89.50

Technical factors behind the outstanding performance to be expected of the new Wharfedale '60 full range speaker system . . .

SAND-FILLED PANEL, being completely non-resonant, gives optimum results with bass frequencies. This exclusive panel, consisting of two layers of wood with a completely inert filler of dry sand between them, causes a marked improvement in the resulting sound, characterized by cleaner, truer bass . . . down to 20 cycles!

THE SPEAKERS are designed specifically for this system. Because of this, and the unique techniques by which they are matched to each other and tuned to the enclosure, no part of the Wharfedale '60 system (speakers, networks, controls, or enclosure) will be sold separately . . . the entire system is properly described and treated as an integrated unit.

THE ENCLOSURE, compact as it is, offers the smooth performance generally ascribed to an infinite baffle, plus a special feature . . . metered, pre-balanced wave pressure release.

STYLING—the Wharfedale '60 is housed in an unusually handsome and versatile cabinet, with a distinctive front molding and grille, and refined proportions established by an internationally recognized industrial designer. Finished on 4 sides, the system will perform excellently, placed horizontally, vertically, or on its back. The overall decorative effect of the Wharfedale '60 is to avoid the commonplace appearance of ordinary stereo systems.

System Impedance: 8 ohms
Shipping Weight: 45 lbs.
Size: 14 1/4" x 13" x 24"

A quality-endorsed component
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The Tape Guide

Improving the Signal-to-Noise Ratio

HERMAN BURSTEIN*

If the performance you are getting from your tape recorder does not come up to the standards you would like, one or more of the suggestions offered may improve your lot. Most of the ideas are fairly simple, but collectively they could make even a poor machine satisfactory.

In Two Parts—Part II

NOISE CAN BE defined as any *undesired* audible signal. Accordingly, noise may be said to include signal remaining on the tape from a previous recording, left there because of imperfect operation of the erase head. The erase head can be ineffective for mechanical or electrical reasons.

Figure 11 shows how erasure may be incomplete for mechanical reasons. The erase head gap is not positioned vertically in proper relationship to the gap of the record head, so that not all of the recorded track is subject to erasure.

Electrical reasons for imperfect erasure include the following: (1) poor design; (2) shorted turns; (3) a weak oscillator or other defective components so that insufficient current reaches the head; (4) an oscillator frequency that is too high; the higher the frequency, the less efficient the head tends to be.

Finding and curing electrical malfunction is largely a task for the electronic technician rather than for the audioman. However, if the cause is a weak oscillator tube, the audioman can at least ascertain this and cure the difficulty by substituting another tube. Frequently it is also within his power to adjust the oscillator frequency by turning the screw protruding from the container that holds the oscillator transformer. Turning the screw so that it recedes into the container will lower the frequency and possibly increase the effectiveness of the erase head by a significant amount. However, when the bias frequency changes, this may also result in a change in the

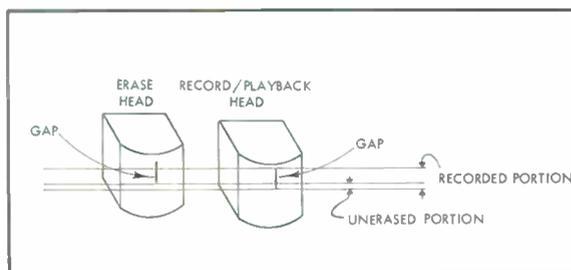


Fig. 11. Incomplete erasure due to improper vertical positioning of the heads.

amount of bias current that reaches the record head, thereby affecting frequency response and distortion. Unless one possesses the necessary equipment for measuring bias current through the record head, it is best not to tamper with the oscillator adjustment.

If one cannot obtain satisfactory results from the erase head, one may have recourse to a bulk eraser. The drawback, however, is that one cannot erase just one track in mono half-track recording or just two tracks in four-track stereo recording; the entire width of the tape is necessarily erased at once.

In connection with imperfect erasure it is necessary to bear in mind that the erase head and oscillator may be functioning properly but that the fault lies in excessive recording level, one that produces a high degree of distortion.

Print-Through

Print-through is a form of noise. The problem may be mitigated or eliminated through one or more of the following approaches: (1) Use of low-print tape,

made by at least two manufacturers. (2) Use of a print-through eraser, described in the article on tape accessories.¹ (3) Reduction of the recording level. (4) Storing recorded tape properly in a cool place and away from the magnetic fields produced by motors, transformers, etc.

Tape Hiss

In the case of a very good tape recorder, where the tape amplifier produces a minimum of noise, it may well be that tape hiss is the dominant noise factor distinguished by the ear. (Although hum may seem dominant on an oscilloscope, high-pitched noise may be the only kind apparent to the ear.) Several courses of action are possible. First, subjecting the tape to a bulk eraser may reduce tape hiss by a significant amount. Second, changing to a different brand of tape or to a higher quality within the same brand might result in noticeable improvement. Third, it is sometimes advisable to look beyond the tape machine,

¹ November, 1959.

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

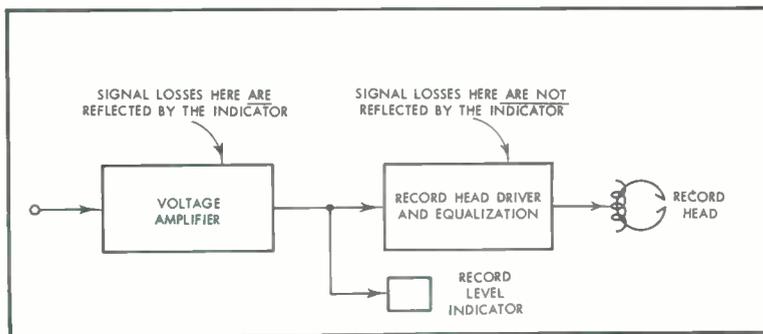


Fig. 12. How the record-level indicator may fail to reflect signal losses.

namely to other components in the audio system; an appreciable departure from smooth frequency response in the control amplifier, power amplifier, or—most likely—the speaker system, will tend to accentuate tape hiss, particularly if there is peakiness in the range of about 3000 to 5000 cps. The course then is to adjust tone controls, filters, or speaker-level controls as best as one can to remove the objectionable peakiness. The audiofan might even want to consider replacing his speakers, or perhaps moving them to a different location in the room if a change in acoustic environment reduces the treble peak.

Departure from NAB (formerly NARTB) equalization may account for inordinate tape hiss. At speeds of 7.5 and 15 ips, a treble droop of 10 db between 1000 and 15,000 cps is called for in playback. In some tape amplifiers, however, substantially less treble droop or quite possibly an appreciable amount of treble boost is encountered, resulting in emphasis of tape hiss. Treble boost in playback is found in tape recorders employing so-called half-and-half equalization, where the boost required to compensate for severe treble recording losses is provided partly in recording and partly in playback, instead of entirely in recording as stipulated by NAB standards.

Tape Squeal

If tape has dried out and lost its lubricant, it may produce an unpleasant squeal as it passes the heads. This squeal can be recorded on the tape, so

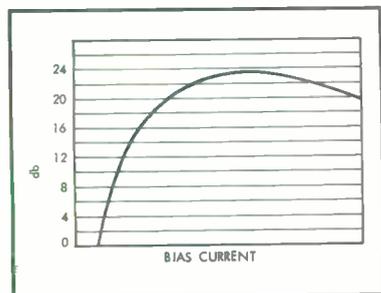


Fig. 13. Variation of output with bias current at 1000 cps at 7.5 ips.

that even if measures have been taken in playback to avoid squeal, nevertheless the unpleasant sound will be repeated.

Tape squeal can be avoided by the following measures: (1) purchasing tape of high quality; (2) lubricating the heads, guides, pressure pads, and so on, with substances described in the article on accessories; (3) lubricating the tape with materials described in articles on accessories; (4) replacing worn pressure pads.

Accuracy of the Record-Level Indicator

Thus far in discussing improvement of the signal-to-noise ratio we have dealt with measures to reduce noise. But this is only one side of the coin, and it is also necessary to consider the problem of getting as much audio signal on the tape as possible without running into excessive distortion.

In this connection, accuracy of the record-level indicator is of vital importance. Should the indicator show a high recording level when actually the magnitude of the signal recorded on the tape is small, obviously the result will be a deterioration in the signal-to-noise ratio. Generally, the technically untrained or unequipped individual cannot correct the calibration of the record-level indicator. Usually this is the province of the technician.

However, what the home recordist can do is to make a more or less rough check whether the record-level indicator is operating properly. Thus he can record a tape at what is presumably maximum recording level, listen to its quality in playback, then try successively higher recording levels. If he can make clean recordings with the gain control advanced well beyond the point where the record-level indicator tells him he should have stopped, this suggests the possibility that the indicator is miscalibrated. It is necessary to bear in mind that the point at which some persons find distortion to be offensive may be considerably different than the point at which others find distortion intolerable.

Another procedure is to compare the playback level of a commercially re-

corded tape that sounds clean with the level of a tape the audiofan has recorded himself. If one's own tape appears to have a distinctly lower level in playback, this points to miscalibration of the record-level indicator.

If one is recording at too low a level, however, the fault is not necessarily in the indicator. It may be, as illustrated in Fig. 12, that the recording signal undergoes losses at a point in the tape amplifier following the record-level indicator. Thus a weak tube in the stage that drives the record head, or possibly a defective head, may produce such losses. Hence if it appears necessary to adjust the record-level calibration in the upward direction, thus permitting a higher input level, it is advisable to have a check made on the recording stages following the take-off point for the indicator.

Use of High Output Tape

As indicated in the article on Kinds of Tape,² one can obtain an increase of nearly 8 db in recorded signal level by using high output tape, although this tends to involve a moderate loss in high-frequency response and may involve greater print-through. However, if one is struggling with a tape machine that produces an undue amount of noise and hum, use of high output tape can produce a very worthwhile improvement in over-all performance.

Bias Current

The amount of bias current fed to the record head is vitally linked to the signal-to-noise ratio that can be attained. The greater the bias current (up to a point), the lower the distortion, so that it becomes possible to put more signal on the tape for a given degree of distortion, resulting in a higher signal-to-noise ratio. But there is a drawback in that increased bias current causes a loss in high-frequency response. Hence, particularly at speeds of 7.5 ips and less, it is not feasible to increase bias current as much as one would like to do from the viewpoint of maximizing signal-to-noise ratio.

On the other hand, if bias current is reduced appreciably below its normal value, this will directly reduce the signal level recorded on the tape, apart from considerations of distortion. Figure 13 shows how recorded level varies with bias current at a frequency of 1000 cps at 7.5 ips. Furthermore, distortion will increase with reduced bias, so that it is necessary to bear in mind that the signal level further to avoid an increase in distortion. Hence it is important to avoid letting bias current fall much below its normal value, although sometimes this is an expedient employed to maintain frequency

² December, 1959.

(Continued on page 71)

PREDICTION:

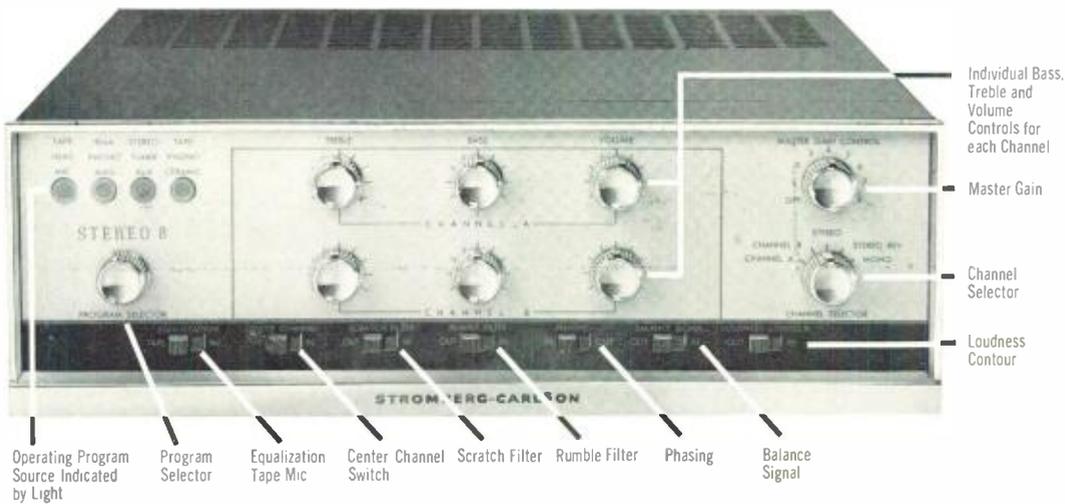
Stromberg-Carlson's new 8-80 stereo amplifier will be the most highly regarded... the most sought after amplifier in the history of high fidelity

The combination of features, performance, and price makes Stromberg-Carlson's new 8-80 one of the most unusual values ever offered in high fidelity. Its control features and listening quality—engineered to Integrity in Music standards—provide a degree and flexibility of performance not available in any other amplifier. Stromberg-Carlson dealers invite you to read, listen, and judge for yourself.

THE POWER AMPLIFIER uses grain-oriented steel transformers and a new circuit design, the exclusive High Frequency Phase Equalization Network. These design innovations dramatically reduce distortion—radically improve performance.

The specifications are conservative. (The power output of each channel could actually be rated at 36 watts rather than our 32-watt rating.) Perhaps more important, the standard Music Power Rating and the more exacting RMS rating are identical because Stromberg-Carlson uses silicon rectifiers for highly effective power supply regulation.

THE PREAMPLIFIER is actually separate even though mounted on the same chassis. It has an extremely wide range of precise control features. Its circuitry includes: ECC83 tubes and D.C. powered filaments for low noise; specific feedback circuit for RIAA and NARTB equalization; improved feedback circuit for tone controls. The 8-80 is available now for only \$199.95. We suggest you compare it—in an actual listening test—with *any* amplifier, at *any* price. You be the judge. For details, write Special Products Division, 1418-02 N. Goodman St., Rochester 3, N. Y.



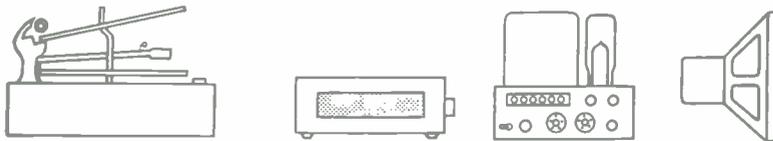
ASR-8-80 SPECIFICATIONS: Power: 64 watts (2—32-watt channels); Response: 20-20,000 cps \pm 0.9 db; Distortion: Harmonic: less than 0.6% at full output, IM: less than 1% at program level; Hum and Noise: down 70 db. Full Frequency Feedback Loop. High Frequency Phase Equalization Network. D.C. on preamp filament; Inputs: Phono (2—mag. and ceramic), Tapehead, Tuner, Tape, Aux.; Outputs: Low, High 4, 8, 16 ohm. Third channel output (A plus B); Tubes: 10; Rectifiers: Two silicon voltage doublers; Price: \$199.95 Zone 1, gold and white finish, top cover extra.

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EQUIPMENT



PROFILE

HARMAN-KARDON CITATION I STEREO PREAMPLIFIER KIT

Following closely on the heels of the PROFILE of the Citation II basic stereo power amplifier kit (January, 1960), we were accorded the opportunity of constructing and testing the preamplifier that goes with it—the Citation I. And while we tested the Citation II with another preamplifier, we noted that it really does make a difference when the power amplifier has a minimum of phase shift and is capable of reproducing a square wave of either 20 or 20,000 cps in an exact replica of the signal from the generator. Similarly, we tested the Citation I with another make of power amplifier, with similar observations. Most sincere audiophiles are acquainted with one or more good amplifiers, and their opinions of anything new may stem from a jaded taste, but most of them who know sound at all will agree that there is a noticeable difference.

It has long been our opinion that a well designed system in which the power amplifier is of really high quality will sound quite good, almost regardless of the speakers connected to it. A good amplifier controls the loudspeaker sufficiently well so that even a mediocre speaker will sound passably good. And it has long been an axiom of ours that if a person cannot afford to purchase excellent components throughout his entire system, he should at least not skimp on the power amplifier, for just this very reason. If the finest of loudspeakers is connected to a poor amplifier it will show up the amplifier's defects just that much better, but if the amplifier has few or no defects, even a poor loudspeaker can do no more than introduce its own deficiencies into the reproduction. We repeat, therefore, that a poor loudspeaker with a good amplifier will sound better than a fine loudspeaker with a poor amplifier, and we submit this as Axiom No. 2 in sound reproduction. (Axiom No. 1 is the LeBel statement that "if a system measures good and sounds bad, it is bad.")

After completing the Citation I preamplifier—in some 24 hours of work (the standard is presumed to be around 30, but we used a chassis cradle which is a great time saver)—we connected it up to a non-Citation power amplifier, and the difference was equally noticeable. Since we were somewhat rushed to make this issue, we haven't yet heard the two Citations together, but we look forward to it.

Circuit Description

Aside from its luxurious appearance, the Citation I, shown in Fig. 1, is essentially a conventional stereo preamp, if one judges solely by the designations on the

various controls, but there the difference ends. While it provides all of the normal functions (and a few extras, too) of a standard stereo preamp, it differs considerably in circuitry. In the first place, it employs nine dual triodes, which is way above average. In the second place, all equalization circuits consist of passive networks located between extremely flat two-tube "packages of gain," or amplifiers. A great amount of attention has been paid to a decrease in phase shift throughout the unit, and when set for flat response, no frequency-correcting networks are in the circuit whatever. This makes for accurate equalization when required, and for absolutely resettable conditions throughout. There are, for example, only three continuously variable controls in the entire unit—the loudness control, the balance control, and the blend control which serves two purposes to be described later. Preamplifier equalization controls—turnover and rolloff—and tone controls are tap switches, with separate bass and treble controls for each channel.

The phono and tape preamp consists of two triode sections with flat feedback around them followed by the passive loss-type equalization networks for turnover and rolloff, followed by another pair of triodes with flat feedback around them. These are followed by the selector or FUNCTION switch, the MODE switch, and the balance and loudness controls. These are followed by two triode sections which drive the LOW-CUT network and the bass and treble tone controls—two sections being re-

quired because of the phase shift change as one turns from boost to cut—which feed a two-triode output section, also with feedback. Then comes the STEREO NORMAL-REVERSE switch and, in the "A" channel, a unity-gain amplifier stage to provide phasing reverse. The outputs are connected together by means of a summing network and feed one section of the BLEND control which serves as the volume control for the "center channel" output, which may be used to feed a third power amplifier to drive a center speaker. The other section of the BLEND control serves to connect the two channels together in varying degree when the MODE switch is in the BLEND position—otherwise the control is out of the circuit.

The FUNCTION switch has six positions—auxiliary, tape amplifier, tuner, phono 1 (magnetic pickup), phono 2 (magnetic, crystal, or ceramic pickup), and tape head. All of these should be self explanatory, but it will be noted that it is possible to accommodate two turntables or a turntable and a changer either of which is immediately selectable from a panel control.

The MODE switch has five positions—stereo, blend, A + B, mono A, and mono B. In the stereo position, both channels are completely independent; blend allows them to be added together in any desired amount. A + B joins the two channels, and is the logical setting for reproducing mono records while using a stereo pickup. Mono A and Mono B feed either input to both outputs, which would permit the use of two separate mono pickups in addition to the stereo pickup, with the selection controllable from the front panel.

The equalization of the preamp section is controlled by the TURNOVER and ROLLOFF controls—each having six positions. The former has positions for TAPE (head), 800, RIAA, LP, AES, and 78, which should probably have been labeled foreign or European, since the turnover frequency is relatively low. The rolloff control is labeled FLAT, 78, LOW, AES, RIAA, and LP. The resulting curves are shown in Fig. 2.

There are three positions on the LOW CUT switch—FLAT, SUBSONIC, and RUMBLE. In the first position the response is flat; in the subsonic position, the very low frequencies are cut off with a slope of around 18 db per octave below 15 cps. In the rumble position, the cutoff begins at 75 cps, and serves to eliminate any turntable rumble completely. The response is shown in Fig. 2.

Each treble tone control has four boost positions, one flat position, and five cut



Fig. 1. Harman-Kardon's new Citation I stereo preamp, available in both kit and factory assembled form.

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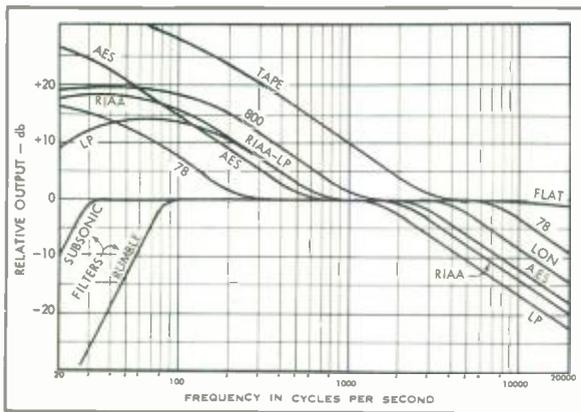


Fig. 2. Response curves for turnover, rolloff, and low-cut controls.

positions; each bass control has five boost, one flat, and four cut positions. Curves of their effect are shown in Fig. 3.

In addition to the rotary step switches, there are four slide switches—contour in or out, tape monitor (which connects the output sections to the TAPE OUT jack for use with certain types of tape recorders), stereo reverse, and phase reverse. These, and a power switch, complete the control facilities.

The panel layout is interesting and exceptionally functional. As seen in Fig. 1, there are three light-colored panel sections. The one at the right contains all the controls that are needed in normal operation—LOUDNESS (which may or may not be contoured, depending on the setting of the top slide switch), FUNCTION, MODE, and BALANCE. Once the other controls are set, they may usually be left alone, and it might be politic to instruct the other members of the family not to touch them. The upper section mounts, from left to right, the turnover and rolloff switches, the blend control, and the low-cut switch, while the lower section mounts the left channel bass and treble controls followed by the right channel tone controls. The front panel itself is relatively heavy (14 gauge, we would imagine) and is finished in charcoal brown enamel; the three light colored panels are equally heavy and are finished in an old gold color. The four slide switches are mounted to the left of the main control section, and below them is the power switch with its clear plastic knob illuminated from underneath the panel by the pilot light. The over-all appearance of the unit and the feel of the controls are sufficient to impress anyone with its quality.

All inputs and outputs are located on a horizontal portion of the chassis. There are eight low-level inputs, four for each channel, and these are grouped in one section. The three high-level inputs and the tape recorder feed for the two channels are similarly grouped in two sets of four each. A fifth group of four jacks provides two outputs for each channel, and a single jack offers an output for the center amplifier. There are four a.c. receptacles, totaling 10 amps. in capacity—three switched and one "hot," and the power transformer is fused for protection, leaving the receptacles unfused so a sufficiently small fuse may be used to provide real protection to the preamp transformer. All tubes are fed with d.c. to the heaters, with two silicon diodes serving as the rectifiers, and four more silicon diodes are used in the voltage-doubling plate supply circuit.

Performance

The frequency response measurements of

the Citation I are shown in Figs. 2 and 3. There is no point in showing distortion curves, since harmonic measurements showed no difference between the output of the oscillator and that of the preamp—all less than .05 per cent—and intermodulation measurements were so far below 0.1 per cent as to be essentially unmeasurable. Rated output to the power amplifiers is 2 volts, but the distortion remained low up as far as 5 volts, which is enough for any power amplifier, and we made no measurements beyond that. For a 2-volt output to the amplifiers, the tape-output level was measured at 0.29 volts. Total noise and hum measured 82 db below 1 volt.

The rated output of 2 volts is achieved by a 2.4-mv input signal on the magnetic pickup inputs (controls set for RIAA), 1.85 mv on the tape-head inputs, and 0.11 volts on the ceramic phono inputs. A high-level input of 0.2 volts gives the same rated output.

Figure 3 shows the relatively gentle effects of the tone controls on the first step in either direction from the flat position. In the treble rolloff, it will be noted that the slope of the curves for positions 2 to 5 is approximately 9 db per octave, which is effectively a cutoff. All curves show a variable turnover for the separate steps, which is the type of control which generally sounds best with top-quality power amplifiers and speakers. With a constant hinge point, a slight bass boost begins to be effective in the range around 200 cps, with the result that voices appear to be "boomy." This type of control shows a boost at the very low frequencies well before any effect

is heard in the middle-low range. Tolerances throughout the circuit are held so close that at no point was there more than 1.5 db difference between the two channels—either with respect to equalization or the loudness control. (Considering the fact that a kit unit is not able to be put on a production test bench for final adjustment after completion, we feel that this is remarkable. The average purchaser buys a kit, constructs it with the specific parts provided, and puts it into service without testing. We did just that, too, and listened for some time before we made any measurements. (We found a wiring mistake that way—no bass boost on the "B" channel, caused by the reversal of one pair of wires.) Only after deciding that the unit sounded really good did we make any measurements, and they bore out the aural impression.

While it does not seem important that response should be flat down to, say, 5 cps, it must be admitted that when the amplifier has that response it sounds better. A similar effect results from good high-frequency response, as well as from a minimum of phase shift. Stewart Hegeman, who designed the Citation I and II units has some "radical" ideas—radical in that they are not common to all amplifiers. For example, the usual 0.1 or .05 coupling capacitor from an amplifier stage will, when followed by a finite value of grid resistor in the succeeding stage, cause some low-frequency rolloff—a small amount, to be sure, but certainly some. Consequently he uses a feedback circuit which connects after the high-voltage coupling capacitor and goes to the cathode of the preceding stage. This results in a voltage at this point of somewhere around 1 volt, so the actual coupling capacitor can be a low-voltage electrolytic with a capacitance of 2 μ f in less space than the usual .001 tubular, and when this high a value of capacitance feeds the usual grid resistor, the low frequency response holds down to a cycle or less. This is the sort of engineering that is seen throughout the entire circuit, and the results show that it is well worth while. Phase-correcting capacitors are liberally sprinkled where necessary, and it becomes possible for the average constructor to come up with a well performing unit.

Construction

There is no denying that there is a lot of work attached to building the Citation I, but that is likely to be part of the fun. For those who don't want this sort of fun (or work, depending on how the individual looks at it) the unit may be purchased in

(Continued on page 73)

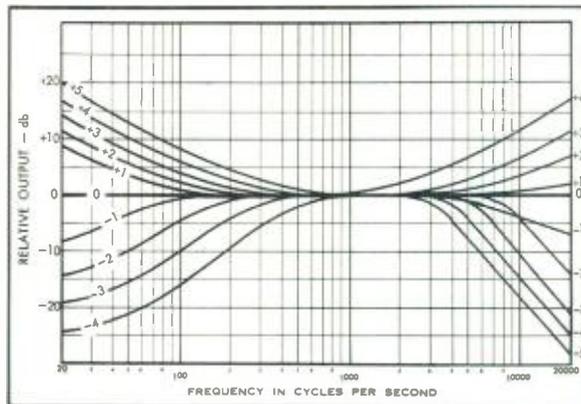
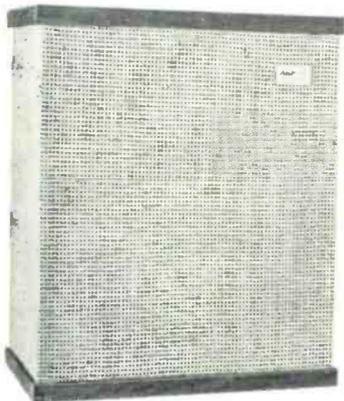


Fig. 3. Tone-control response curves. Numbers do not appear on the panel, but indicate steps above and below the flat position.

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Record Review

EDWARD TATNALL CANBY*

1. SORIA

The Royal Ballet—Gala Performances.
Royal Opera House Orch., Ansermet.
RCA Victor LDSO 6065 (2) stereo

The Soria Series, at last! Ever since Angel was taken over directly by Capitol and the Sorias (Dario and Dorle), who had launched Angel, cut loose and tied up for a future series with RCA, we've been waiting to see what would come of it and, more important, how the Mr. and Mrs. Soria plus RCA would compare with the Sorias at Angel. The Angel label was an offshoot of the British EMI company and the main planning was, of course, a product of that company via its many activities in England and on the continent.

This particular album is rather clearly a sequel to the most famous of the earlier Angel extravaganzas and a pioneer of its type, the "Hofmannage a Diaghileff" album, based on the music and history of the famous ballets under that master's tutelage. We have here the same large, colorfully illustrated book of background material and a similar (and somewhat anticlimactic) set of records offering music from a few of the ballets involved. This album, I'd suggest, cannot compare in interest with the earlier one; but the reasons are partly in the nature of the subject matter.

The Diaghileff period in France was one of incredible artistic fruition, in and out of ballet and around it. The earlier booklet, thus, could assemble relevant material from the very greatest artists of the day—astonishing stuff, with splendid layouts and gorgeous color printing to play it up for full effect.

The Royal Ballet (ex-Sadler's Wells) is of relatively recent origin and uninspiring background. The ballets themselves have been splendid, but the hazy assemblage of artistic personalities that gyrated around Diaghileff in France simply did not exist in England. The booklet, therefore, is far less flamboyant and, indeed, is somewhat at a loss to fill itself up in properly spectacular fashion. There are lovely small color prints of stage designs and the like, some handsome full-page blacks of ballet stars and a great deal of not very inspired description of each and every ballet, story and history. All in all, I'd class this as good but not exactly startling material.

As for the music, the two records boast a collection of often-played music that with few exceptions is available in all sorts of other recordings—some under the very same conductor, Ansermet, in his stereo series for London. (The Nutcracker excerpts on London are brand new and direct competition.) Good stuff here, but the Sorias—or RCA Victor—might have chosen something more special from the Royal Ballet's musical repertoire, for the records in this set.

Verdict for this Soria item: passing fair.

Vienna Philharmonic Festival. Herbert von Karajan, conductor.

RCA Victor LDS 6407 (4) stereo

Here's another in the Soria series, an album with more interest musically—for once—than in the accompanying spectacular booklet. The musical fare is substantial, and all of it very much the property of this famous Viennese orchestra and its Austrian conductor—four symphonies and a selection of Johann Strauss. The symphonies are the Mozart G Minor, the Haydn "London," the Beethoven Seventh and the Brahms First.

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

This is a good collection because, though all of these works have many recordings, there is a clear and present Viennese way of doing this music, all of it out of Vienna itself, and the musical combination of this orchestra and von Karajan give the style a definitive and very musical form. (Sometimes Viennese playing is just stodgy playing. Not here.)

The Vienna Approach is one of sincerity, on the slow and weighty side—never as slow nor as weighty as you at first think, when it is well done. The famous tympani beats that open the Brahms First pound sullenly here, like the slow pulse of fate itself—none of the relentless tautness in Toscanini's version's more rapid beginning. No concessions to the modern pace of life at all and—in Vienna—this is as it should be. The Mozart G Minor, in the same way, is beautifully, richly played with a full orchestra and not a trace of the new "classic" leanness that is the fashion elsewhere. Good—in Vienna. (It won't work in New York and in San Francisco it's a travesty of Mozart.) So, too, with the Haydn "London" and so on, down to the ever-easy and natural lilt of the Strauss dances, entirely at home in their home town. It's all solid, yet relaxed; von Karajan can be a somewhat chilly conductor away from home but in Vienna he warms up nicely—or the orchestra does it for him. Yes, a definitive collection of Viennese music.

As for the inevitable Soria show-booklet, this one is a mixed blessing. For some reason, it is hipped on housing. Every apartment that Mozart, Haydn, or Beethoven ever lived in seems to have its picture here, interior and exterior; even the Vienna Philharmonic's office door has a close-up photo, just for the record. The big color prints survey Vienna in the times of Brahms, and in the times of the others, again concentrating on buildings (perforce), plus a few parks and what-not. The articles doggedly tackle Brahms in Vienna, Beethoven in Vienna, with quantities of statistics on lodgings, when and where.

Odd preoccupation, I say, and not particularly imaginative.

Handel: Messiah (arr. Goossens). Soloists, Royal Philharmonic Chorus and Orch., Beechom.

RCA Victor LDS 6409 (4)

You've probably read some very disapproving accounts of this major release in the Soria series; so have I. To my surprise, however, I began this album with misgivings and ended up with a sense that it is really quite excellent. I recommend it.

Here, of course, the music comes first though the art booklet is a fine job. And the music is Handel revised by Goossens for Sir Thomas—a revision that is as drastic and uninhibited as the famous Handel-Beecham suites for orchestra of years ago. Harps, bells, cymbals abound, elaborate orchestration of the lushest sort accompanies every page; my ear tells me that the Goossens imagination has even added quite a bit of free counterpoint here and there—it certainly didn't sound familiar to me.

All of this Sir Thomas justifies in a crackly essay which will be unlikely to convince most of his American listeners, though it makes jolly good reading—he is basically right in plenty of respects, beneath the outrageously humorous jibes at the craze for "authenticity" in old music today, which leaves him snorting with disgust!

Yes—outwardly this is an outrageously unauthentic "Messiah." But inwardly, in the es-

entials, it is wholly musical, beautifully and consistently styled within its own stated format, the tempo meaningful and dramatic, the choral voices given their proper head (and they sing beautifully), the whole shaped with a supremely expert sense of over-all drama and musical aliveness. I promise you, in ten minutes I had learned to forget the harps and the bells and what-not; they are non-essentials when deeper verities are at stake. Sir Thomas is an unbeatable performing musician.

Don't forget that "Messiah," of all big musical works, is the most extraordinarily adaptable. It has always been thus, has survived vast alterations in the past with never a dimming of popularity, and can take even this Beecham-Goossens reconstruction without loss—given such a very musical performance. Best thing is just to call it a Messiah-Fantasy, an imaginative re-arrangement of the work and not the original at all. Indeed, part of its charm is that it is so very far from the original that there is little pain of conflict.

As for the Soria booklet, this one is an artistic whiz, with a batch of superb detachable Skira color prints having to do with the biblical texts of the piece, plus a gratifying bevy of Handelian illustrative material in black and white (including score facsimile), the complete text being printed in and between the color prints, for easy perusal.

Verdict on this: Really excellent, and most unexpectedly so.

2. DIFFERENT WORLDS

Hello, World. The Greatest Sound Around. Eleanor Roosevelt, narr., John Longstaff, tenor, The Little Orch., Soc., Schermon.
RCA Victor LM 2332

Mrs. Roosevelt's ideals are unapproachable and perhaps she is quite right here—this is a "musical trip around the world," based upon the words for "Hello" in various languages and put together as a sort of musical comedy routine, with a theme song ("everybody join in") and a tenor voice to sing the music, a large orchestra to play it. Maybe this will help the children of the world, or of our country, anyhow, to feel the brotherhood of man. Myself, I doubt it seriously and for two good reasons.

First, the music is just plain nothing, blown up to large proportions. If the way to approach the kiddies through the medium of music is to feed them this stuff, then (as we used to say in school), I resign. This is music for morons, all right, and not half as good, even as the much livelier Disney sort, nor as all-out sentimental as the usual musical comedy fare; it hits neatly somewhere in between, falling between every stool in sight; it has no shape, no style, no focus, no punch—it just swings and sways, with a big, false grin of world pseudo-brotherliness on it. Ugh.

Second, though I'm all for the basic idea that "hello" in any language is a greeting of friendship, and that a kind of children's game of repetition can be made up by getting around to "hello" in one language after another, like the verses in a song—I honestly can't see that this gets the great cause of international brotherhood to first base, nor much beyond home plate. It's a beginning, a gimmick, but no more.

Real knowledge of other peoples in this world must be based on more than a "hello." It must start with the idea that people are different—and to hear Mr. William Mayer's title, pathetically feeble musical descriptions of Spain, Japan, the Congo, Russia, and what-

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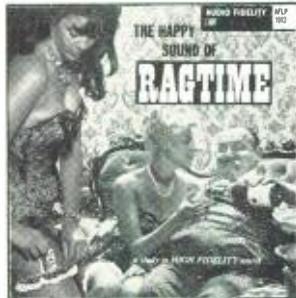
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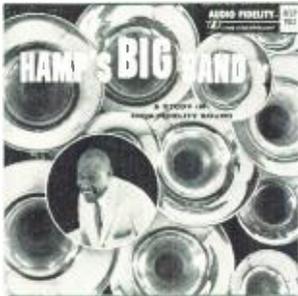
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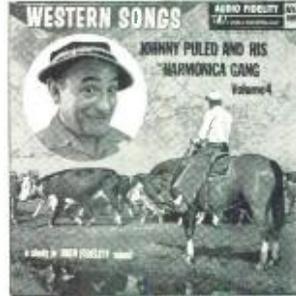
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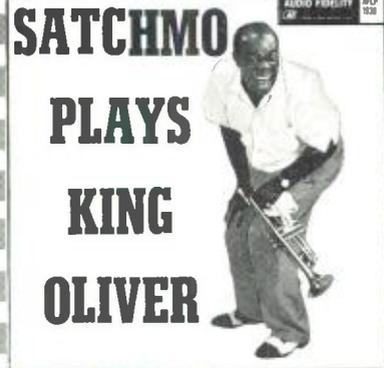
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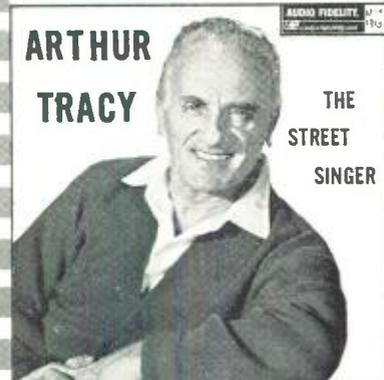
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not, you'd never know any of them existed outside an RCA studio.

In other words, here is sure-fire insulation for every American kiddie who wants to keep strictly away from the rest of the world's realities and maybe most of his own, too. Very cute, very successful (so I gather) and, for me, a painful commentary on that famous road that is paved with good intentions.

As for the Greatest Sound Around, it features the same performers, minus Mrs. FDR, and it gets a bit further merely by being no more than a simple-minded tune (with huge orchestra) about the fine sounds the animals make, each claiming his to be the best. The best of all, it seems, is the giraffe's—silence. Good idea as far as this disc is concerned.

Brahms: Violin Concerto. London Philharmonic, Barbirolli (reissue).

Angel COLH 35

This historic reissue, from a relatively recent period (1936), is surprisingly modern in sound. The approach to the concerto is not radically different from today's: only the bright, pure, warm tone of Kreisler himself is a thing you do not hear often now. The electrical recording has the typical big bass and somewhat muffled high range of the period and the even more typical dead acoustics—taken for granted as normal until our recent preoccupation with big echoes, live and synthetic. Other than these things, there is little to keep you from a wholly up-to-date enjoyment, as though it were brand new. It didn't take me three minutes to forget all about its advanced age.

As in most of this series, the LP joining of the old short sides is perfection—only the occasional distortion of what are obviously inner grooves gives the sequence of sides away. It is astonishing how well the segments match, considering that each was done as a separate undertaking, without benefit of editing after the fact.

The Art of Galli-Curci, Vol. 2. Bellini; Donizetti. RCA Camden CAL 525

The Camden label was originally launched to propagate LP reissues of RCA's priceless older 78 records, and in discs of this sort it continues to do a job in that area, stereo or no. I'm not enough of an old-record fan to know whether these are the best of Galli-Curci (and I was too young to care in those days) but, no doubts about it, this rather nicely balanced selection from just two opera composers, one on each side, gives a concise idea of what a really fine voice was like thirty years or so ago. A different world.

The instrument is one that can't be matched today. She sings with a purity of delivery, high or low, a relaxed quality, an accuracy of pitch, that is far beyond anything I've heard in later times. The sheer speed and precision with which she can produce rapid notes is unbelievable—except that, clearly, most fine voices could do as much in the by-gone days stretching back to at least the seventeenth century. We just don't train for instrumental accuracy any more, now.

No, it's not just the old-fashioned sound of the acoustic recording that makes this voice so distant and incredible. In stereo hi-fi she'd be the same, I'm willing to bet.

Boswell's London Journal. A Reading by Anthony Quayle. Caedmon TC 1093

What a riot! Young Boswell was a brilliant rake who kept a set of very self-conscious diaries, obviously intended to be read, on certain aspects of his daily life mostly involving the ladies. These excerpts have to do with his pursuit of an actress named Louisa, his heady success with her and subsequent confinement with an illness that is named once, most clearly, and which wore off after five or six weeks. It is all delightfully risqué; Quayle reads it with masterful naturalness and understatement—in ten seconds you'll forget that this was all of two centuries ago.

The great Doctor Johnson appears by degrees, he whose biography, by Boswell, has kept our college English departments in a tizzy of admiration for ever and ever. Nice way for us to meet him, offhandedly at a social gathering. Quite unacademic.

3. HIGH CLASSIC

Handel: Messiah. Solosists, Huddersfield Choral Soc., Royal Liverpool Philh., Sargent. Angel S 3598C (3) stereo

This big album is easily and benevolently listenable. It is the third "Messiah" from the Huddersfield Liverpool performers, the previous mono version having been an Angel release, too, back in 1954, and the earliest one dating from 78 rpm days on Columbia. All three are of a piece, in a tradition, the change in soloists being the main musical difference (Elsie Morison's soprano for Isobel Baillie, for instance)—but even here, the British style is well served and well preserved in the changes.

What style? Well, this is the currently accepted version of the long time mammoth type "Messiahs" that have delighted Britishers for well beyond a century and a half. It isn't quite like our American standard performance, being larger in scale, more comfortable and more earnestly performed. The singers, flat-voiced and perfectly blended, are tops in amateur ability; they've sung the music most of their lives. The orchestra plays blindly and reverently, with pagantry and splendour but never with much tension—this performance is high on amperage, low in the voltage.

Over the whole there is that spirit of almost dewy-eyed reverence that tends to break forth at the mention of Handel in England. It adds lustre to the singing and provides wings for inspiration and, indeed, is the saving grace of what would otherwise be a colossally laden affair, on such a large scale.

Of course there isn't a trace of the new Authenticity that, elsewhere in music of Handel's time, is now quite the rage. No harpsichords, no toothy Baroque organs, no counter-tenors, and above all, no "original" instrumentation, for small orchestra. Far from it! Maybe in another 100 years, Authenticity will reach Huddersfield, I sort of hope not. It won't work—not there.

Handel: Messiah. Soloists, Vienna Academy Chorus, Vienna State Opera Orch., Scherchen.

Westminster WST 306 (4) stereo

Better grab this one quick if you want it—there may not be many of them.

This is a stereo re-make of the earlier Scherchen "Messiah" and more or less the same interpretation, though with different forces. It's in English, but such an international bag of voices has surely never before sung the piece on records—two French singers, Marie and Simoneau, the American Nan Merriman and the Britisher Richard Stauden, with an Austrian chorus! But since the emphasis in the recording is hardly on linguistic clarity, it doesn't much matter.

Perhaps it's enough to say that Scherchen's Handel is strong, opinionated almost, that it is certain to annoy any one who has his own ideas on the music but will also surely please plenty who enjoy forceful performance of any sort. This is a semi-"authentic" performance, with a relatively small group of performers, no burden of extra, modernized instrumentation, a correct continuo accompaniment (rare in the piece) and even some of the original solo obbligato violin music that is normally ignored in the blown-up versions. It is far from the original Dublin performance, however, though indeed it is "based upon it"—as are all performances!

The most difficult aspect of this reading is Scherchen's choice of tempi, which if you know the music at all is bound to jolt you, here and there. True—this splendid musical war horse has had more revamping than perhaps any other famous work, over the centuries, and still needs a lot of reevaluation, especially in regard to the speeds of many a movement sung only a few years ago by choruses in the thousands. The blubber needs shrinking, but Scherchen's tempi are apt to run to extremes of innovation—say, three times as fast as you've ever heard a given number before, and the next one is as likely as not to be triple-slow. These tempi do not help to put "Messiah" into the framework of other Baroque-period music where it originally belonged, which is surely one of our aims in the present time.

Moreover, Scherchen's is a fundamentally



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instrumental concept, in the face of Handel's unique feeling for vocal music. The words are somehow put in the shade here as arbiters of the musical drama—both in the choice of tempi and in the actual singing itself. There seems only the mildest concern for the natural capabilities of the voice—the singers are sometimes dragged at a breath-robbing slow pace, at others asked to perform at a frightening speed. Perhaps as a choral singer myself I am more than usually aware of this.

I should add that the rather lengthy annotations from the earlier recording are held over here, complete with numerous handwritten musical examples and a discussion of the highly ornamental, semi-improvised style of solo singing that was taken for granted in Handel's day. The notes are my own.

Haydn: Symphonies #44 ("Mourning"), #57. Netherlands Chamber Orch., Szymon Goldberg. Epic BC 1046 stereo

Two particularly interesting early Haydn symphonies, one because it is an outstanding work—the "Trauer" or "Mourning" Symphony—and the other simply because it is new and unplayed, for most of us (a first recording). The "Mourning" is really a superb piece, not that serious-minded (it is merely in a minor key) but with plenty of guts, energy and originality, and quite unlike the familiar later Haydn symphonies—this earlier style is very "busy" in the strings, with much bustle and fuss. Same, more or less, for the new and later symphony, though this one is more stylized, a highly refined entertainment piece.

Szymon Goldberg's orchestra is beautifully tailored to the original specifications; his conducting produces a precise, very slightly didactic performance, a bit too exact, not quite human enough.

Mozart: Piano Concerti #19, K.459; #20, K.466. Ingrid Haebler; Vienna Symphony, Melles. Vox PL 11.010

Mozart piano concerti aren't easy to review in quantity—one must strike while the iron is hot and memory still serves. The Mozart style is so poised, the permissible liberties so slight in their deviations, that after three or four Mozart records the various performances merge and confuse themselves. This one I played 'way back, then played again just now, as a refresher. It's good.

It is one of those straightforward, simple, natural Mozart performances that does not in the least lack finesse yet manages to project the work without self-consciousness. This is the best kind, even better than the "brilliant" performances by some of the bigger names—they often convey greater intensity, their phrasing and contrasts may well be much more outspoken, but in the end, especially after repetition, they seem to drive too hard, make points too emphatically. Not so this milder type of Mozart.

Haebler is an adroit, skillful, easily authoritative Mozart player, impeccable in her touch and phrasing, utterly easy in lyric expression. A pleasure to hear her, and the Viennese orchestra generally plays a well integrated partnership. The lines are soft, perhaps because this is Vienna; neither piano nor orchestra plays a harsh note anywhere. But even the tumultuous D Minor Concerto, for all its tension, is effectively projected and the sunny F major Concerto, K.459, gets all the energy that its great fugal finale requires. No stoddiness here—just an appealing softness.

Mozart: Symphonies #41 ("Jupiter"), #39. London Symphony, Schmidt-Isserstedt. Mercury SR90184 stereo

I like this Mozart in a number of ways. First, the combination of the always-thoughtful and reverent English attitude towards the composer with the "sturdy" German approach of Schmidt-Isserstedt makes for splendidly coherent, solid, clear Mozart, wonderfully sensible and reasonable in execution and thereby all the greater for its unhurried accuracy. I'm frankly tired of too much tension, too much whirlwind Mozart virtuosity, as—long ago—I used to be tired of the exaggerated delicacy which once was high style for him. This is

ment-and-potatoes Mozart, but done to perfection, the tempi neither too fast (in the finales, particularly) nor dragging, either, the phrasing carefully shaped, the dynamics always interesting.

And Mercury has turned out an interesting stereo sound, too. It was done in a British Town Hall (nothing much like our town halls, I'm sure); the acoustics are mellow and natural. The orchestra is in part very close, as seems customary with Mercury, but in this hall, and with this music, the effect is one of unusual transparency without coarseness. The violins are nearest and sound like chamber music, but they play well enough to take it and their poignant edginess blends in well with the more distantly placed brass and strings. A fine record.

Mendelssohn in St. Paul's Cathedral. E. Power Biggs, organ.

Columbia MS 6087 stereo

Col. Executive: Now look here, Mr. Biggs. You've done a mighty fine job on this—ah—classic isn't it—this classic organ business. Or do they call them Baroque? A fine reputation, and if I may say so, er, profitable too. But don't you think . . . well, we must all avoid being typed, of course—

Mr. Biggs: Excellent, excellent sir. Now as I was saying, there's one ancient organ—let's see, it must be in the North counties of Greenland—that I somehow missed on my many tours—how could I have—

Col. Executive (impressively): Mr. Biggs to be absolutely frank, we think you should exert your valuable talents upon something new, er . . . well, not new but—dare I use the word—er, Romant—

Mr. Biggs: It has a superb *gedeckt*, too, and they tell me the chiff is . . . pardon me, what was that word you used? I didn't quite catch?

Col. Ex. (evasive): Well, perhaps it wasn't quite what I meant, you see . . .

Mr. Biggs: You mean MENDELSSOHN! What a capital idea. We'll do up Saint Paul's in no time. Shades of Sir Christopher! You know, that organ has a surprisingly audible vestige of genuine chiff, all things considered, and a quite delightful variety of Romant—er, should I say, post-classic tone color. Yes, by all means. And of course we can stop off in Greenland, in a jiffy. Fine! Do call Mr. Sorensen for me, at once.

Beethoven: Symphony #2; Ruins of Athens Ov., Prometheus Ov. Berlin Philharmonic, Bavarian Radio Symphony, Jochum.

Deutsche Grammophon DGS 712006 stereo

The Second of Beethoven has changed astonishingly in recent years, from a "Mozartean" work into what it clearly always was, a very typically brash, violent, good humored piece of well-developed young Beethoven. Jochum's version is recorded in a large hall at a fair distance, but still manages to convey the startling, bear-hug energy of the music. I positively jumped—for the 99th time—at one of the musical explosions, near the end of the last movement; it never fails to catch me unawares, as intended! (And I was bored, as always, by the outright padding in the second movement, one of Beethoven's weakest over-all structures, though the thematic material is lovely.)

The two overtures, not often heard, are brilliantly set forth—the "Ruins of Athens" is particularly inspired and surprisingly interesting under Jochum's direction, though it is over almost before it begins.

I carp at one technical aspect of the disc itself. In order to get the two overtures and the symphony onto two normal-looking sides, the first two symphonic movements are spread out over the whole of side one, then the last two, plus the overtures, are jammed onto four bands on side two. This evidently required a lower cutting level on the second side, which means that when the symphony is flipped in midstream (in itself a poor idea), the loud, brash third movement begins weakly, at a lower level than the preceding music. Not good, and the fact that you can turn up the volume control isn't any excuse.

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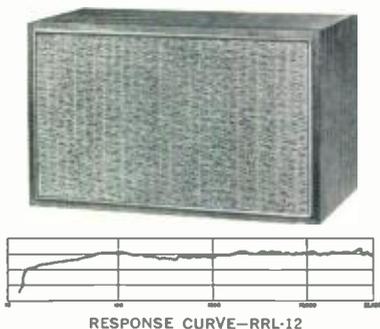
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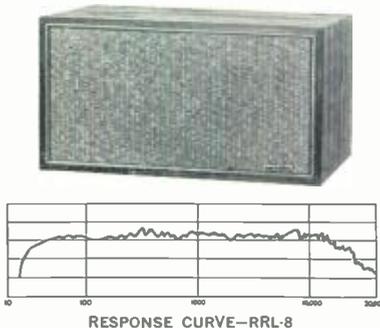
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throughout any given piece of music that is to be heard continuously. This is a rule that shouldn't be broken for any reason, and especially from one record side to another, where continuity is hard enough to feel at best.

Dvorak: Symphony #2 in D Minor. Vienna Philharmonic, Kubelik.
London CS 6083 stereo

This is one of the loveliest Romantic symphonies going, and these performers know its best values, as London knows how to capture them in stereo.

It seems to me that as time moves onward our "ideal" music of a given past period must move forward too; where awhile back, Brahms and Wagner were dead-center, as we thought of the High Romantic period, now Tchaikovsky is moving over a bit and Dvorak, whose best work was at the very end of the last century, is expanding his hold on us. Just try this one and see for yourself—it may not have the solid, Germanic structure of Brahms but it has a lightness, a modernity of harmonic coloration, that seems perfect for us.

(It isn't Dvorak's Second at all, of course, but his Seventh, and a mature work. He made hash out of his own numerical catalogue by launching a revision of all his opus numbers after the old ones were well established, and nobody has been able to fix things up since.)

Vaughan Williams, Symphony 8 in D Minor; Parita for Double String Orch. London Philharmonic, Boult.

London CS 6078 stereo

Vaughan Williams was Britain's most distinguished and noble composer and I find it vaguely embarrassing that I seem to react with such persistent absent-mindedness to his large-scale music. It's fine, excellent, expressive, well constructed... but I just can't keep my mind on it. Rather heavy and old fashioned, full of folkish modal writing (of the type he and Holst pioneered back after the turn of the century), modern in dissonance but not in over-all feeling; I liked the Parita best—it goes well in stereo, of course.

4. PIANISTS

The Young Schumann (Scenes of Childhood; Carnaval; Sonata in F Sharp Minor; Papillons). Leonard Pennario, pianist.
Capitol SPBR 8480 (2) stereo

You can't afford to hold fixed judgments in the record reviewing business and I try not to. Leonard Pennario is not my favorite pianist and I've sampled his wares only occasionally, each time deciding that his playing wasn't for me. But this title intrigued me and I tried again. I am rewarded. Maybe this isn't the greatest Schumann on discs. But the collection of items, to begin with, is unusual in a single album; the recording, moreover, is the finest stereo piano sound I've run into yet, and all in all, the whole project is, as they say, a labor of love. It shows it, right through.

Schumann was a very moody, emotional early Romantic, a difficult character in his own day and an even tougher proposition now, though once you get onto him he'll wear forever. His piano music isn't good concert material; it's far too personal, too intimate in spite of numerous showy passages. His ultra-poetic approach made sense in his day, with its elaborate and whimsical descriptions, its acoustic puns, its deeply emotional quality, but it takes a concert magician to convey its mood to a big audience now, and few can do it. Mostly, Schumann is either done up sentimentally or with too much thunder—either way, he's killed dead in a hurry. On records, of course, he has a chance for the right intimacy, given the right pianist.

Pennario must have worked a long time on this—or thought about it very deeply. He still puts out some of that hard, metallic playing, here and there, that has not endeared him to me in the past—mainly, in the few very fast and loud passages. But in between there are minutes and minutes of quite lovely and well-thought-out Schumann. The album is clearly a unified concept in his head, not a mere collection of separate works. There's a surprising lot of gentleness in it.

Only a persistent, very slight blurring of

the harmonies with the pedal betrays, still, a certain missing sense for that important aspect of the music. Only a slight tendency towards time-beating, a weakness in phrasing, show that there is more to be learned and more to be projected in the music. But even so, the Pennario Schumann can stand up as a legitimate and quite new portrayal of the composer in the light of today's pianistic thinking. Times change fast and Schumann must change along with them.

Schubert: Piano Sonatas in B Flat (Op. Posth.), A Minor, Op. 143. Joerg Demus. Westminster XWN 18845

It isn't often that we get to hear the B flat Schubert sonata, completed only a month before he died. It is so long—fabulously long, like the great C major Symphony. But it is endlessly gentle, endlessly rocking, firelessly modest and, for most pianists hopelessly difficult to sustain from beginning to end of its long movements. There isn't enough to play. And yet—what a moving piece of great music! It begins with the same casual, quiet sort of theme as the C Major symphony but this one rarely builds to any climax; it just meanders, wonderfully meaningfully, from key to strange key, with those remarkable modulations that are so typical of late Schubert.

Demus can play it, by golly. It seems to take a pianist of the Austrian tradition to manage the music with sense and ease. He knows enough not even to try to hurry; you can't "tighten up" this work. And Demus is aware of the marvelous moments, as even a great pianist like Serkin (I heard him do it) is not. This is not an exciting interpretation; but perhaps that's why it goes so well, straight through the two long opening movements, spread across a whole record side.

The much shorter and simpler A Minor Sonata fills out the second side, also beautifully.

Chopin: Polonaises (Nos. 1-6). Alexander Uninsky, pianist. Epic LC 3623

One virtue of this recording is the elaborate and interesting article on the jacket by Edward Cole, who usually fills up M G M jackets with the same. The music itself is, for my ears, a bit of an anti-climax.

To be sure, the playing of Chopin is by now a highly specialized business, as is the criticism of the same—for every pianist and every teacher still knows the Chopin repertory intimately as the basis for much of piano study and technique. Non pianists may judge their Chopin at their own risk, so to speak, and I do so at mine. I can only say, then, that for my musical ear the Uninsky playing is somehow both dry and overly mannered, lacking in that sense of musical projection that makes one forget the piano entirely in favor of the music. I feel—can't prove it—that the pauses, the slowings down, are in the wrong places, the pedal blurs the harmonies and yet the sound is too staccato and dry. It's fancy piano playing without a doubt, but it doesn't add up for me to the magic of Chopin.

Polonaise. Lorin Hollander, pianist. RCA Camden CAS 534 stereo

Listen and weep! That is, if you were over an aspiring pianist who couldn't play the fast notes fast enough. Mr. Hollander plays some of the toughest virtuoso pieces of the nineteenth century on this record in a manner that suggests it's utterly old stuff to him and maybe he should try something harder. He is all of fourteen. He played his debut in Carnegie Hall, some three years ago.

Now nobody in his right mind expects a fourteen year old pianist to play with the full understanding of a veteran musician. Sure—this one plays like a veteran; he has learned the style and drama of such big pieces as the Chopin A Flat Polonaise to unbelievable perfection and his ear is infallible—no blurring of harmonies from him, everything clear as crystal and perfectly articulated, highly dramatic and enormously convincing. What further is there to learn?

Well, as I say, this is an incredibly skillful imitation, so real you can't believe it's true. But a fourteen-year old must study on and on.

(Continued on page 31)

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STEREOPHONIC

**Humphrey Lyttelton: Humph Dedicates
London Stereo PS178**

When looking around for an American band leader to compare to Humphrey Lyttelton, such disparate figures as Louis Armstrong, Benny Goodman, and Gil Evans come immediately to mind. Perhaps it is because this trimvurate spans the early, middle, and contemporary periods of jazz, thus providing a thumbnail sketch of the course the British trumpeter followed since he resigned a commission in the Brigade of Guards at the close of World War II. After founding the first good traditional band in Britain, he branched out with a mainstream group and on the present LP flirts with up-to-date arrangements for a big band.

A noted wit, Lyttelton once carried on a second career as a successful newspaper cartoonist and has completed a second volume of his autobiography. As a leader, he recognizes all schools and uses them without hesitation, achieving the same timeless quality that Gil Evans puts into arrangements for his own band. His easygoing personality permits the members to operate with considerable freedom. "I don't impose any sort of limitation upon them," says Lyttelton. "They play the way they want. I'll just sit back for a couple of months and listen to them—might not even like what I hear much, to begin with. And they on their part listen to the way we play, or I play; and so I don't lay down any laws as to how the should play. There is never any question of saying 'Don't play like that, it's too modern.'"

During his traditionalist days, a fervent admiration of Armstrong prompted him to form a trumpet style on lines set down by the master. He solos with drive and enthusiasm, sounding much like Buck Clayton did back when Basie was snapping at his heels. Constantly broadening his base, he is willing to adapt to the ideas of younger men and may yet take the trouble to develop a ballad style. In his first book "I Play As I Please," Lyttelton answered a query about the future of his playing with the characteristic reply, "If I know where I was going I'd be there now."

As to plans for the band, his views are more definite. "In two or three years," he remarks. "I think, and hope, we shall establish an absolutely cohesive style. It's coming now, but it does mean that you have to listen carefully to the players you have with you. I couldn't make head or tail of Joe Temperley when he first joined us, and I am sure he didn't understand what I was doing. But now we both pick up ideas from each other—ideas that work their way into my playing and vice versa. You must find out how to use to the fullest extent the musicians you have with you."

When visiting this country, British bands are sent on a swift tour of main cities and receive a less concentrated exposure than the Americans who go to the tight little island in exchange. Like the Chris Barber band which preceded it, Lyttelton's group got little attention in the jazz press on its trip over

here last summer, and was sandwiched among other acts in one of the three-ring circuses that are called jazz concerts. This LP, one of the finest editions in the London stereo library, affords a much better opportunity to meet the band in favorable surroundings.

The regular septet is augmented on four numbers by seven men, mostly borrowed from Ted Heath, and the tunes are dedicated to leaders who introduced them in the Swing era or before. The arrangements, mainly by trombonist Eddie Harvey, are all new and list such novel diversions as Kathy Stobart playing tenor sax on *I Can't Get Started*, and Joe Temperley's agile baritone sax on the vibraphone part of *Midnight Sun*. Tony Coe, an able alto saxist at twenty-one, provides a moving setting for Becket's *Southern Sunset*, and the leader is surrounded by five clarinets while soloing on *Sleepy Time Down South*. A highpoint is the full band on Fats Waller's *Alligator Crawl*.

**John Lewis: Odds Against Tomorrow
United Artists Stereo UAS5061**
**Modern Jazz Quartet: Odds Against Tomorrow
United Artists Stereo UAS5063**
The Caravans Gospel MG3005 (Mono)

Repeating the procedure followed so successfully with the jazz score of "I Want To Live," United Artists is releasing two different readings of the music from the film "Odds Against Tomorrow." One contains the original soundtrack recording with John Lewis, the composer and musical director of the Modern Jazz Quartet, conducting an orchestra of nineteen New York studio musicians and the balance of the Quartet, while the piano parts are played by Bill Evans. The other consists of compelling elaborations on six selected themes, improvised by the Quartet alone, with Lewis back at his rightful place as pianist.

As Nat Hentoff and Gunther Schuller, who leads the section of four French horns, settle to their satisfaction on the liner notes the question of whether the score is jazz or not, suffice to state here that it certainly is not conventional movie music. Even the purely programmatic passages hold points of interest and are not likely to bore either classical or jazz listeners after several hearings. Lewis comes closer to pleasing both persuasions than he does in his "European Windows" album.

Of necessity, the soundtrack is episodic and some of the interludes are fragmentary. By taking the trouble to switch records, you may increase your enjoyment of an orchestral piece if the Quartet's version follows immediately afterward. This would be the ideal order in which to have the two albums arranged, but expecting a movie company to disregard the sequence of film cues is asking too much of a good thing. You can do so safely, however, and it is to be hoped that Lewis will find the occasion to explore additional themes in this manner. Enough good material is left undeveloped to fill another LP.

This method of tracing themes is especially rewarding on *Skating In Central Park*, which is a lilting Viennese waltz in the film and becomes a sanctified blues by the time Milt

Jackson and the Quartet are finished with it. The vibraphonist lives up to every word of praise ever bestowed upon him, and for once the designation genius is not misplaced. If combined with *The Carousel Incident*, this composition could be worked up into a highly desirable vehicle for the MJQ and a symphony conductor as adventurous as Leonard Bernstein. Perhaps the most surprising transformation occurs on *A Social Call*, which receives a dixieland touch and recalls shades of *In A Little Spanish Town*. Stereo placement is good in both instances, and the Quartet was recorded by Dick Olmsted.

Frequent mention is made in jazz literature of Milt Jackson's sanctified origins and the influence of gospel music on his style, but examples for direct comparison are not always easy to find. The curious can trace his performance of the waltz theme a step further by referring to *He Will Provide*, a number which enjoys a similar rhythmic treatment at the hands of a wonderful Chicago quartet known as The Caravans. The composer is Albertina Walker, who leads the group and contributes four other songs to the album. No stereo, and the full impact is also impaired by the constricted sound. The label is a Savoy subsidiary and the parent company might be expected to realize that gospel singers are as deserving of a good recording as its jazz artists.

**Ornette Coleman: Tomorrow is the Question
Contemporary Stereo 57569**
**Ornette Coleman: The Shape of Jazz to Come
Atlantic Stereo SD1317**

Since the release of his first Contemporary LP, Ornette Coleman has invaded the East Coast and appeared in concert at Town Hall. Each of the present albums, recorded shortly before the alto saxist left Los Angeles, offer an excellent opportunity to study a figure which has alternately stunned and stirred the jazz world. All the tunes are original works, played with various rhythm men and an inseparable companion, Don Cherry, on pocket trumpet. As the average listener may need to acquire a taste for the tone of Coleman's plastic instrument, the new Contemporary LP is recommended as a starter. Drummer Shelby Manne and bassist Red Mitchell, who take to heart the leader's strictures about freedom, launch blithely into inspired performances. You are likely to return time and again to their solos on *Lorraine*, and *Turnaround*, even though not all of Coleman's questions are answered. And if you are slightly bemused by his intentions, there is some comfort in finding such a worthy as bassist Percy Heath in a similar state on several numbers. Manne's drums sound fine in stereo, as recorded by Roy DuNann.

On Atlantic, the presence of regular bassist and drummer, Charlie Hagen and Billy Higgins, enables the quartet to attain greater unity of expression, and form is more apparent in Coleman's compositions. Some loss of freedom attends this achievement, however, and the rhythm men seem to operate under wraps. One of Coleman's stated ambitions is to "reach into the human sound of a voice" on his horn, which is hardly unique among jazz players. It is the lack of any adherence to conventional vocal lines that sets him apart from the rest. His sound and phrasing result from attempting to delve beneath the surface and give utterance to feelings of joy, despair, or passion at the moment when they are happening. When he portrays *Lonely Woman*, you are there. *Tears Inside*, on the Contemporary album, is described as "wanting to cry, but the human emotion won't release the tears." A bullfighter would call it the moment of truth, but you may find it a traumatic experience.

**Jack Teagarden: At The Roundtable
Roulette Stereo SR25091**
**The Bobby Hackett Quartet
Capitol Stereo ST1235**

The last meeting of these two gentlemen was a rare occurrence, resulting in a fine LP on Capitol, and the next best thing to having them together is to enjoy them apart. Jack Teagarden makes his first recorded appearance since returning from a tour of seventeen South Asian countries, which was

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followed by a seige in the hospital. The veteran trombonist, heard on-the-spot entertaining a gathering at the New York club last summer, sounds as good as ever. Besides his favorite tunes, he plays one given him by the King of Thailand during a command performance. A high spot is Don Ewell's piano solo on *Honeysuckle Rose*, and drummer Ronnie Greb and bassist Stan Puls work out on *Big Noise From Winetka*. Teagarden gets a chance to sing on *St. James Infirmary*, and *St. Louis Blues*, which means a cabaret tax added to the bill. The jovial crowd sounds appreciative anyway. The leader is an active campaigner against this levy, which prevents him from singing in many clubs, and passes out cards asking customers to write Washinton requesting its repeal. Too bad nobody thought of slipping one, or two for stereo, into the album.

Bobby Hackett is able to call on several trumpet styles, ranging from pure Bixian tone to plump phrases for Jackie Gleason's mood music. In the smarter clubs, he essays a jaunty, please-the-customer attitude and succeeds in doing just that here. Bassist Bob Carter contributes two originals, one titled *Stereo*, and the other bearing the name he answers to in his native Hawaii, *Kahakalau*. The leader is especially effective on *Bernie's Tune*, and on his own tune, *Michelle*. Dave McKenna, piano, and drummer Richard Scott

complete the quarter, which stretches out comfortably in stereo.

Dave Weirbach: Dixiland Banjo
Audio Fidelity Stereodisc AFSD5910

Bob Bain: Latin Love
Capitol Stereo ST1201

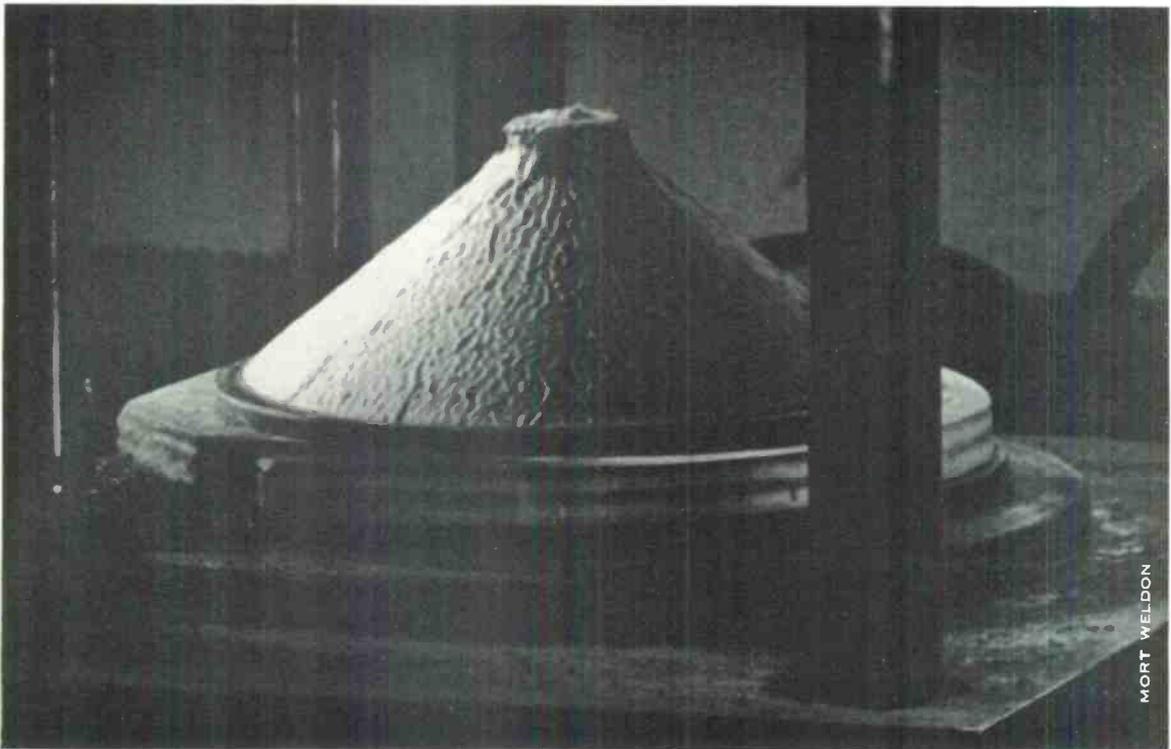
Because of the emphasis on vocalists nowa days, the sideman who plays popular music can become quite a virtuoso and still be unknown to the general public. The talented individuals who are the focal points of these LP's play with great dexterity, a sure sense of rhythm and melodic warmth. Both recordings involve a certain amount of electronic trickery, but neither indulges in souped-up sonics. No lover of the banjo is going to object because Dave Weirbach's instrument is given more prominence than it would rightly assume, unless played directly into a microphone, in a dixieland group. The true fan either has a suppressed desire to pluck away at the strings or wants to sit next to someone doing it. The stereo placement gives him a chance to satisfy the last request, as the banjoist sits right in front and not a plunk is missed on *Bye Bye Blues*, *King Chanticleer*, and *Running Wild*. Thanks to stereo, none of the solos of the fine accompanying

group is obscured and the rhythm section sounds less ponderous than that of many dixieland outfits. Dancers will find the beat infectious.

Bob Bain is much in demand in Hollywood, where he backs singers and plays everything from rock and roll to jazz. A dozen romantic Latin melodies, lightly spiced and delicately shaded on unamplified Spanish guitar, comprise the program and show him in yet another light. Through multiple recording, the rhythmic pulse comes from one channel and the lyric lines from the other, with Bain accounting for both. A gimmick, of course, but it works, and stereo helps make clear just how Bain answers himself. Listen carefully, and the next time you turn on the radio you may recognize him in one of his anonymous roles.

Cole Porter: Kiss Me Kate
Capitol Stereo STA01267
RCA Victor Stereo LSP1984

Many of the older Broadway shows are gaining a new lease on life through the courtesy of stereo, and the present instance offers two different ways of playing "Kiss Me Kate." Capitol aims at the full sweep of the original production, apparently taking advantage of an effort made in the same direction on Hall-



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Research and Development Corp. Cambridge, Massachusetts

mark's Hall of Fame, where the stars gathered for a reunion during a ninety-minute telecast. The polished performance which results will undoubtedly be regarded as definitive for some time to come. Alfred Drake, Patricia Morison, Lisa Kirk, Harold Lang and Lorenzo Fuller are all on hand, while Pembroke Davenport conducts. The franker lyrics, omitted on other versions, are restored to circulation. Stereo is used imaginatively and with all the care that London puts into recording an opera. There is plenty of movement from entrances and exits, plus attractively conceived vocal duets and fine placement of chorus and orchestra. Among the special effects are the waltzing on *Wunderbar*, and the tap dance on *Bianca*. All in all, perhaps the best stereo version of a musical yet.

By contrast, the performance recorded by RCA Victor is closer to the way you are likely to hear a revival of the Cole Porter score today—at a summer theater or supper club able to afford an orchestra as good as the one Henri Rene conducts. He supplies light, swingy arrangements, suited to more intimate surroundings than the stage of a large theater. This music is eminently adaptable to this treatment and, quite naturally, the stereo picture is sealed to fit. Ann Jeffreys, of the national company, and Gogi Grant sing the female leads, while Howard Keel returns to the role he played on the screen.

Eddie Jackson: Eddie Jackson And His Dixielanders

Audio Fidelity Stereo AFSD5909

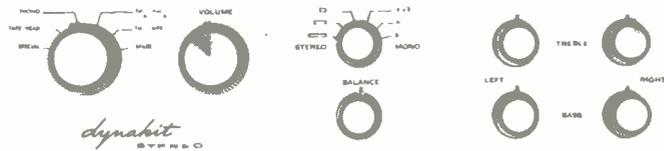
There are quite a few old vaudevillians left, but Eddie Jackson comes about as close to the end of the line of strutting minstrel men as anyone around today. Once he hangs up the old straw hat, who is there to replace him? Certainly not the Bobby Darins and Sal Mineos. After forty-odd years on the boards, including the fabulous ones with Clayton and Durante, the veteran trouper still generates a full head of steam on such tunes as *Jealous*, *Ain't She Sweet*, and *Is It True What They Say About Dixie*? When it comes to dixieland, Jackson and Durante have forgotten enough to write a book. What Jackson does remember would fill another book, and the musicians which he picks to front all sound like trusted accomplices. Spread across the stereo stage, they fill the interludes between vocals with some accomplished solos. Jackson slices and dices about in his accustomed robust style. When will his like be heard again?

Earl Taylor: Folk Songs From The Blue Grass United Artists Stereo UAS6049

Alan Lomax plus great faith on the bluegrass bands, citing them as developers of the first true orchestral form in five hundred years of Anglo-American music and an able match for any folk orchestra in the world. Along with Mike Seeger, he discovered Earl Taylor and his Stony Mountain Boys in Baltimore, arranged for them to appear in concert and set up this first recording date. At Carnegie Hall, the furious precision of the quintet's attack caused the audience to revise its notions about hillbilly music. Each member is a virtuoso, intent on contributing to the complex group interplay. Although their modern style of mountain music has a roof over its head and shoes on its feet, few concessions are made to the gaudier demands of commercialism. Which is not to say that color, humor, or a keen sense of drama are missing as the boys barrel full tilt through *Flint Hill Special*, *Lee Highcap Blues*, and *Cripple Creek*.

Besides playing mandolin and singing lead voice, the leader picks up the harmonica to imitate a locomotive and a crying child in the manner of Sonny Terry. Lomax provides texts and compares the combination of fiddle, five-string banjo, guitar, mandolin and bass viol to the component parts of early New Orleans jazz bands in his generous notes. But it is possible to enjoy the music without pondering too deeply on this, or on his predictions of a bright future for the style of playing. Stereo is an immeasurable help to anyone who hears the group for the first time and wonders what makes it tick.

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Val Valenti: Italian Street Singer
Audio Fidelity Stereo AFSD5902
Katyna Ranieri: Italian Love Songs
Capitol Stereo ST10221

Quite a bit of sentiment and a large chunk of the history of Italian popular song distinguish these albums. Val Valenti sings a dozen older favorites, dipping into opera for a choice aria or calling forth an impassioned serenade. His virile tenor voice conveys enough manly ardor to please members of the opposite sex, and is not too languorous to give offense to masculine sensibilities. The stereo recording surrounds him with the woodwinds and strings of an orchestra conducted by Dick Dia, who plays mandolin in close support.

Katyna Ranieri picks tunes which migrated to this country via the hit parade, omitting from her delivery any extreme vocal effects they may have picked up on the voyage. Singing in her native Italian, she restores all the original freshness to *Volare, Come Prima,*

The Man With The Mandolin, and *Zitto, Zitto.* Since her marriage to the Mexican orchestra leader Riz Ortolani, she has lived in Mexico City, where the recording took place at the Musart studios. Her husband conducts and the musicians are nicely distributed in stereo.

Shel Silverstein: Hairy Jazz
Elektra Stereo EK57176
Pee Wee Hunt: Dixieland Kickoff
Capitol Stereo ST1265

These items are designed to break down inhibitions and get any party off to a flying start. After hearing Shel Silverstein shout through unrestrained choruses on *I'm Satisfied With My Girl,* and *Ragged But Right,* even the most bashful and untalented guest will be impelled to give voice in an attempt to drown him out. Besides being tone deaf, Silverstein expends any talent he may have drawing numerous cartoons for magazines. His vocalizing is purely relaxation and should

encourage anyone to do the same. But he does know the lyrics to glorious tunes and also thinks up some of his own on *Broken Down Mama,* and *Pass Me By Just Like You Never Knewed Me.* The Red Onion Jazz Band, a righteous dixieland group, plays steadily throughout, just as though it never knew Silverstein.

Pee Wee Hunt, after checking his corniest tricks at the stadium gate, gives a straightforward dixieland treatment to a dozen college fight songs. The leader's trombone sounds as mellow as ever, and the septet marches joyously through *Across The Field, On Wisconsin,* and *As The Backs Go Tearing By.* The tunes are self-starting and everyone should know the words without the prompting of a vocalist. Both albums are fine for dancing, and the stereo spread is like two elevens waiting for the whistle.

MONOPHONIC

Memphis Slim: The Real Boogie Woogie
Folkways FA3524

When the juke box ruined his trade as an itinerant pianist, Peter Chatman took leave of Memphis and went to Chicago in 1939, arriving just as the popular fad for boogie-woogie piano was at its height. By the time he was ready to join the older players in reaping the benefits, public fancy had turned elsewhere and today he has cause to say, "I left like a late freight." But he did acquire a nickname and began making blues records to fill the juke boxes. Big Bill Broonzy, who became a friend and used him as an accompanist, advised him to forget about other pianists and develop his own style. Long before Big Bill died, he had reason to say, "Now you sound like Memphis Slim. Now you feel it."

The feeling ran deep on the day this recording was made, prompting recording director Moses Asch to remark, "I left him alone for an hour and he worked out the program. Then he sat down at the piano and went from one piece to another, with only a pause between to look at me and see if the cut was right. Yet the playing of one did not affect the character of the next. This is unusual because with most performers the mind retains the character of the one in the playing of the following one. Often an artist needs a long pause between numbers. With Slim, this wasn't the case. I remember only one other artist who did this—worked out a program and went right through it without a stop—Carlos Montoya, the Flamenco guitarist."

At a time when the experts are burying boogie woogie and every other style not currently in vogue, this recording is especially valuable. A fresh and creative approach is brought to such classics as Charlie Davenport's *Cow Cow Blues,* and Freddie Shayne's *Mr. Freddie.* The pianist sings one of his own blues, and Lonnie Johnson's *Crowing Rooster.* Mixed in with original works are the traditional themes of *Sail On,* and *44 Blues.* Here is ample proof that boogie woogie just went underground for awhile, instead of dying, and is ready for a new generation of listeners. As long as there are pianists like Memphis Slim around, it will stay very much alive.

The Country Blues of John Lee Hooker
Riverside RLP12-838

John Lee Hooker: House Of The Blues
Chess LP1438

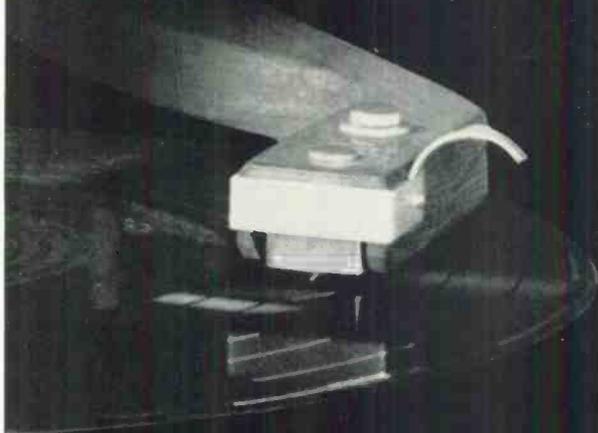
The present flow of interest in country blues seems to be swelling to the full proportions of Bessie Smith singing about a Mississippi flood. What with a book on the subject by Samuel Charters, whose rediscovery of Lightnin' Hopkins on Folkways is being followed up on a second LP recorded by Mack McCormick for Tradition, it is taking on all the dimensions of a revival movement. At this point, it is Bill Grauer's turn to jump into the boat and take a turn at the paddle, presenting John Lee Hooker adequately recorded under proper circumstances for the first time.

There is nothing legendary about Hooker and his reigning position in the morass of rock-and-roll singers makes him not too difficult to find. The process of effecting a rescue

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appears to involve the services of Cannonball Adderley in exchange, however, and the old, half-remembered blues which predominate are not supposed to compete on today's market. Hooker was born on a farm near Clarksdale, Mississippi, the home of Robert Johnson and Muddy Waters, and recalls from the days of his youth such themes as *She Weeps Like A Willow Tree*, *Pea Vine Special*, and *Behind The Pines*. He gives a unique and original account of *Water Boy*, and his unamplified guitar peals mournfully on *Church Bell Tone*. The date took place in Detroit and Bill Hevron of United Sound Systems was engineer.

All of Hooker's other LP's are salvaged from single sides and the Chess release is a particularly horrible example of how he was recorded before. In more than one instance, the voice is echoed until the singer sounds like two persons engaged in a duet. Some poor copies were employed in the dubbing and the over-all quality is below that of the average field recording. But it does afford an opportunity to examine Hooker's two styles, and together the LP's offer different versions of the same theme. *Ground Hog Blues*, sung with amplified guitar in the modern and supposedly sophisticated manner, sounds actually naive and slightly humorous. While the threat on *Black Snake*, sung simply and directly on Riverside, is evil and sinister and not soon to be forgotten.

Miles Davis: Jazz Track

Columbia CL1268

The jazz background to the French film "Elevator to the Scaffold" has gained some circulation in this country through importation of the original disc, winner of the "Prix Louis Delluc 1957" in France. Due to this advance notice of the feat extempore accomplished by Miles Davis and a group of French musicians in creating the score while watching scenes from the film in a studio, the domestic release is bound to attract considerable attention. In fact, Bud Shank adopted this method when composing the soundtrack of "Slippery When Wet," a movie about surf boarding. Davis is known for his practice of understatement, a policy which stands him in good stead when dealing with a strange medium. Although carrying most of the solo burden on trumpet, Davis always holds something in reserve and is ready to rise to any unexpected demands as climaxes develop. Rather than attempt to describe each episode, he rears smoothly to the shifting moods and tempos of the action on the screen. At the end, the various parts hang together like a suspense story and form a continuous whole. Davis evidently feels a close affinity for the French way of life and his dapper phrasing conveys an indefinable Gallic air. The bassist, Pierre Michelot, makes an unfailingly apt choice of rhythms and, with drummer Kenny Clarke, complements the leader to perfection. The French engineers record the trumpet larger than life-size. The Davis sextet of 1958 fills out the reverse side, playing *Green Dolphin Street*, *Stella By Starlight*, and *Put Your Little Foot Right Out*.

Alan Lomax: Folk Song Festival At Carnegie Hall
United Artists UAL3050

Last year during the Easter holidays, Alan Lomax brought some of his favorite performers to the stage of Carnegie Hall. After picking a formidable drawing card in Pete Seeger, he depended largely upon new faces to bring the audience close to the folk sources of American music. Not since John Hammond's last "Spirituals to Swing" concert in 1939 has so much fresh and original regional talent been introduced in a single evening.

Lomax uncovered many of the various roots of jazz without employing an actual jazz unit as a catalyst, choosing instead to shake the intellectual aplomb of the assemblage with a rock and roll vocal quartet. His remarks on behalf of these youngsters, who deserved a better reception, should be called to the attention of broadcasters and the investigators in Washington. He seems more discerning of the virtues of the idiom than either Dick Clark or Alan Freed. Should they be displaced and their flocks shepherded by a Lomax, rock and roll might amount to some-

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thing after all. With or without this unlikely eventuality, the concert is having some of the same happy aftermaths that Hammond's brought about. In addition to this release, both the Stoney Mountain Boys and Memphis Slim are on current LP's of their own that might not have happened otherwise.

Four groups, each making what might be termed a New York concert debut, share the on-the-spot recording. Jimmy Driftwood, up from Arkansas with his Picking Bow, sings *Sal's Got a Sugarlip, Down in Rackensack*, and *Unfortunate Man*. Busy at the time promoting his albums on another label, he wore the fringed-leather outfit of the wilderness road. Earl Taylor's Stoney Mountain Boys, a bluegrass quintet from Baltimore, demonstrate how to bring an audience to the edge of the seats on Woody Guthrie's *Mule Skinner Blues*. Memphis Slim, a blues singer and pianist from Chicago, delivers two originals and Leroy Carr's *How Long Blues*.

Muddy Waters, one of the discoveries Lomax made while gathering field recordings for the Library of Congress, is more respected abroad than in his own country. When touring Great Britain, his troupe met with great critical acclaim. If given the chance to make a few recordings not tailored for juke boxes,

he should draw a similar response at home. Until Chess decides to record him with the care it devotes to Ahmad Jamal, the best of Muddy Waters will be found here. His *Hoochie Coochie Man*, a Mississippi voodoo tale, is a blues classic. Dick Olmsted and Lew Whittier are to be credited with the engineering, and a stereo version is available.

Bud Powell: The Scene Changes Blue Note 4009

As Bud Powell made this recording just before leaving for Paris last year, the prevailing atmosphere is one of pleasant reminiscence on past achievements. All of the themes are his own and manifest an inner assurance which stems from the pianist's knowledge of an area where he is still unexcelled. Like many other innovators, Powell is at his best when improvising on his own ideas and has progressed to the stage where the creation of an over-all design is more important than new effects. When figures characteristic of his early work reappear, they are now patterned to fit more snugly. In this process of assimilation, he hears a certain relationship to such elder statesmen as Earl Hines and Thelonious Monk, both of whom are also actively engaged in

broadening the base of concepts which they originated.

In fact, Powell's *Gettin' There*, with its horn-like phrasing, is an extension of the trumpet style developed by Hines and sounds remarkably like him. *Comin' Up*, a cheerful Latin-flavored opus lasting almost eight minutes, is often amusing as the pianist reacts to the rhythmic pulse of bassist Paul Chambers and drummer Art Taylor. *Broderick*, a tune dedicated to his three-year-old son, seems to be less related to jazz than to Bartok's *Mikrokosmos*. And the nostalgic feeling of an empty ballroom permeates *Danceland*. 25

STEREO BALANCING

(from page 26)

a few degrees of mechanical rotation away from true balance on a level control or balance control would account for such tremendous error output voltage from the Channel 1 loudspeaker.

Practical Nulling Circuit

The circuitry described above must be modified to become practical for a stereo balancing technique on home amplifying equipment. Injection of the nulling external "feedback signal" must be on a momentary test basis only, so that the two channels are returned to normal stereo operation after accurate balancing has been accomplished. Secondly, speaker two must be momentarily disconnected during the adjustment so that the very sharp null can be clearly discerned by the listener as he adjusts his level or balance control. Finally, as a protective measure, a dummy load should be placed across the output terminals during the adjustment, so that amplifier two is not operating open circuited or into an infinite load. These criteria have been accomplished in the circuitry of the Madison Fielding Model 360 as shown in the partial schematic of Fig. 3. A momentary spring-return slide switch is depressed to make the balance adjustment. LEVEL ONE is adjusted to comfortable room volume. Then, LEVEL TWO is raised until sound disappears. (In actual production models, absolute cancellation of sound does not quite occur, but sharp nulls as great as 45 db are obtained by careful adjustment of the individual level controls. Furthermore, rotation of one of the level controls away from perfect balance by as little as 10 deg. will result in an increase of residual sound of about 15 db.)

Tonal Alignment

Since the adjustment is made under actual program signal conditions, the Channel 1 tone controls may be adjusted with respect to the Channel 2 tone controls in the same manner. If the Channel 2 treble control is not set electrically identical to the Channel 1 treble control, residual sound will be heard even when maximum null has been obtained by means of the level controls. The sound will consist primarily of treble tones,

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since it is this portion of the spectrum that is out of perfect balance with respect to its companion channel. Slight readjustment of *one set* of bass and treble controls will further increase the null, till virtually no sound is heard at all.

After balancing both level and tone for perfect equality, the nulling switch is released and the two channels are perfectly balanced. It should be noted that the balancing operation is best performed in the monophonic position of the mode switch, so that the signals introduced into the both channels are completely identical. After balancing, the mode switch of the amplifier is returned to the stereo position.

Speaker Equality

The Aural-Zero-Null circuitry guarantees that the electrical signals present at the output speaker terminals are in every way identical. It cannot, of course, assure equality of speakers used. In order for this circuitry to have real meaning, therefore, it is essential that identical speakers be used for both channels of the stereo set-up. Obviously, two loudspeakers having different acoustic efficiencies will produce different audible sound levels even if electrical input signals are completely equal. If speakers of unequal efficiency must be used, the Aural-Zero-Null circuit will still be effective if the speaker having greater acoustic efficiency is "padded down" to equal the one having the lower efficiency, using the familiar L- or T-pad arrangement at the loudspeaker itself.

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TAPE GUIDE

(from page 34)

response at the extreme end of the treble range.

Some tape recorders provide a ready means of adjusting bias current. In others, adjustment involves replacement of components, which is a matter for the service technician. In either case, adjustment requires certain equipment, which, together with the procedure, will be discussed in a later article.

Not only is the magnitude of the bias current important to maintaining signal-to-noise ratio, but so is the purity of the waveform. Ideally it should be a sine wave. Departure from a symmetrical waveform results in noise. Checking the waveform requires an oscilloscope. Some tape recorders incorporate an adjustment for balancing the bias current oscillator to minimize asymmetry and noise. Usually in such a machine there are separate record and playback heads, so that one can make the adjustment while listening to playback of a tape which is put through the recording process but without putting an audio signal on tape.

Æ



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14 PANEL CONTROLS — including dual bass and treble controls and switches for additional speakers
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MODEL SA-40 — Kit, complete with case... **\$79.95**
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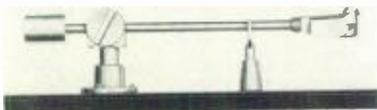
NEW PRODUCTS

• **Transistor Tester.** This low-cost self-powered instrument is designed to test transistors under actual operational environment. Fast and easy to operate, it checks a wide range of transistor types, including small-signal, "drift" types, medium- and high-power types. It provides a quick, positive check for opens, shorts and gain, and automatically identifies PNP



and NPN models. If desired, similar transistor types can be effectively matched. The unit is powered by a self-contained 1.5-volt battery and utilizes a Type NE-51 glow lamp as the visual signal to indicate test results. Compact and portable, the tester measures just 3 1/4" w x 6 1/4" l x 2 1/4" d, and weighs 1 1/2 lbs. For detailed specifications write Seco Manufacturing Company, 5015 Penn Ave., S., Minneapolis, Minn. **B-1**

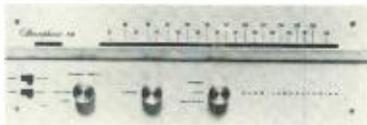
• **Stereo Pickup Arm.** So well-balanced in all planes that it could be used upside down, provided a means could be found for keeping the record in place, the new Empire 98 Stereo/Balance arm assures absolutely equal pressure on both sides of a 45-45 stereo groove. Critical turntable levelling is not necessary because the arm is capable of tracking with minimum force



at any angle. Balance of the arm is accomplished by means of a temperature-compensated alloy clock mainspring which is linear in operation. Adjustment is by means of a single knob calibrated in grams. Dual ball-bearing races manufactured to instrument tolerances are used in both horizontal and vertical pivot axis. Instantly removable arm shell is equipped with four gold-plated spring-loaded contacts, and accepts all standard cartridges. Audio-Empire Division, Dyna-Empire, Inc., 1075 Stewart Ave., Garden City, N. Y. **B-2**

• **Karg FM Tuner.** This new Karg Model CT-1 is of the continuous tuning type, and features twin audio channels for FM stereo. It is equipped with a socket for plugging in a companion multiplex adaptor. Radio-frequency and oscillator coils are copper-printed on a phenolic strip for stability. The a.f.c. circuit includes a d.c. amplifier in the control section to assure adequate hold even on weak signals. A Karg-designed muting circuit does not require critical threshold adjustment, but is merely switched in or out. Sensitivity is 1.5 microvolt under the new IHFM standard, afforded through use of a low-noise r.f. amplifier followed by three high-gain i.f. stages and a dual-function limiter design. Flat-topped i.f. response and a wide-band Foster-Seeley discriminator insure the low distortion level of 0.5 per cent intermodulation. The CT-1 is handsomely finished

in brushed brass, with a 10-in. dial on which each megacycle is thoroughly calibrated. Flywheel tuning and high dial ratio



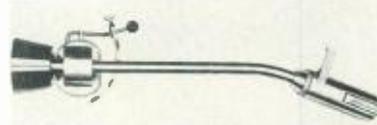
are additional factors to afford precise tuning. A catalog on the CT-1 tuner is available free from Karg Laboratories, Inc., South Norwalk, Conn. **B-3**

• **Scott Tuner-Amplifier Combination.** Designated Model 339, this new instrument combines two preamplifiers, two 20-watt power amplifiers, an AM tuner, an FM tuner, and complete audio control facilities on a single chassis. In it are incorporated all the features of the H. H. Scott Model 299 40-watt stereo amplifier and the 330D AM-FM stereo tuner. The unit is extremely compact, allowing great flexibility in installation. In designing the 339, Scott engineers overcame the problem created by heat dispersion with the use of a copper-bonded aluminum chassis which, in addition to dissipating heat efficiently, permits



unusually low hum specifications. Direct current on all preamp heaters also contributes to low hum. Separate tone controls on each channel permit matching of speakers to room acoustics. There is a convenient phase-reverse switch on the front panel. Featured is a "third-channel" output which allows the user to feed a full signal from both outputs to a middle speaker to give more realistic stereo effects. Although there are more than 30 separate front-panel controls, the 339 is simple in operation since each control is marked explicitly for average use. Full technical information is available by writing to H. H. Scott, Inc., Dept. P, 111 Powdermill Road, Maynard, Mass. **B-4**

• **Fairchild Stereo Arm.** The technical demands of stereo recordings have resulted in a unique design for the new Model SA-12 transcription arm recently introduced by the Fairchild Recording Equipment Corporation, 10-40 45th Ave., Long Island City 1, N. Y. It incorporates an exclusive cueing device which permits pinpoint accuracy in placing the stylus in the record groove despite extremely light



tracking pressure. In addition, the SA-12 has a spirit level built into the base to permit accurate leveling and elimination of lateral drag. Mass counterbalancing is completely springless. Arm contour is calculated to minimize geometric tracking error. The counterweight is resistively isolated to damp resonances. Height of the arm is adjustable for any turntable. These and other features combine to make this

arm meet the demands of the most discerning stereo record enthusiast. **B-5**

• **Quad Electrostatic Speaker.** This full-range speaker is a design of modest size intended for a high grade of music listening under domestic conditions. It is suitable for use in rooms of 1000 to 5000 cu. ft., and is capable of providing exceptional reproduction under such conditions up to a volume level similar to that experienced in a concert hall. It is free standing and does not require the use of a corner position. Position is, in fact, not critical, except that the speaker should not be operated closer



than two feet to any wall or large surface parallel to the plane of the radiator. Both front and back radiation should be as unrestricted as possible. The speaker will operate indefinitely with relative humidity of 90 per cent, and will safely withstand reasonable periods of up to 100 per cent relative humidity. Built-in power supply calls for 100-120 or 200-250 volts at 50-60 cycles. Power consumption is negligible. Because of the unique nature of this instrument it is heartily suggested that the reader write to the exclusive U. S. agent for full particulars. Manufactured by The Acoustical Manufacturing Company, Ltd., Huntingdon, Hunts, England, the Quad electrostatic speaker is distributed in the United States by Mr. I. M. Fried, Electronics of City Line Center, 7644 City Line Ave., Philadelphia 31, Pa. **B-6**

• **Knight Deluxe Stereo Amplifier.** This versatile instrument delivers 30 watts per channel on stereo and 60 watts in monophonic operation. Its features include a "stereo separation" control for continuously variable adjustment of channel separation, and a loudness-contour switch for compensation at three different listening levels. The amplifier incorporates precision bridged-T scratch and rumble filters, and concentrically clutch-mounted tone controls which may be operated either sepa-



rately or simultaneously. To permit filling the "hole-in-the-middle," a blended third output is provided for connection of an additional speaker. Response is ± 0.5 db, 25 to 20,000 cps at 60 watts. Harmonic distortion is less than 0.75 per cent at full rated output; intermodulation is less than 2.0 per cent at 30 watts per channel. For good regulation and long life, a silicon-bridge power supply is employed. The control panel has solid turned-aluminum knobs and is finished in gold and charcoal-brown. Available from Allied Radio Corporation, 100 N. Western Ave., Chicago 80, Ill. **B-7**

● **Electronic Megaphone.** Extremely durable, the "Megavox" is an all-transistor, battery-operated portable megaphone which weighs but six pounds and covers a distance of more than 600 yards, depending upon weather conditions and background noise. It is unique in the fact that it is equipped with a jack for an external microphone, so that it may be used as a



portable p.a. system. Constructed of lightweight aluminum, the Megavox is equipped with a waterproof magnetic microphone and is usable under any weather conditions. Powered by three standard NEDA Type 706 4.5-volt batteries, it incorporates a class B transistorized 5-watt push-pull amplifier, and is equipped with a pistol-grip trigger switch and variable volume control. **Fanon Electronic Industries Inc., 98 Berriman St., Brooklyn, N. Y. B-8**

● **Norelco Record Changer.** This fully automatic 4-speed stereo-mono changer, Model AG-1024, features push-button controls for ease of operation, and is equipped for automatic intermix of 7-, 10-, and 12-in. records. Wow, flutter, and rumble are reduced to a practical minimum by means of a shaded-pole mechanically-balanced motor which drives a precision-engineered



turntable. Although not expensive, the AG-1024 is extremely rugged in construction, and is handsomely finished to blend with any decor. For further information, write to North American Philips Company, Inc., High Fidelity Products Division, 230 Dufty Ave., Hicksville, N. Y. **B-9**

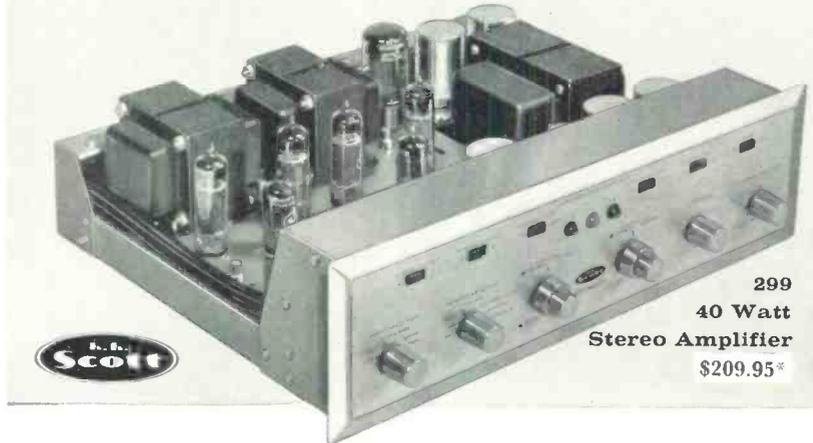
EQUIPMENT PROFILE

(from page 54)

factory-wired form. Since the cost of the assembled amplifier is \$100 more than that of the kit, anyone can see that there must be rather more work than with the Citation II, in which the difference is only \$60. But a large part of the pride of ownership may derive from the fact of having contributed something of yourself in its making. Certainly there is nothing that an inexperienced person could not do in the construction of this kit as long as he followed the well written instruction book, for each step taken separately is quite simple.

The preamp consists of five basic sections—two military-type phenolic terminal boards (one for each channel, and one being the mirror image of the other), the chassis proper, the front panel, and the power supply. The terminal boards are

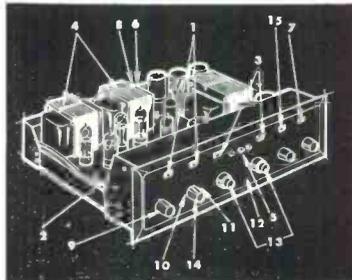
3 NEW STEREO AMPLIFIERS FROM H. H. SCOTT



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40 Watt
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1. Provision for connecting two phono cartridges.
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 11. Play a monophonic source through both channels simultaneously.
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 13. Completely separate Bass and Treble controls on each channel.
 14. Special balancing circuit.
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- Specifications: Distortion (first order difference tone) less than 0.3%. Frequency Response: 20 cps to 30,000 cps. Harmonic Distortion: 0.8% at full power output. Noise and Hum: Hum better than 80db below full power output; noise equivalent to 10 microvolts on low level input.

222 24 Watt Stereo Amplifier

This budget priced stereo amplifier has such features as Third Channel Output and separate tone controls usually found only in much more expensive equipment. It is backed by H. H. Scott's reputation for quality and engineering leadership. **\$144.95***



130 Stereo Preamplifier

All the features of the 299 plus many more. Used where it is desired to separate heat producing power amplifiers from control location or where higher power is required than available in integrated amplifiers. **\$179.95***



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CONFIDENTIAL INFORMATION

Not so long ago the mahatmas of hi fi were solemnly preaching anent loud-speaker enclosures that "the bigger the box, the better the sound." Since the advent of stereo, this catch-phrase is no longer heard. The reason, obviously, is purely commercial. The monaural market was able to swallow one big box, but the stereo market couldn't swallow two.

Since necessity is the mother of invention, this situation created a galaxy of new geniuses. Though they had never thought of it before stereo, or even said it couldn't be done, there suddenly appeared a rash of small boxes, even "shelf-size," all with the most astonishing attributes. They were "even better" than their big brothers. Actually, they were nothing more than smaller versions of the same old bass-reflexes and folded-horns with their inevitable boom and distortion.

Some time before this stereo-forced miniaturization, an entirely new, definitive and compact loudspeaker enclosure was invented . . . an invention of such outstanding novelty and merit that fifteen claims . . . all that were asked . . . were allowed by the Patent Office. Equally valuable foreign patents were also granted. The principle was ingenious, logical and scientific, and should appeal at once to anyone who has perception enough to grasp the idea.

The best loudspeaker enclosure is, obviously, the totally enclosed cabinet because it is entirely neutral and neither adds to, nor takes from, speaker performance. Unfortunately, it must be large (20 cubic feet) or the enclosed air acts as a cushion upon cone movement, thereby impairing reproduction. The Bradford Baffle, by its patented pressure relief valve, eliminates this air pressure, and can, therefore, be made compact . . . only a few inches larger than the speaker itself . . . without sacrificing any of the performance values inherent in the large infinite baffle. Furthermore, there is no cabinet resonance, boom or distortion. For these reasons, the Bradford Baffle was and is the only compact cabinet fully equal to, or better than, the large enclosures, either before or after stereo.

Totally enclosed "acoustic suspension" systems have become popular. The Bradford Baffle was the original "acoustic suspension," only better, for the degree of "suspension" is automatically self-adjusting.

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first wired with strapping between the various required points; then the lead wires are attached, and finally the resistors and capacitors are mounted. When these two sections are completed—incidentally using up practically all of the resistors and capacitors—they are mounted back to back with spacers. The chassis is then assembled, and the terminal boards attached to it. The nine rotary switches, all of which come with resistors and capacitors already attached and soldered in place, are next fitted with connecting leads, cut to specified lengths. The switches are then mounted on the front panel, along with the slide and power switches. The terminal boards are then wired to the sockets and the remainder of the chassis, and most of the chassis wiring is completed. The power supply is constructed on its own small sub-panel. The front panel is then mounted and connected to the terminal boards and to the chassis as required, and finally the power sub-panel is mounted and connected up. Nothing is difficult, but the finished amplifier is neat, readily accessible for servicing, and something one would be proud to exhibit.

But the proof of the amplifier is in the listening, and the Citation I is sure to satisfy the most critical audiofan. B-26

UHER TAPE RECORDER "STEREO RECORD III"

In the October, 1959, issue the Uher Universal tape recorder was reviewed—rather contrary to our usual practice of not reviewing any other than 7½-ips machines. This deviation from normal was occasioned by the high performance of the machine, and because of the many unusual facilities that it offered. The Stereo Record III is similar in many ways, having some features not offered in the Universal, and giving up others not really necessary for a machine intended basically for music recording. The Universal had a number of features that would make it useful for special applications—a lowest speed of 15/16 ips, automatic operation, and so on—but it could only accommodate 5-in. reels. It would not play at 7½ ips, and it was not stereo.

The Stereo Record III is larger, records and plays four-track, and plays two-track, either stereo or mono. Furthermore, it can record on one track of a pair while it is playing back from the other, and vice versa. This machine, shown in Fig. 4, is 16½ in. wide, 15½ in. deep, and 8 in. high in its gray luggage-type carrying case. The illustration shows the machine with Ger-

man designations on the panel, but in the U.S. the designations are in English. At the left of the head covers are five knobs—the top one being power switch and speed selector, the left pair (dual control) vary tone separately in the two channels, and the right pair control playback volume, also separately. The two front buttons select the playback channels in four modes—reverse stereo, mono I, mono II, and stereo. Speeds of 7½, 3¾, and 1½ ips are available.

At the right are the recording interlock button, and a dual control in which the lower section serves as a selector between microphone and radio or phono pickup (high-level). This is a fader-type control with the center being off, so that the knob may be set for a limiting value for the selected input, thus preventing overload as the small knob (which controls recording level) is turned to maximum. The two buttons select stereo, mono I, or mono II for the recording operation.

In the front portion of the head cover, four "keys" control the mechanical operation of the machine. The right key-type control is the start button, the center key is stop, and the left key is a latching type momentary stop. Fast forward and rewind are controlled by the front bar, which slides to right or left for the desired operation. Just behind the stop key is a dual indicator tube to show recording level.

Access to all inputs and outputs is through a plug panel at the right end of the case, with a plastic tambour slide to cover the opening. Separate receptacles are provided for two microphones, one being wired for five leads to accommodate a stereo microphone, but it will also take the 3-pin plug for a single microphone; the other receptacle is a 3-pin type. A third receptacle is for phono pickup input—either stereo or mono. Another accepts radio, and at the same time provides a high-impedance output from the preamp section for optimum playback quality. Loudspeaker outputs are available on still another receptacle, balance control (remote) on another, and the last provides for plugging in a Synchro-Akustomat for use with tone-actuated switching, such as with an automatic slide projector, or for sound-actuated starting and stopping. This unit was described more fully in the October issue. The machine is equipped with a counter which is driven by the take-up reel. As an added feature, the internal speakers can be disconnected by pulling up the small playback level knob a slight distance—probably less than 1/16 in. A metallic strip on the tape will stop the machine at



Fig. 4. The Uher Stereo Record III packs many of the features of the Universal but also has many of its own—not the least of which is the reel size, 7 in., and the higher speed, 7½ ips.

the end of the reel—or anywhere the strip is put on—and through the Akustomat receptacle, remote starting and stopping is possible.

Also, by putting the machine in the record mode with no tape on it, then depressing the momentary stop key, the internal amplifiers can be used as a public address system.

The flexibility of the Uher is to be noted carefully, and there are not many machines on the market (if any) that permit recording on both channels simultaneously or on either one separately or playing back on either one or both, and of recording on I while it is playing back on II or vice versa—the only thing it apparently cannot do is to record stereo while it is playing stereo, but the requirements for this are probably quite rare anyhow. You can, however, monitor stereo on both channels while you are recording stereo—the same program, that is. One other thing it can do is known as “sound on sound.” Having a track recorded with one program, it is possible to avoid erasure and record another program on top of the one already recorded by inserting a “Trick” key in a slot provided in the head cover. This key covers the erase head, holding the tape away so erasure does not occur. Then with the machine in the record mode, the new signal is recorded over the existing one.

Also available in a matching case just slightly smaller is a pair of loudspeakers. The case separates to become two sloping-front baffles, each with a 7 × 10 in. woofer and a 4-in. tweeter in a reflexed enclosure, each with a tambour slide to cover the cable compartment. A single 3-wire cable leads from the recorder to the first speaker, and a cable from the second plugs into a receptacle in the first speaker. Both cables are 15 ft. in length, allowing a considerable separation from the recorder. For maximum portability, however, two speakers are built into the recorder case. These provide a center fill, if desired, when the recorder is placed between two normally spaced external speakers, giving a complete stereo system practically in one package, and providing an ideal “starter” system for one who wishes to acquire his components gradually.

Performance

Mechanically, the Uher does a 1200-ft. fast forward or rewind in 1 minute and 45 seconds; wow and flutter measure a total of less than 0.2 per cent—undoubtedly due to the hysteresis synchronous motor and heavy flywheel.

Electronically, the machine measures exceptionally well—which was to be expected after measurements on the Uher Universal. The standard tape, for playback, only goes up to 10,000 eps, which is hardly sufficient for today's machines, but over this range the response was within ± 1 db. Recording (at 7½ ips) a constant-level signal from an oscillator and then playing back through the high-impedance output gave a figure of ± 3 db from 35 to 18,000 eps, with distortion at normal recording level of 1.5 per cent at 1000 eps, with this figure including both record and play functions and the tape itself, which we consider quite satisfactory. At 3¾ ips, the response was within ± 4 db to 15,000 eps, and at 1½ ips response varied ± 4 db to 11,000 eps.

With all of its features combined with excellent performance, it is hard to find any faults with the stereo Record III. It is not a low-priced machine, but it is also not the most expensive. And whether or not one needs all of the special features, as a simple tape recorder it gives a good account of itself.

B-27

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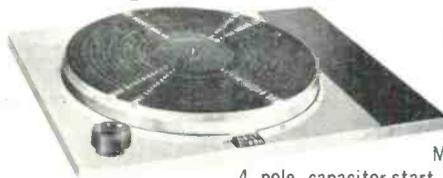
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ABOUT MUSIC

StereoAroma — The Smell of Music

HAROLD LAWRENCE*

IT WAS BOUND to happen sooner or later. The "smellies" have arrived. With the introduction of AromaRama ("You must breathe it to believe it") the olfactory dimension has now been added to those of sight and sound in the movie theatre. The pioneer smellie, *Behind the Great Wall*, was originally produced as a normal travelogue but the distributors of the film felt that it would possess more box-office appeal with the addition of a scent track. Accordingly they engaged the firm of Rhodia, Inc., a manufacturer of industrial perfumes, to fabricate a repertory of some 40 odors. Rhodia considered itself well equipped to handle the assignment, having developed a number of commercial smells, such as tobacco smell for cigar boxes, leather smell for plastic briefcases, pine fragrance for knotty-pine-patterned wallpaper, new car odor for used cars, and strawberry scent for embalming fluid. The success of these products depended upon two factors: close approximation to the original odor, and staying power.

Now the perfume makers were faced with the task of preparing high fidelity scents that were at the same time highly volatile, in order to eliminate scene-to-scene olfactory hangover. The new cinematic perfumes were therefore built on a quick-evaporating base and the theatre's ventilating system incorporated electrically charged baffles that precipitated the aromatic particles as the air was drawn off. The exhibitors boast that with their high volatility process they can reach every nose in the house within two seconds and remove the odor swiftly.

The premiere of the first of the smellies could hardly be described as an unqualified triumph. Most of the odors seemed ersatz to most of the critics. *Time* magazine, for example, reported that the pine grove in Peking "smells rather like a subway rest room on disinfectant day," the intensity of the odors was overpowering, "strong enough to give a bloodhound a headache," and, despite the air-conditioning, smells had a tendency to linger. It remains to be seen whether Mike Todd Jr.'s new Smell-O-Vision will constitute an improvement over AromaRama.

Since nowadays nearly everything eventually finds its way onto a phonograph disc—from stethoscopic recordings to steam locomotives in stereo—it is interesting to speculate on the possibility of reproducing odors electronically in the home as an accompaniment to appropriate musical works.

A primitive version of the scent-enhanced disc appeared in the mid-Fifties when a record of Marlene Dietrich songs was brought out in a special cellophane-wrapped package, including a perfume-impregnated card designed to put the listener in the proper mood for La Dietrich's inimitable charm.

The scented-stereo system of the future would be a far more elaborate affair. It might include an aroma tank, a rubber tube, and a scent mask. The scent mask would permit maximum smell with a minimum of aromatic particles and would facilitate rapid and efficient odor changes; the length of the rubber tube would be determined by the distance between the listener and his control unit. A high-frequency cueing device would trigger the release of the right odor at the right time. For those who can afford the ultimate, of course, special ducts could be installed in the audio room coupled with a highly efficient pump and exhaust mechanism.

StereoAroma will no doubt create new departments in record companies, spawn a new vocabulary of technical terms, and open up virgin territory for the chemical industry. Each record company will find it necessary to hire a scent director who will program aromatic sequences and work closely with the chemists preparing the desired odors, just as the art director currently supervises the reproduction of color transparencies for record jackets.

What will StereoAroma mean for the classical record field? First, it is not likely to affect music of the Baroque and Classical periods generally, and abstract and non-programmatic music specifically. Bach preludes and fugues, Haydn quartets, Mozart concertos, and Boccherini quintets are not suited to aromatic programming, nor are the trios of Schubert, sonatas of Prokofiev, or symphonies of Hindemith. But there are vast areas of musical literature that call for the olfactory dimension. A large portion of this repertory falls under the category of "nature" pieces, of which a classic example is Beethoven's *Pastoral* Symphony. The composer himself gave the following verbal description to his work:

1. A beautiful countryside where the sun shines, the soft breezes blow, the streams cross the valley, the birds twitter, a cascade murmurs, a shepherd pipes, the sheep leap, and the shepherdess lets her gentle voice be heard.

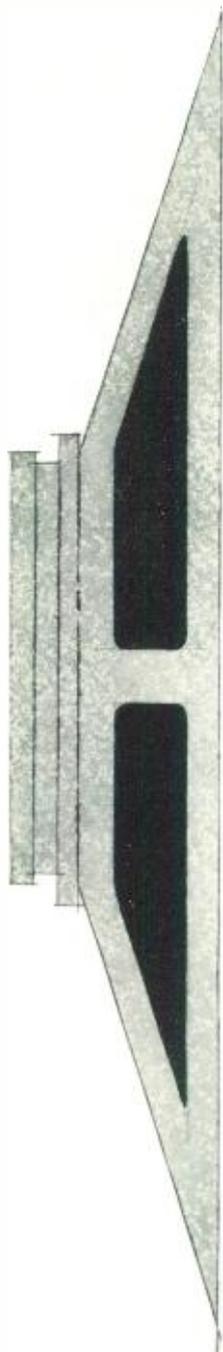
2. The heavens are suddenly darkened, all breathe with difficulty and are afraid, the black clouds pile up, the wind makes a rushing sound, the thunder grows from afar, the storm slowly descends.

3. The storm, with noise of wind and driving rain, roars with all its force, the tops of the trees murmur, and the torrent rolls down with a terrifying sound.

4. The storm is appeased little by little, the clouds scatter and the sky clears.

5. Nature, in a transport of gladness, raises its voice to heaven, and gives thanks to its Creator in soft and agreeable song.

The sequence of odors here suggests itself—grass, breeze, sheep, sun-warmed atmosphere, ozone (from lightning), rain on leaves, damp earth, and wet clothing—and with Leopold Stokowski synchronizing the sound effects, as he did in RCA Victor



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A treasure trove of nature smells may be found in the music of Delius whose works fairly exude the fragrance of the English countryside: *On Hearing the First Cuckoo in Spring*; *Summer Night on the River*; *North Country Sketches*; and *Song Before Sunrise*. Following is a list of some other nature compositions ripe for aromatic treatment:

- Respighi—Pines of Rome
- Strauss—Alpine Symphony
- Berlioz—Symphonie Fantastique: Scenes in the Country (3rd mvf.)
- Falla—Nights in the Gardens of Spain
- Villa-Lobos—Origin of the Amazon River
- Shostakovitch—Song of the Forest

Turning from the land to the sea, here is a list of watery compositions that have their own special gamut of briny smells:

- Delansey—La Mer
- Vaughan Williams—A Sea Symphony
- Delius—Sea Drift
- Rimsky-Korsakov — Scheherazade: The Sea & Sinbad's Ship
- Wagner—The Flying Dutchman

The smell of gunpowder plays a major role in the following works featuring both military and civilian explosives:

- Tchaikovsky—Overture 1812
- Beethoven—Battle Symphony
- Handel—Royal Fireworks
- Stravinsky—Fireworks
- Khatchaturian—Battle for Stalingrad
- Shostakovitch—Fall of Berlin

Food aromas are easily a prime target for StereoAroma. The Dinner from Strauss's incidental music for *Le Bourgeois Gentilhomme* runs the culinary scale from lamb to roast thrushes, an Italian main course, Rhine wine, and a parade of other dishes. The same composer's ballet, *Schlagobers*, is a riot of Viennese pastries. The first act of *La Bohème* features a garret feast of roast beef, wine and fritters, topped off with cigars. Pheasant is the *piece de résistance* of the banquet in the final act of Mozart's *Don Giovanni*. But the assortment of foods and wines represented in music is too extensive to cover in this article.

No more perfect coupling of music and odor can be found than in the song literature, where specific verbal references point the way for the scent director.

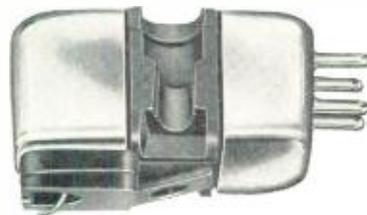
The less said about Saint Saëns's *Carnival of the Animals* the better. Lions, kangaroos, hens, mules, and elephants may be interesting visually but are not much fun to smell. The same can be said for Respighi's *Snake Pit* (from "Brazilian Impressions"), Suppé's *Light Cavalry Overture*, and parts of Strauss's *Sinfonia Domestica*.

In the absence of precise odor guides, a compatible smell system could be devised for other musical compositions. The choice of fragrance could be dictated by the tonality, tempo, mood, and medium of the work involved.

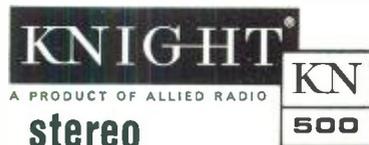
(You can just imagine the assortment of odors associated with a jazz combo in its natural habitat. Ed.)

If StereoAroma is to become the next chapter in the history of recorded music, then doctors will have to discover surefire remedies for sinus trouble, allergies, and the common cold.

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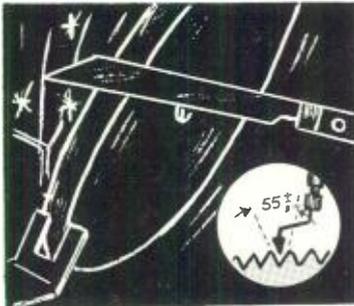
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SECOND THOUGHTS ABOUT STEREO

(from page 28)

listening room—maybe another theater, or some kind of auditorium, the ideal arrangement utilizes widely spaced microphones that achieve relatively large time differences and also minimize confusing reverberation at the receiving end by being relatively close to the individual sound sources that also are widely separated.

A subjectively correct reverberation can be achieved by a remote pickup mike out in or over the audience area, or by echo chambers, or by electronic artificial means.

The playback system also uses widely spaced loudspeakers because the transverse component cannot be expected to radiate sound into any appreciable proportion of a large auditorium (Fig. 7). Under these conditions, the lengthened reverberation times accepted as natural for such listening environment make the greater difference times natural for widely spaced speakers acceptable and achieve a satisfactory stereophonic illusion over a relatively large section of the auditorium.

Having taken the opposite extremes, the next thing is a medium-sized studio with a medium-sized listening room. This would be something in the region of twenty to thirty feet square or similar dimensioned rectangles. When both studio and listening room are in this dimensional category, the optimum results seem to be obtained when widely spaced microphones are used with close-together loudspeakers, or vice versa (Fig. 8). This may briefly be explained by the fact that we are in a size category where a complementary arrangement of the two opposite possibilities achieves the best results.

But what about other combinations? We have different sized listening rooms, and we certainly have different sized re-

ording studios. What are the ideal microphone and loudspeaker techniques for other combinations?

A series of experiments aimed at discovering this, with average type program material as source, seems to suggest that in a small studio the close-together microphone technique, that gets dominantly intensity differences rather than time differences, is invariably the better one.

In a very large studio, such as a theater, regardless of the size of the listening room, the widely spaced microphones, or individual microphones for different sections of the sound source seem to give the better result, in the latter case using an over-all microphone at a distance to pick up a general reverberation component, which is suitably mixed into the individual channels.

But if either the studio or the listening room comes in the middle-size bracket just referred to, there appears to be some advantage to using a setup to correspond with that idealized for the other. For example, if the studio is of medium size and the listening room is small, then a close-together loudspeaker setup is ideal for the listening room. This means the best technique in the medium-sized studio will usually be the close microphones, using the MS or stereosonic technique.

However, if the same sized studio is used for recording program intended for reproduction in a large auditorium, the wide spaced microphone technique will produce better over-all results, utilizing the wide-spaced speakers for playback.

The reader can readily fill in the best arrangement for the other combinations for himself. But this analysis has only taken cognizance of existing more or less accepted methods and techniques.

From the discussion in the earlier sec-

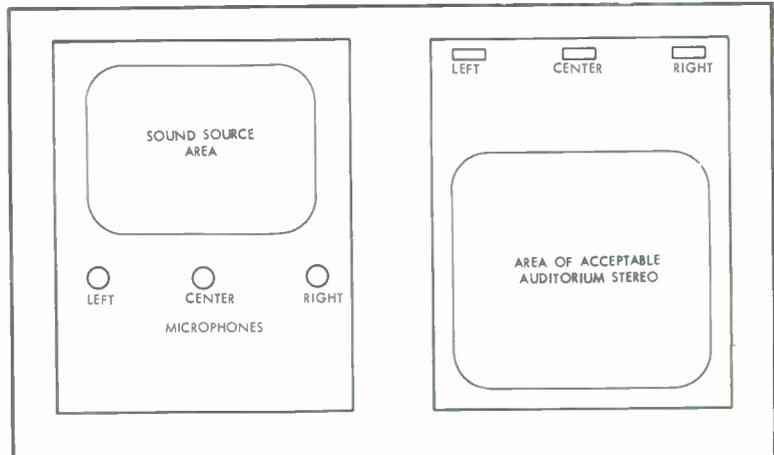


Fig. 7. Best arrangement when studio and listening room are both large—of theater or auditorium size.

tion of this article, it seems probable that the precise relationship between reverberation and direct sound components carried on each channel could be more precisely utilized for establishing definite location effects. It may well be that more precise control of distribution between reverberation components of individual sounds, as well as the direct components, could be utilized in synthesizing individual sound tracks to make them more acceptable for reproduction in listening rooms of all sizes, by using a playback setup suitable for the room size in each case. This is suggested as a further avenue for work in the endeavor to achieve more consistent improvement in stereophonic illusion by properly applied recording techniques. **Æ**

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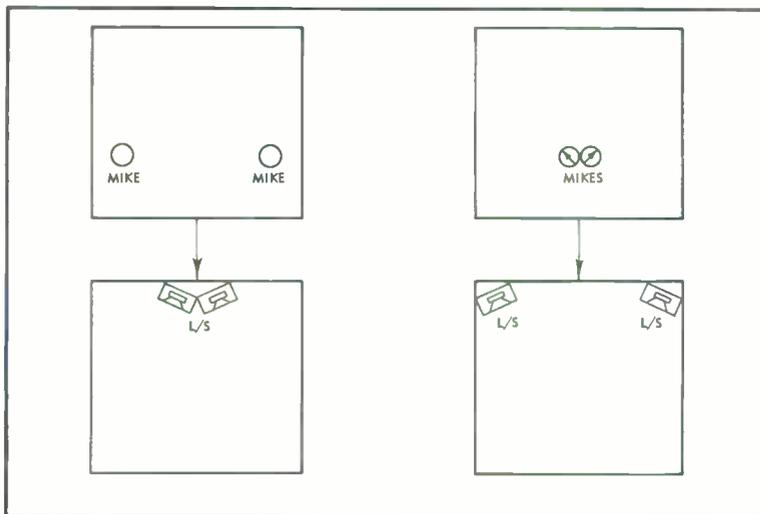


Fig. 8. Alternative arrangements suitable when studio and listening room are both of medium size.



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THE AUTHORS

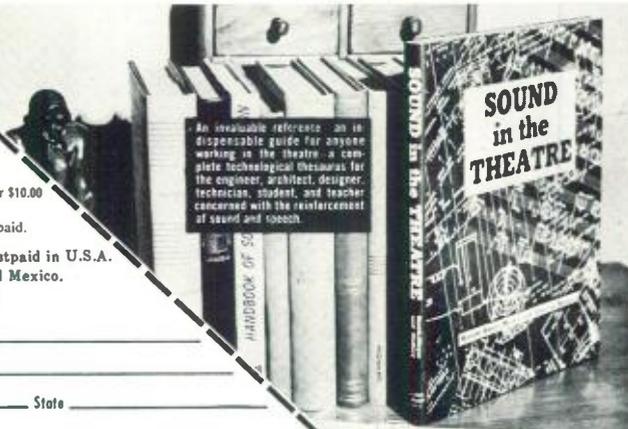
During the past thirty years, the authors have developed the techniques of sound control in opera, open-air amphitheatres, theatres on Broadway, theatres on-the-road and off-Broadway, in concert halls and night clubs, in Hollywood and in the laboratory. Some of their techniques are used in broadcast 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.

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ARM DESIGN

(from page 28)

the case—then the problem is keep the variation in error small at the inside of the record, while not allowing it to rise too high on the outside. Here the curves drawn will be useful—by sliding a plastic straightedge up and down the graph paper, one can select a value of average angle, which will then be the tracking angle, which seems to suit the above requirements best.

Those who are not yet tired of calculation can try to work out the ratio of tracking error to radius and use this to find the "best" curve. However, even by inspection one can find that using a 12-in. arm, with an offset angle of 16 deg. and an overhang of 7/16 in., the error varies over plus or minus 0.5 deg. from 5 to 9 inches record diameter, and then rises to 2.5 deg. at 12 in. diameter, all quite acceptable values.

In passing, three points should be mentioned. First, the offset angle is not the angle of the pick-up to the arm, but the angle between the pick-up and a line joining the stylus and the arm pivot. Second, the overhang is measured from the center of disc or turntable spindle. Third (and important), the overhang is quite critical and should be measured accurately. Æ

RECORD REVUE

(from page 67)

many a year, before this kind of expression is really first hand, his own.

I listened very closely, for instance, when he got to the Liszt Mephisto Waltz, for that piece is a fine show-off vehicle that hides some of the most poignant of ultra mature Romantic expression in its gentler parts. Nope—he missed that cold. He just played the notes, pleasantly and correctly. Tripped him up there.

But, for Heaven's sake, what do you expect? He may have the most fabulous fingers alive—I think he has them—and a fabulous musical ear, too, but there's no substitute for living, for human experience at length, for life itself. At fourteen a man who can understand how it is to be, say, sixty five is really a freak.

What Lorin Hollander has, surely, is the makings of one of the finest pianists alive. In a few years and provided he lives and learns in the right direction, provided he isn't exploited until he cracks. (That has happened often enough.) Right now, he has everything, but he plays mostly the brittle, brilliant show piece stuff and his technique tends towards the steady and brash. No matter, for an ear like this and a rhythmic sense so utterly secure can't go too far wrong. If you want a sample of things to come, don't play the Rachmaninoff Prelude or the Liszt Hungarian Rhapsody, try the quietest and simplest piece on the disc, The Brahms Intermezzo in B Flat, Opus 117 number 2. Absolutely lovely. His Brahms G Minor Rhapsody, come to think of it, is extraordinary too. Many a veteran can't possibly match him right here. Genius? Maybe.

Debussy: Children's Corner. Schumann: Scenes from Childhood. Kabalevsky: Children's Pieces. Yakov Zak, Kabalevsky, pianists. **Monitor MC 2039**

A pleasant piano pot-pourri on this Russian import and an interesting musical contrast. Mr. Zak plays the Debussy and Schumann with a good deal of personal eccentricity and a lot of musical feeling—perhaps it is in part simply the fact that as a Russian pianist he is out of touch with conventional Western ways of playing these pieces that gives his interpretations so much interest, but I suspect that in any case he is a good musician and has musical ideas of his own. In particular he has a lovely way with pianissimo effects.

As in so many of these Russian recordings, the composer himself plays the Children's pieces by Kabalevsky. Almost every contemporary composer has had his try at piano music for children and every one of them gives himself away as to what he thinks children are up to. Few composers can write children's music that is both simple and yet on a really high plane, worthy of an intelligent child's mind—Prokofiev and Bartok are two. Kabalevsky's pieces are pleasantly run-of-the-mill modern Russian, full of rhythm, conventional harmonies and conventional rule-breakings—parallel fifths, hidden octaves and the like. They sound awful hard to me, but that's for Teacher to decide.

5. DEBUSSY

Debussy: Le Martyre de Saint Sebastien. Danco, Wough, Gontmollin; Union Ch. de la Tour-de-Peils, L'Orch. de la Suisse Romande, Ansermet.

London OSA 1104 stereo

This is the stereo version of a London record I received back in 1955, and I don't for the life of me know whether it is a remake (it has the same performers) or was actually taken down in stereo at that time. Perhaps it was, for I note that the two have the same master number in upside-down characters on the label (a trick of London's that always has struck me as whimsically cryptic). If so, then the 1955 engineers were pretty darned good, and this is a worthwhile modernization.

The big Debussy spectacular came into its own on discs when we were able finally to

hear it in reasonable completeness, with chorus, three soloists and orchestra, if not with the accompanying stage action of the original production. My favorite recording, also via London, is the French Ducroet-Thomson version which includes the entire exciting French spoken narration—it takes two LP records. This London version is a compromise, the narration omitted, plus some minor repeats and the like, but all the solid musical stuff left intact. You can follow the story via the notes.

It's a unique work, in the Swiss epic style more or less ("King David") but of a late-Impressionist mystical impact that is extraordinary, taken as a whole. Perhaps the only comparable work of music is Debussy's own single opera, "Pelleas et Melisande" and if you have fallen for that, you'd do well to try this more acid, more mysterious, more tortured work. Arguments as to which is "greater" are pointless; all that matters is that this piece has something unique to offer, and the more complete is its presentation, the more compelling is its dramatic sense.

Debussy: La Boite a Joux (ballet); Printemps (Symphonic Suite). L'Orch. de la Suisse Romande, Ansermet.

London CS 6079 stereo

Here are two unusual Debussy items, in the seemingly endless series of Ansermet recordings that come out month after month; I found them somehow not very exciting, though it might have been my mood both times. (I tried twice, to be sure.)

"The Toy Box" is a late Debussy ballet score, full of bits of French folk tunes. A workmanlike job but somehow all polish and dreadfully uninspired, at heart. "Printemps" is a sweet and very easy work with piano, transcribed from a piano original.

Debussy: Iberia. Ravel: Alborada del Gracioso. Ibert: Escales. Orch. Nat. de la Radiodiffusion, Stokowski.

Capitol P 8463

This was one of the continuing Stokowski discs from Capitol—he's now working for Everest. The combination of flamboyant Stokowski and the well disciplined French orchestra is good in these war horse French pieces; they rattle along with professional aplomb and plenty of drama though I would not say any of the playings are overly subtle. Just well styled, slick, effective. Mine is mono—don't know whether it comes in stereo too; it's fine this way.

Stravinsky: Suite Italienne. Debussy: Sonata #1. Piatigorsky, cello; Lukas Foss, piano. RCA Victor LSC 2293 stereo

RCA keeps plugging its longtime artist "stable" until, as here, something new must be added for variety. The two main items (there are several smaller ones, too) are specialties of considerable interest, even in the relatively limited cello-piano medium, not a sound to most listeners' taste.

The contrast is striking. Stravinsky re-wrote his "Pulchella" suite especially for Piatigorsky, but to my ear the playing of the suite for cello is disappointingly academic in an unctuously cellistic way. The piece is a lovely one in its proper form, based on themes by Pergolesi nicely squared off in Stravinsky terminology; here, it just sounds like a rather ungainly cello exercise. I didn't even enjoy the piano part much.

The Debussy, on the other hand, is a genuine cello-piano work in Debussy's most original manner, out of his last days, and the style is clearly right up Piatigorsky's alley; he does a magical job on it, making music that strikes far beyond mere cello virtuosity. Foss goes along with him.

The other items, a little suite by Busoni, an early Lament by the same (Busoni was a revered teacher of many prominent musicians of today) and a little Capriccio by Lukas Foss himself, add nice encore interest to the big items. Buy the disc for the Debussy. **25**

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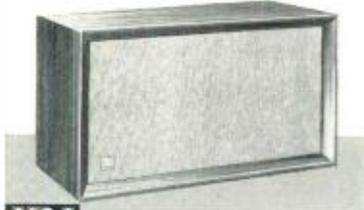
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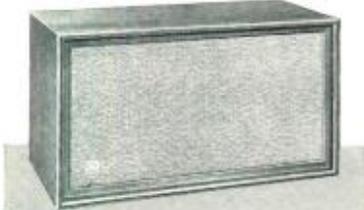
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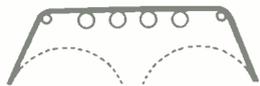
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OUTPUT TRANSFORMERS

(from page 32)

can be minimized by working the transformer core at a low magnetic flux density.

Eddy-current losses are the second component of the iron loss and are found to be proportional to (flux density)² and (frequency)². Their origin is interesting. Very early in the present discussion it was noted that an E.M.F. was induced in the turns of a coil by the alternating magnetic field "flowing" through the coil. On looking again at Fig. 5 it will be seen that the iron core itself constitutes a large single turn and

tween laminations. It was also noted that the losses are proportional to (flux density)² and thus the losses can be greatly minimized by designing the transformer to work with a low flux density.

The copper losses need little description. If a current of *I* amps flows in a resistance of *R* ohms, then there is a total power loss of *I*²*R* watts dissipated as heat in the resistance. In an audio transformer there are power losses in the primary coil due to the signal current and due to the current required to supply the iron losses. In the secondary winding there are losses due to the signal current flowing around the voice-coil circuit. A more complete analysis shows that all the losses are not so simply explained as in this preliminary discussion but the explanation is adequate at this stage.

The losses grouped together under Item 3 are perhaps a little more troublesome to understand but the problem is greatly eased by the introduction of an equivalent circuit, a technique much used in the study of valve circuits. The basic practical circuit of an output transformer in the anode of a single valve is that of Fig. 1. The first step in producing an equivalent circuit is to remove all those items that do not affect the signal-frequency performance of the circuit, the aim being to simplify the circuit by reducing it to the bare essentials in order that the effect of each component should be more clearly seen and understood.

TO BE CONTINUED

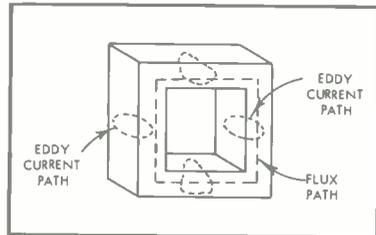


Fig. 5. Eddy current paths are at right angles to the flux path.

thus current will tend to flow in a circular path across the iron core section at right angles to the direction of the magnetic field. Power is absorbed from the source to supply the *I*²*R* losses due to this current flowing in the iron path. The circulating current and hence the losses can be reduced by increasing the resistance of the path taken by the current, a result that is generally achieved by laminating the iron circuit so that the circulating current must pass across the relatively high resistance contact be-

AUDIO ETC

(from page 14)

stroke, you see, was that with this new (and legitimate) center-emphasis, it became possible to yell about three channels. What else, if you add something in dead-center, with something on each side? That makes three, does it not?

You know, I have a suspicion that maybe a few of the admen don't even know they are misrepresenting anything. There are three output "channels" of sorts and how is an advertiser to know what really gives, in audio terminology? Wishful thinking, perhaps, but it is easy enough to go along with the new designation.

Especially when "three-channel" makes that silly old two-channel stereo of 1959 sound so utterly obsolete. Most of it is, alas.

* * * *

Just for the record, let's say it again (and I'll cease fulminating for months and months, maybe).

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stated that stereo—any stereo—requires at least two well-separated and identical speaker systems, of exactly equal importance, people would have learned to get along with the idea. Good results would have "sold" stereo itself on its own good merits.

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2. SHERWOOD AM-FM

A brace of Sherwood components came in a few months ago, the first I'd had a chance to try, and herewith an in-use report on one of them, the well-known Sherwood tuner, in this case the S2000 II, AM-FM model.

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I guess I'm a sucker for a certain type of good looks and good feel in my equipment—I liked the Fisher feel and I like the Sherwood feel, too, not to mention the looks. I positively enjoy the chaste but stylish "solid gold" frame around this front panel, set off against white with gold-black lettering. I enjoy even more practically the deliberate simplicity of this panel, with a minimum of verbiage and a maximum of visibility. The dial is glass with white letters against a very dark plush-like background; the AM and FM scales are separate, one above the other, and the "pitch" is plenty wide enough to keep your stations apart for the eye. You can mark them down on the white expanse, too, if you feel like it. (I did.)

Indeed, this is a "basic" AM-FM tuner, minus fancy stereo duplications and intended for the most straightforward radio usage. Stereo in this model will await its ultimate radio form, which is very likely to be multiplex in one shape or another; there is a multiplex FM output on the rear, for the future, and if you want AM-FM two-station stereo in the meantime, you'll have to go elsewhere. (I don't and won't.)

Two knobs are enough for this Sherwood, tuning to the right and ON-FM-AM to the left. Two slide switches, too, AFC in and out on the right and broad vs. narrow tuning for AM on the left. There is a common tuning eye for both circuits, an excellent idea, and it is of the type that looks like a large French *fleur-de-lys*, a sort of tall bayonet in the middle sprouting from two side pieces; the bayonet gets thicker as the signal gets stronger, spreading sidewise until it hits the slide "leaves" at maximum. I found this the most easily readable tuning eye I've run into so far and appreciated not having to look two different places for FM and AM.

There's one extra gadget on this tuner, the interchannel hiss circuit, which dumps out the familiar hiss between stations. It is adjustable, via a lever that slides around the left-hand knob, since it must be set so that the weaker stations which you may want to hear aren't swallowed up bodily along with the hiss—the circuit can't tell the difference. At maximum, this circuit lets only the very strong stations through, reducing the area between to complete silence. In my excellent location (and with the FM-Q antenna pointed to a favorable compass quarter) I logged about twenty strong stations at maximum. At minimum I can hear the sound of at least sixty or seventy. Tuned up about half way, the lush circuit lets through those stations with a signal strong enough for good musical listening. For distance logging, you turn it all the way off.

As a matter of fact, I find the hiss quite unobjectionable in my particular situation—possibly it is inherently low in this tuner (as to the circuitry, I would not know) or, more likely, I run my radio at a lowish listening level and my room acoustics and listening spots are favorable on the ears. But in situations where hiss is unpleasant, this gadget can be very handy. My only mild criticism of it is that when it is used there is a tendency for rather severe rattling "breaking-up" noises (square-wave distortion?) to occur at the edges of each station's tuning point, and on those weaker stations that just barely

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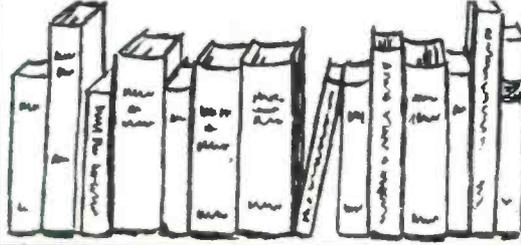
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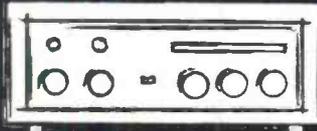
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No. 112

TAPE RECORDERS AND TAPE RECORDING

by Harold D. Weiler

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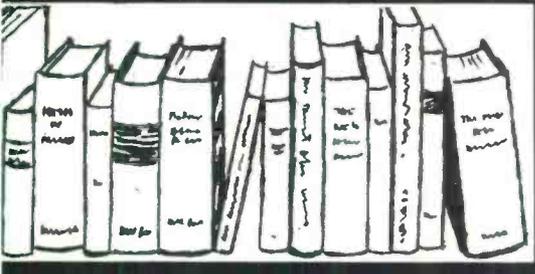
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get through at the setting you are using. Personally, I prefer the hiss to this type of tuning distortion, but I am not a very typical listener in this respect and Sherwood probably knows its buyers' tastes better than it does mine. The interchannel hush could well be a very useful feature for most listeners.

Yes—this tuner is highly sensitive; it has been out in front in the sensitivity derby at various times during the last few years and is right up at the top now, if not actually at the number one spot. There begins to be a question in my mind as to how sensitive you can get, when orders of sensitivity well below the "unity" figure (1 μ v for 20 db quieting) are now available. No question about it, though, in any country location, especially where good distance-getting is possible due to an unobstructed antenna plenty high up, the extra sensitivity makes a world of difference in good listening. My major radio needs are for good reception of New York City stations a hundred miles away and, at right angles, reception of our leading local station and one of the best programmed outlets in the country, WTIC in Hartford, Connecticut. (The only intelligent, intelligible weather service I've ever heard, that talks sense, gives the odds, explains what is going on, and almost always is right, too.). WTIC is some 50 miles off, through a local mountain, but I get it perfectly. All New York stations are audible, most of them with maximum limiting, and Philadelphia's juke box outlets (pardon my strong feeling) come through mostly clear at 200 miles.

Finally, I must mention the AFC, which on this tuner is not adjustable on the front panel. It grabs stations with extraordinary tenacity, but oddly enough, seems to be able to hold onto a weak station right next to a stronger one, jumping to the more potent signal only when the weak station momentarily fades completely out, usually on a "swish" pulsation, due to interference or reflection. This seems to me unusual, but being no circuit man I make no attempt to explain it. I can only say that this is a very good AFC circuit, more useful than some I have tried, and I use it virtually all the time.

Nuff said. For a high performance basic tuner, this one is a fine buy as far as I can see.

3. EXCEPTIONAL AREA

Here's an odd sidelight on the use of the so-called sampler record, a device that has spread widely during the last few years, and an excellent idea, too—it being now virtually impossible for the record buyer to sample his discs until after he's bought them.

Peter Bartok of Bartok Records, a distinguished small label, decided a year or so ago to give up regular retail distribution through record stores and try for an all-mail-order business. He had found (and I'm not surprised) that the small label has little chance for sales in most record stores, where the big labels flood in faster than the dealers can keep track of them. The outlets in most towns, simply can't, or won't, stock minor labels and, indeed, mostly won't even take orders. They are hard pressed, and if you push them they're

as likely as not to mutter that they never heard of the label, or it went out of business long ago and never did have anything worth listening to anyhow . . . a fine kind of salesmanship but inevitable, I guess, under the hectic circumstances.

Those are my words, not Bartok's; but any how, for his mail order clientele he worked up a sampler disc, available for one dollar, refundable upon purchase of any regular Bartok merchandise—you mailed the coupon and took a dollar off your bill. I thought it was a fine idea, and I tried the sampler myself, found it one of the best-tailored jobs of the sort I'd run into a sensible and communicative sampling of typical parts from each of the mostly longish works, an admirable lack of those ugly fade-outs that leave you high and dry right in the middle of the music in most classical samplings, and even a well-planned sequence that allowed the music to be played straight through, like a concert, with a minimum of jolts and bumps. Now that's a tough job to pull off in classical music, which does not lend itself comfortably to sampling in most cases.

(Pops samplers are a cinch; the music falls automatically into three-minute slices and all you do is make a collection of the numbers.)

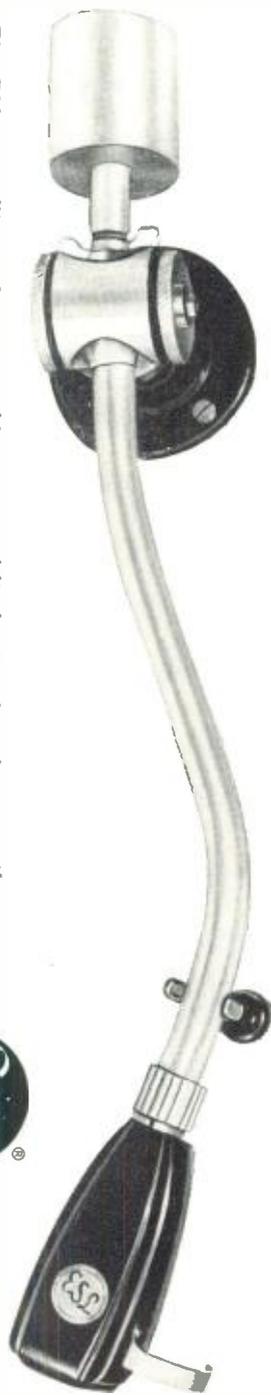
Well, now I hear that Bartok Records are back in the shops again. People are perverse and you can't tell what they'll do; they bought the Bartok sampler, but very few of them ever got around to sending in the refundable coupon—no more than one person in ten on the average, over the country. Maybe the grown-ups get too much of this coupon business from their kids, via soap boxes and cereals and what-not. Maybe they thought there might be strings attached, or they might get put on a mailing list—and is *that* a good reason for not signing your name and address, these days. No—people aren't happy today about coupons of any sort, not even those convenient little guarantee cards that come with most hi-fi equipment. I'm willing to bet half of them never get mailed in, guarantee or no. . . . So, the result is that the Bartok sampler is now for sale straight, for a flat \$2 and minus any coupon. Probably sells better that way, and it serves the buyers right, I say.

But there's one dizzy angle to this little story that is the reason I relate it. One person in ten cashed the refund coupon as far as the country-wide figures were concerned. But in one exceptional area, there was a radical and quite astonishing difference. In that region "practically every coupon came back," says Peter Bartok. Every bargain hunter out there who bought the sampler sat straight down with profit in his eye and ordered more Bartok, at the dollar saving.

My suggestion to Bartok Records is that this area would be an excellent place to move to, lock, stock and sampler, for it just happens to be the home of the mail order special, birthplace of Sears Roebuck and Allied Radio and a host of other shop-by-mail outfits—Chicago. Chicagoans evidently loved refund coupons—or maybe they love Bartok. Whichever it is, Chicago has a ten-to-one edge on the rest of us. Won't surprise Chicagoland one little bit.

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AUDIOCLINIC

(from page 4)

Measurement of Magnet Strength of Speakers

Q. What are the meanings of the terms gauss, maxwells, and gap energy, as measures of loudspeaker magnet efficiency? How are they interrelated, and what is their significance in evaluating loudspeaker performance? Lawrence Blaustein, Farmingdale, N. Y.

A. When a speaker manufacturer refers to the number of Gauss of his unit, he means the number of magnetic lines of force per square inch as measured across the air gap, or the opening in which the voice coil is hung. If he refers to Maxwells, he refers to the total number of lines of force in the magnet structure. Gauss is a far better measurement. No matter how strong the magnet is in terms of a total field, it is completely valueless if these lines are not properly directed to the air gap in as great numbers as possible. The more lines which can be directed into the gap, the greater will be the efficiency of the speaker and the better will be the damping. There are other factors which govern the efficiency of a loudspeaker, and therefore, it is impossible to determine the efficiency of a speaker simply by knowing the magnetic strength at the gap.

So far as I know Jensen is the only U. S. manufacturer which lists gap energy level. Jensen uses a standard speaker whose magnetic properties are known, and compares this speaker to all others made by the company.

It is impossible for us to convert one measurement to the others because we would need to know too much about the construction of a given speaker. Such intimate details of manufacturing are rarely disclosed.

Three-Channel Stereo

Q. I have read in recent ads about three-channel stereo. Where can I get suitable three-channel discs and tapes for use with this new technique? Arthur Darrow, Troy, New York.

A. Some record manufacturers make three-channel stereo masters, but they are never released in that form. The third, or center channel, is blended into each of the side channels and enhances the stereo effect. To date there is no three-channel tape equipment suited to home music systems. Also, we have not developed a system capable of impressing third-channel information on disc.

It is obvious, therefore, that the ads of which you speak should refer to center-speaker stereo or third-speaker stereo rather than to three-channel stereo. Three-channel stereo specifically refers to separate recording channels from microphone to speaker. In center-channel stereo, the middle speaker derives its signal from both power amplifiers or from a third power amplifier which derives its signal from a mixture of the signals from each of the two preamplifiers. **Æ**

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UNUSUAL VALUES. Hi-Fi components, tapes and tape recorders. Send for package quotations. Stereo Center, 18 W. 37th St., N. Y. C.

SALE: 78 rpm recordings, 1900-1950. Free lists. Collections bought, P. O. Box 155 (AU), Verona, N. J.

HI-FI COMPONENTS, tape recorders, Special quotes Dynakits, Bell equipment. Bayla Co., 1470-0 Elenor Road, Wantagh, N. Y.

RENT STEREO TAPES—over 900 different—all major labels—free catalog, Stereo-Parti, 1608-11 Centinela Ave., Inglewood 3, California.

FOR SALE: Fisher 101-R stereo tuner, new, only \$165. F. O. B. W. E. Hill, 6876 Emsign Road, Millington, Tennessee.

FOR SALE: Ampex 4-Input monophonic or 2-input two-channel stereo mike mixer—\$190; EMT echo chamber, original cost over \$2100, will sell in brand new condition for \$1590; Pilot SP215 stereo preamp—\$90. Joe Holzman, 116 W. 14th St., N. Y. C. OR 5-7137.

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SELL.—Half price for each: Goodmans 852 woofer, Jensen RP-41 mid-range, JBL 075 tweeter. Excellent 3-way system or will sell separately. George Duebow, P. O. Box 4002, Gary, Indiana.

WANTED: Used Leak monophonic Varislope preamplifier, and Stephens 15-inch woofer. State year and condition. Harry S. Johnson, 2235 Overlook Drive, Minneapolis 20, Minn.

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Industry Notes . . .

SORRY, Mr. KARG — SORRY, Mr. FREEMAN. While preparing the caption for the "family-style" cover which adorned the December issue of *AUDIO*, the editors inadvertently neglected to turn on the automatic gremlin eliminator with which the office is equipped. As a result there was no mention of the fact that the tuner illustrated is the new **Karg Model CT-1**, or that the picture was taken by **Al Freeman**, audio service manager for Liberty Music Shop, New York. Mr. Freeman was a crack magazine photographer before finding the true light of his professional love lay in the field of high fidelity.

WBAL GIVEN TO PACIFICA. Louis Schweitzer, owner of **WBAL**, New York's leading commercial FM hi-fi station, has announced that he is giving the station to **The Pacifica Foundation**, which operates two West Coast FM stations on a listener-contribution basis. **KPFA** in San Francisco and **KLPK** in Los Angeles ask their listeners to volunteer contributions of twelve dollars per year to maintain the stations, and **WBAL** will attempt operation on this basis. At this writing it is indicated that **Bert Cowlan**, present manager, will continue to manage the station for Pacifica.

E-V ANNOUNCES NEEDLE LINE. Expansion of the Electro-Voice product line to include top-quality replacement needles has been announced by **Larry LeKashman**, vice-president of marketing for **Electro-Voice, Inc.**, Buchanan, Mich. **C. E. Seaman** has been appointed product manager for the new line. More than 250 precious-metal, diamond and sapphire, and single- and double-point styli will be offered.

NESHAMINY APPOINTS EXECUTIVES. **Harold Barton**, former general manager in charge of merchandising for the New York stores of **Sam Goody, Inc.**, has been named vice-president in charge of sales for **Neshaminy Electronic Corporation**, manufacturers of a variety of compact high fidelity loudspeakers including the widely known **JansZen** electrostatic tweeter. He comes to Neshaminy with a background of over 20 years in the field of electronic product distribution, both in the United States and in Great Britain. Concurrently, **Henry Guggenheim**, formerly with **Hudson Radio & TV Corporation**, New York, became eastern regional sales manager for Neshaminy.



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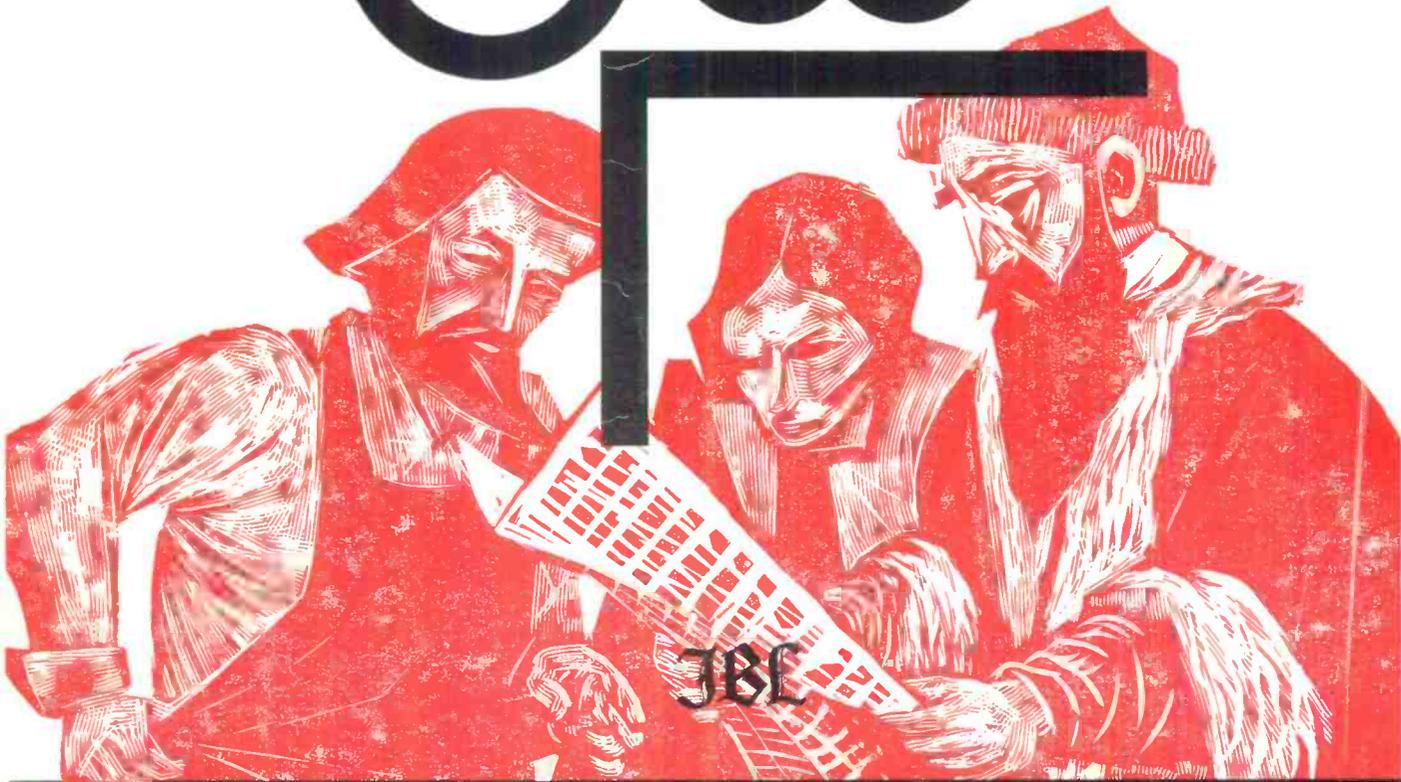
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Johann Gutenberg of Mainz on the Rhine is credited with the invention of movable type, a contribution of immeasurable worth to the arts and sciences. Unmeasured surely, but of great significance, are the contributions to the art-science of high fidelity made by James B. Lansing Sound, Inc.: There is the four-inch voice coil with its attendant high efficiency... the acoustical lens... the ring radiator... Now JBL brings you wide field stereo reproduction through radial refraction. This is the principle on which the magnificent JBL Ranger-Paragon and the more recent JBL Ranger-Metregon are based. Two highly efficient, full range, precision loudspeaker systems are integrated by a curved, refracting panel. You are not confined to one "best" listening spot, but can perceive all the realistic dimensions of stereophonic reproduction at its very best throughout the listening area. The JBL Ranger-Metregon comes within the reach of all true high fidelity enthusiasts. For, no less than seven different speaker systems may be installed within this exquisitely styled, meticulously finished acoustical dual enclosure. You may start with a basic system and progressively improve it. Perhaps some of the JBL loudspeakers you already own may be used. Write for a complete description of the JBL Ranger-Metregon and the name and address of the Authorized JBL Signature Audio Specialist in your community.



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