

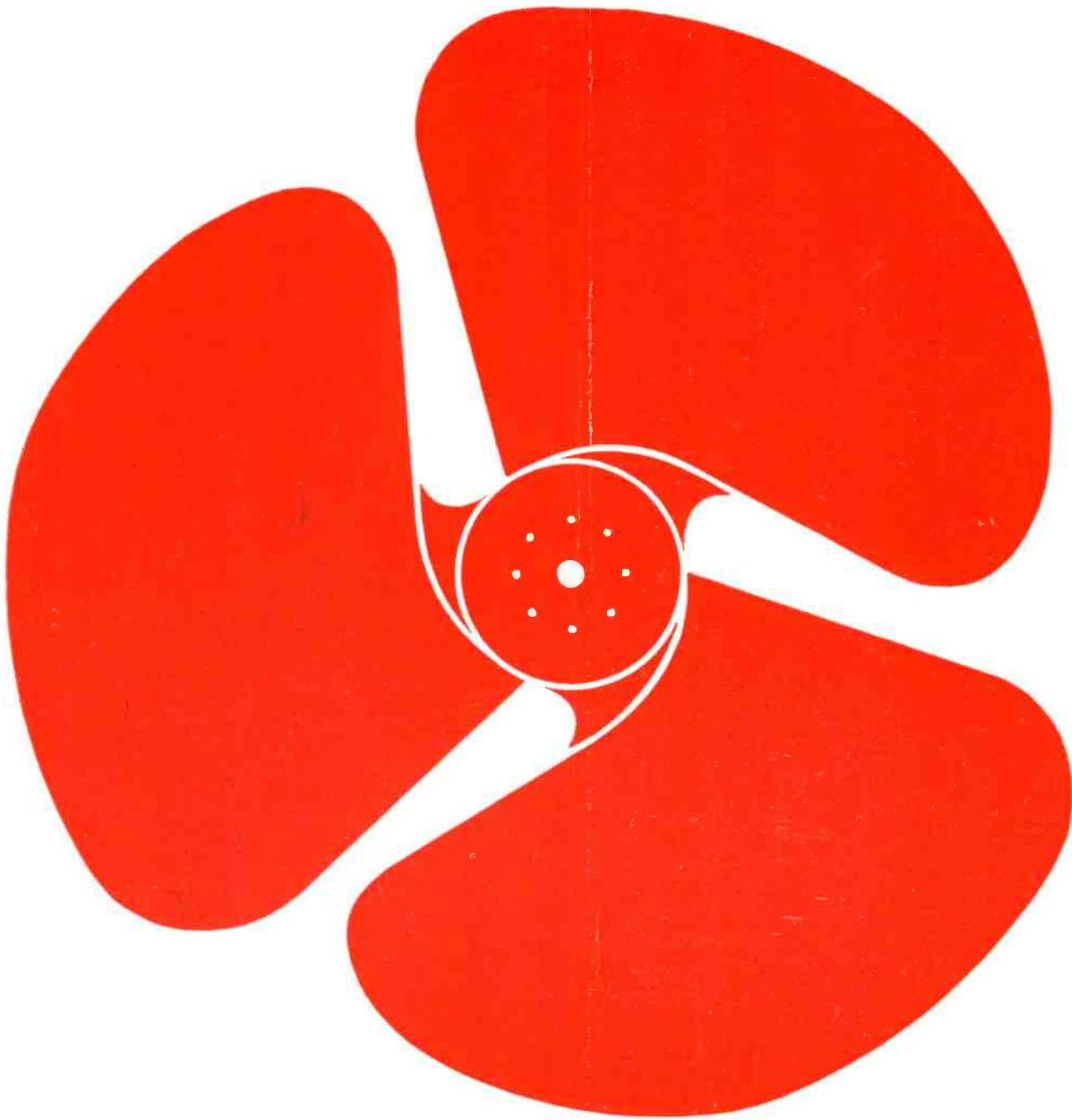
# AUDIO

FEBRUARY, 1959  
50¢

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Invention of the screw propeller in 1836 by John Ericsson provided water transportation with a means for using steam power that was far superior to any method of propulsion previously devised. In our day **radial refraction**, brought to you by the laboratories of James B. Lansing Sound, Inc., provides the best—and perhaps the ultimate—method of reproducing two channel stereophonic music in your home. Radial refraction integrates two, balanced JBL precision loudspeaker systems to eliminate the “hole in the middle,” obviate “split” soloists, and to distribute the stereo effect over a wide area. The two, full-range, balanced speaker systems used reproduce all of the phenomena required for full stereo perception. Radial refraction was first used in the JBL Ranger-Paragon, a magnificent instrument that has found its way into the great homes of audio cognoscente throughout the world. Now a smaller unit, the JBL Ranger-Metregon, has been designed to bring radially refracted stereo to the usual-sized living room. No less than seven different JBL speaker systems may be used with the Metregon. You may wish to make use of JBL transducers you now own for one channel, and install matching units in the other. You may progressively upgrade your Metregon system. 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.



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

THE BRITISH INDUSTRIES

# Sounding Board



**CALIFORNIA  
RE-VISITED**

The 1959 San Francisco and Los Angeles High Fidelity Shows have some interesting historic significance.

For one thing, it is a full year since the stereo record was first demonstrated on the west coast. Of course, at that time there was very little in the way of stereo repertoire. Only a few labels released "samples," and these were "experimental" *first* pressings...replete with the sounds of the bowling alley, ping-pong balls, the ferry boat, the railroad engine—and of course, some incidental music. Actually, this was intentional and the basic consideration in the arrangement of the stereo program was to achieve (for these first pressings used to demonstrate the effects of stereo) the greatest auditory perspective... depth... dimension.

With regard to "timing," these records were a "found blessing" to the few phono pickup manufacturers who had "first" models of their stereo pickups and demonstrated them at the 1958 California High Fidelity Shows. It may interest you to know that certain of these manufacturers, even without our knowledge, had rewired the Garrard Model RC88 record changer as the ideal instrument for use with their stereo pickups, and then reported to us their complete satisfaction. Incidentally, by this time Garrard changers, already wired for stereo, were in production. Aside from the "handful" of stereo pickups demonstrated at the California High Fidelity Shows a year ago, there was little else in the way of stereo equipment for the "stereophile."

Of course this will not be the case when the high fidelity industry *re-visits* San Francisco and Los Angeles for the 1959 High Fidelity Shows. Music will be plentiful—music for everyone—from the deep classics to the exciting tempo of the jazz combo. Today... the stereo repertoire already amounts to something like 2,000 selections on about 25 labels!

Naturally, British Industries will be at the 1959 San Francisco and Los Angeles High Fidelity Shows, and at virtually every other high fidelity show throughout the country in 1959. As in prior years, this year with our stereo demonstrations, we will continue to maintain the feeling of *listening within the home*... of enjoying a musical experience. We will be demonstrating BIC high fidelity components as follows:


We are using the **Garrard** Model RC 88 because this changer reproduces stereo music precisely as recorded, without introducing any disturbing or distorting factors such as rumble or wow. In fact, the Garrard changer performs better than most so-called "professional" turntables, because this changer is actually a superb turntable combined with a scientifically engineered aluminum tone arm which tracks at the correct stylus pressure without undesirable resonances. You have the added convenience of not only being able to play records simply by hand, but also stacked, with the assurance that they are being handled automatically more gently than by any human hand. This is true on a Garrard changer and at a price much lower than you

*The Sounding Board*

may have been led to expect. When considering the claims of changers "specifically designed for stereo," or turntables "to play stereo properly," it is well to remember that for years Garrard changers have had all the qualities necessary for this type of sensitive reproduction. Now more than ever before, it is essential to insist on a Garrard changer, and accept no substitute, if you want the finest Stereo or, of course, Monaural reproduction.

The new **LEAK** stereo amplifier and preamplifier are being used to control the sound. Leak professional quality amplifiers are unique because they keep distortion down to a trivial one-tenth of one percent (0.1%) at full rated power...the lowest figure ever achieved!" This explains why the Leak stereo sound you will hear is so natural, and why you could enjoy it for hours without fatigue. Low distortion is the key to quality stereo reproduction. Invest wisely. It is important to remember that the amplifier and preamplifier are the very heart of your stereo system.

You will hear the **Wharfedale** speaker systems...integrated combinations of 2 or 3 Wharfedale speakers in enclosures designed by G. A. Briggs. These systems are preferred for stereo because of practical size, moderate price and unusual versatility. The reason why people so appreciate speakers and speaker systems by Wharfedale is that Mr. Briggs has designed them to reproduce music naturally, without electronic, mechanical or acoustic coloration. You have only to hear a pair of Wharfedales to realize, that in their performance, they achieve a non-strident musical quality... a quality of clean, spacious sound that heightens the stereo effect.

A pair of  Super 8's are used as an alternate speaker system. You may well wonder how such splendid sound could come from so small a speaker enclosure. The answer lies in patented RJ design principles, which mean that no other small enclosure can match the RJ in performance. Stereo does create some new problems in room arrangement which are easily solved with versatile RJ enclosures.

We have prepared a series of Comparator Guides covering the various BIC product lines. If you have not already obtained them at the shows, we will be happy to send them to you. Please write, specifying the BIC products which interest you.



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*The Sounding Board*

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COVER PHOTO—Model home installation at Los Angeles County Fair in September, 1958. Speaker and equipment cabinets comprise Ruxton Electronics Company's "Venezia" stereophonic ensemble, with equipment by Scott, Tandberg, Gray, Grado, Grommes, and Garrard making up the electronic portion.

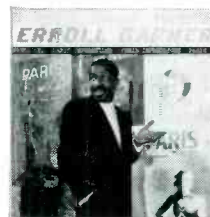
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# AUDIOCLINIC??

JOSEPH GIOVANELLI\*

## Tuner Sensitivity and Quieting

*Q. Can you tell me whether it is possible to have an FM receiver which will completely suppress ignition noise interference even when the latter appreciably exceeds the desired signal? If not, what type of circuit most nearly approaches this ideal? Can you explain exactly how the sensitivity in mv for 20 db quieting is obtained for FM tuners? Judging by the advertisements in AUDIO and other magazines, there are two or more methods in use. What does absolute sensitivity mean? What is the theoretical limit of sensitivity of an FM tuner? B. H. Murdoch, Belfast, Northern Ireland*

A. The only answer I can give with regard to a tuner having perfect suppression, is that there is no such thing as perfection. Any limiter can be upset when overloaded with noise signal. The amount of signal needed to accomplish this will depend upon both the strength of the desired signal and upon the design of the limiting circuit. Probably the closest approach to this ideal is the discriminator circuit, preceded by two limiters. Following very closely behind this is the ratio detector preceded by a single limiter and containing stiff AGC. As a matter of fact, the discriminator circuit should also employ some AGC, especially at the front end. This is because a tuner must handle signals of greatly varying strength. In the New York area, for example, it is possible to receive signals as strong as 0.5 volt (yes, 1/2 volt) at the antenna terminals. At the other extreme, the tuner must accept signals as small as 2 microvolts and still manage to quiet satisfactorily. That's asking a lot of a front end, and it is the reason that AGC is very much needed. Notice that with the discriminator circuit, two limiters are needed, whereas with the ratio detector, only one is needed. This comes about because the ratio detector circuit has inherent limiting properties. Further limiting would only reduce i.f. gain, and this would serve no useful purpose.

Now, let's go into the problem of sensitivity and quieting. There are several methods for measuring these two quantities. When these are applied properly and interpreted correctly, they mean much the same thing. The standard employed by the Institute of Radio Engineers may be summarized as follows: What voltage, when fed into a 300-ohm input, will give 30 db quieting, when 22.5 kc deviation is applied? Notice that there are two other terms which must be taken into account besides input voltage and the number of db of quieting. These are the input impedance and the amount of deviation, or percentage of modulation. If we make our measurements at an impedance of 72 ohms and feed the same power to the input, the voltage appearing at the antenna terminals will be half that which would be obtained at the 300-ohm impedance. This means that if our tuner requires four microvolts for 30 db of quieting at 22.5 kc deviation and at an impedance of 300 ohms it will need only two microvolts for the same degree of quieting when an impedance of 72 ohms is employed. This sounds like an improvement, but a 72-ohm antenna system gives us only half the signal voltage provided by

a 300-ohm antenna system. Naturally it is assumed that both antennas are of equal efficiency; and that they are in identical locations. In other words, the two measurements are, for all purposes, identical.

Next, we come to the matter of deviation. The I. R. E. used 22.5 kc because it corresponds to 30 per cent modulation. This, in turn, is roughly equal to average program level whose peaks are 10 db higher, equaling 100 per cent modulation. This figure was selected because people listen to average program level most of the time, rather than to peak levels. The Institute reasoned, therefore, that noise impairs average level more than it does peak levels because the average signal strength is weaker than peaks. Other methods, however, make use of a deviation of 100 per cent, 75 kc, as the basis for their quieting measurements. This gives us an apparent improvement of slightly more than 3:1. Our tuner which required four microvolts for 30 db of quieting will now require only 1.333 microvolts and actually slightly less, for 30 db of quieting. If we use an antenna system and input circuit designed for 72 ohms impedance, we will have a tuner requiring only 0.666 microvolt for 30 db of quieting. That sounds like a pretty good tuner, but it's no better than our original model, or should I say, "no better than our original specifications," since we have really done nothing at all to the tuner. Actually, it's all in how you interpret the figures.

We can go even further in our direction of smaller and smaller input voltages for good quieting. All we need do is to assume that good limiting can be had with 20 db suppression, rather than 30 db. We need only 1/2 as much signal to obtain this degree of suppression, and our figures are growing small indeed, but then, so is our suppression. There are other factors which affect suppression.

There are other factors, however, which caused the standards committee of the Institute of High Fidelity Manufacturers, Inc., to propose a new set of standards. They note that as the signal strength decreases, not only does the noise increase but so does the distortion. This increased distortion is largely caused by a narrowing of the i.f. band-pass. Therefore, the standards committee of the Institute of High Fidelity Manufacturers conceived the idea of a total usable signal measurement. The method for making this measurement can be summed up as follows: What signal voltage, at an impedance of 300 ohms, and at a 75 kc deviation, will be required to cause a signal at the output of the tuner which shall consist of 3 per cent total noise and distortion? The method described takes both these factors into account, and this method is quite valid. However, it certainly is going to add much confusion to already troubled waters.

Lastly, you wanted to know what is meant by absolute sensitivity. It is approximately 0.71 microvolt for 20 db of quieting, at a deviation of 22.5 kc. The reason that no greater sensitivity is possible is that the input circuit will contain noise of its own which will be 20 db below this value. It should be stated that this measurement is based upon an input impedance of 300 ohms. Any impedance generates its characteristic amount of noise, and there is no way we can prevent this, unless this impedance were placed at

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

# THE Garrard PAGE

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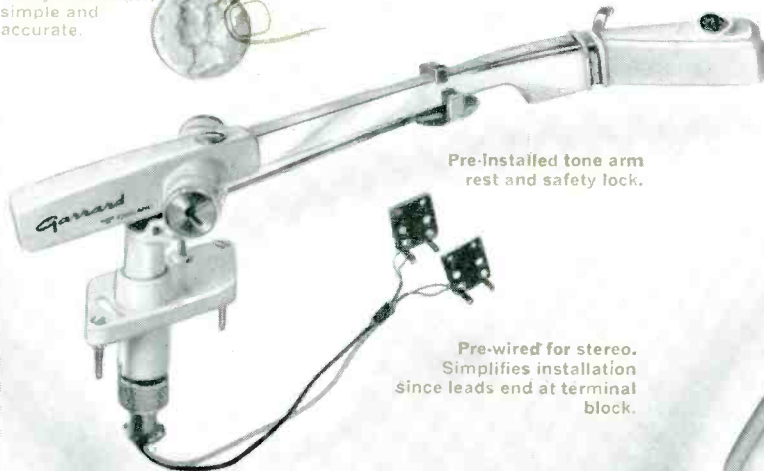
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a temperature of absolute zero, which would of course cure the random noise generated across the impedance, but so placing the impedance would pose grave problems for the tuner manufacturer.

When making any measurement where impedance is a factor, it is important that the input to the tuner be truly matched if valid results are to be obtained. Most signal generators have outputs of 50 or 72 ohms. Equal values of resistance should be placed in each leg of the generator, and the total should equal the impedance of the tuner input. Only balanced generators should be used, since an unbalanced unit will introduce standing waves which will affect the validity of the measurement. If an unbalanced generator were used, however, all the padding resistance would have to be placed in the hot side of the line.

I wish to thank Mr. Leonard Feldman, president of Madison Fielding Corp., Brooklyn, N. Y., for his invaluable assistance in compiling this material.

#### High Fidelity Equipment and Dampness

*Q. I have just purchased an Altec Lansing 820C speaker for my seashore home. Though I have the house on low heat all the time, dampness is ever present at the shore, and I have been told that dampness will affect the paper cones of the speakers or possibly cause the speakers themselves to rust.*

*I would welcome your best opinion as to whether this dampness would also have some adverse effect upon amplifiers, pre-amplifiers, etc. What means, chemical or otherwise, might be employed to overcome this?*  
John Sabritt, Philadelphia, Pa.

**A.** You are quite correct in your concern as to what dampness can do to high fidelity equipment. Of course, much depends upon the degree to which the equipment is exposed. Extremely damp, salty air can easily cause cones to go off center, and can corrode many of the parts of your equipment, leading to a breakdown of many of the capacitors and to freezing of the controls.

Fortunately, there are things which can be done to overcome this problem partially. One thing which can be done is to place silica gel in the boxes or cabinets in which the equipment is contained. In addition, you could include in each cabinet to be protected, a device known as a Damp-chaser. This device is used extensively by piano tuners and manufacturers to keep pianos dry and at a constant temperature. These devices are also used by many manufacturers of electronic organs to protect the chassis of these instruments from the ravages of dampness. The Dampchaser is nothing more than a heating element. Its purpose is to raise the temperature of the device being protected two to four degrees above the surrounding temperature; this simple act will reduce condensation. These units are available in several sizes, and I would recommend that you use the largest possible size.

Once the equipment being protected is turned on, its own operating temperature will be sufficient to avoid condensation. Because of this, the Dampchaser need not operate at this time. This can be accomplished quite easily. Simply connect the linecord of the Dampchaser across the terminals of the switch of your system. When the device is turned on, the Dampchaser is automatically shorted out of the circuit. When the equipment is turned off, current can flow through the device. Since the power consumed is very small compared to the device being protected, most of the voltage will be developed across the Dampchaser, and almost none across the primary of the power transformer. Æ



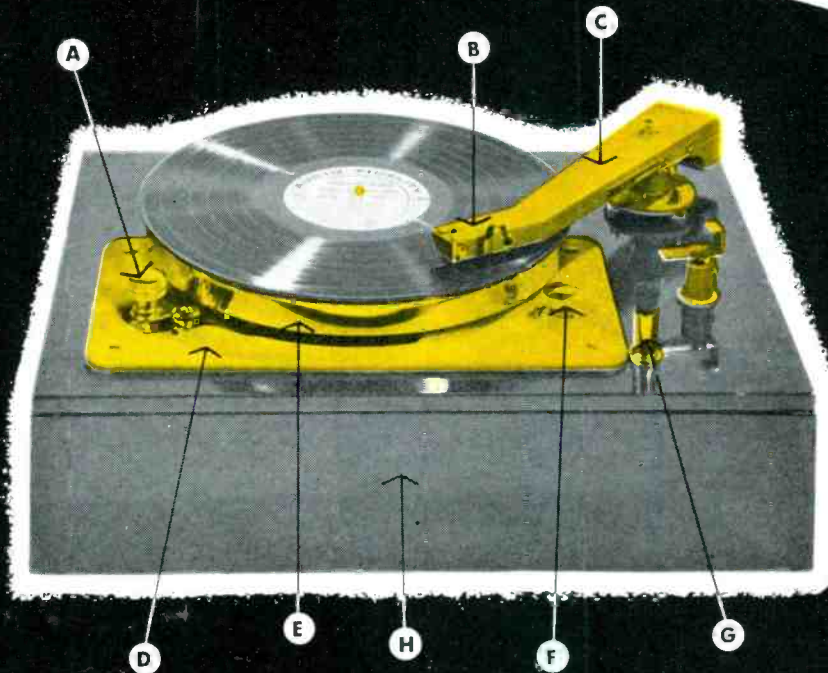
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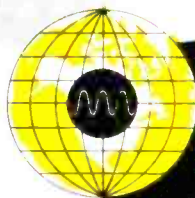
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# LETTERS

## Stereo Cartridges

SIR:

Reference your review of General Electric Stereo Cartridges in the December issue. We feel we may be able to add further useful information for your readers on the subject of hum in stereo systems, as the result of our tests with G-E and other popular magnetic cartridges in a number of different record changers.

As the review mentioned, hum does not seem to be much of a problem with most turntables. As for changers, our tests showed that hum pickup from changer motors is not serious in a good proportion of those tested.

In general, we found no problems with changers which have four-pole motors with a full four coils. At the other end of the scale, we found a high possibility of hum generation in a changer with a two-coil motor directly beneath the cartridge. One popular changer with a two-coil motor, however, produced very little hum. This motor has a heavy iron cross-section, and is located well away from the pickup. Its position, besides the fact that it appears to operate at a very low flux density, results in a very low radiated hum field.

Our tests showed the other major source of hum to be phono input wiring and grounds. To assist in correcting this, we recently published a 16-page booklet on cartridge connections and input wiring. The booklet is available without charge from our dealers or from our plant.

In summary, we feel that record-changer performance of our stereo cartridges should be highly satisfactory providing (1) the changer motor meets the design criteria as noted above, and (2) the cartridge connections and input wiring are made or changed according to our recommendations.

W. W. DEAN,  
Manager, Audio Components  
Engineering,  
General Electric Company,  
West Genesee Street,  
Auburn, N. Y.

## Large Box or Small Box

SIR:

Messrs. Williams and Noval, in accepting my invitation to explain their statement about unvented speaker enclosures—"A large box always allows more and cleaner bass than does a small box"—have, I am afraid, missed my point.

The substance of their answer is that the statement referred to only applies when the same speaker is used in both the small and large boxes being compared. This may seem at first to be a reasonable limiting condition, until one realizes that there are speaker mechanisms specifically designed for a small box and entirely unsuitable for a large one.

When the first AR-1 acoustic suspension speaker system was introduced, the final resonant frequency of the mounted woofer (43 cps) was, to my knowledge, at least as low as any closed box system available commercially, and lower than the free-air resonance of many, if not most, speaker mechanisms. I believe that this is still true today.

Thus Messrs. Williams and Novak, in not accepting my assumption of the same final resonant frequency in small-box and large-box systems (an assumption which implies the use of different woofer mechanisms), invite the reader to compare small-

box bass performance, not with existing large-box systems, but with a non-existent system comprising a "high-compliance" speaker in a large box. Yet the high-compliance speaker mechanism, in its current subsonic-resonance form, owes its design to predicated use in a small box.

The letter shows a graph in which the mounted resonant frequency of a speaker system is reduced by more than an octave, and performance presumably improved, by substituting a large box for a small one. This is a perfectly valid analysis for a speaker with conventional suspensions. On the other hand, an AR-1 woofer mechanism, mounted in a box so large as to allow a final resonant frequency of 20 cps, would provide inferior performance through increased bass distortion and/or severely limited power handling ability. This is due to the fact that voice-coil excursions, for constant electrical input, would continue to increase (by a factor of four for each lower octave) below 43 cps. The original resonant point acts as a protective device, by limiting excursion at lower frequencies.

The AR-1 has a voice coil half an inch longer than the gap, allowing a half inch of excursion without changing the amount of copper immersed in the gap. This is an unusually conservative design; speakers with less voice-coil overhang relative to their cone area should not be used at as low a resonant frequency if they are to handle equivalent bass power as direct radiators. When the speaker suspensions are themselves stiff enough to provide a resonant frequency high enough for the necessary protection against over-large bass excursions, of course, the larger the box the better.

In short, a direct-radiator speaker system has an optimum resonant frequency (a point explained in my patent<sup>1</sup> on the acoustic suspension system), and the designer is free to determine what proportion of mechanical and acoustical elements he will employ to achieve this resonant frequency. Box size, in relation to the particular speaker used, merely indicates what part of the elastic restraint is mechanical and what part acoustic. In the acoustic suspension system acoustic stiffness is a substitute for, not an addition to, conventional mechanical suspension stiffness.

A brief comment on the remarks about speaker Q: The AR-1 has a Q, when driven by an amplifier with a high damping factor, of less than 1. (Beranek,<sup>2</sup> incidentally, suggests that the Q of a direct-radiator, for good transient response, should be less than 1.36).

I originally controlled the Q of the "granddaddy" of the AR-1 at will by a series of small holes in the cabinet. Although this is a perfectly valid design approach, I found the results with lower Q's unsatisfactory and I stopped up the holes with plastic wood.

EDGAR VILLCHUR,  
Acoustic Research, Inc.,  
24 Thorndike St.,  
Cambridge 41, Mass.

## Maybe it WAS True!

SIR:

The recent article by Mr. Mahknit describing the Steampax recorder is positive proof that American industry can meet

(Continued on page 10)

<sup>1</sup> U. S. Patent No. 2,775,309.

<sup>2</sup> "Acoustics," Leo L. Beranek. McGraw-Hill Book Co., 1954, p. 226.

# Easy-to-build



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 MODEL C-SP-1 (converts SP-1 to SP-2) **\$21.95**  
 Shpg. Wt. 5 lbs.

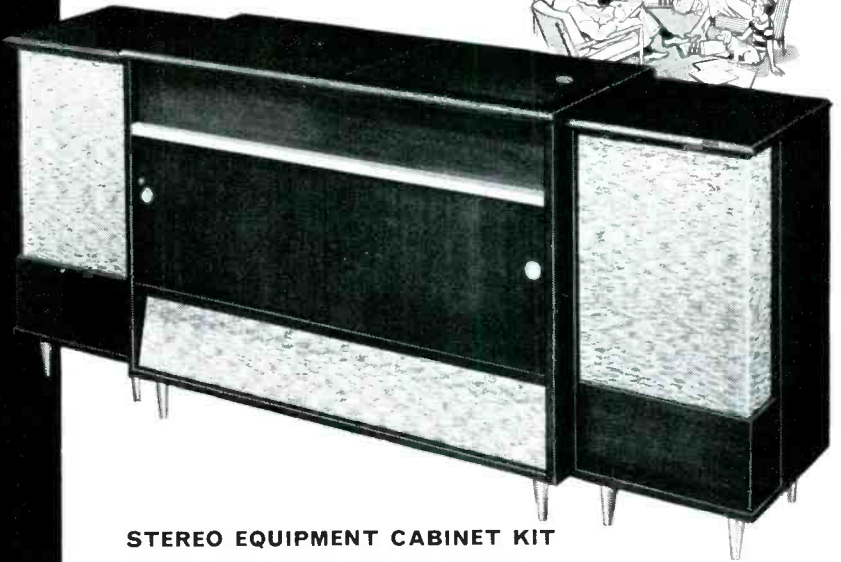
Special "building block" design allows you to purchase instrument in monaural version and add stereo or second channel later if desired. The SP-1 monaural preamplifier features six separate inputs with 4 input level controls. A function selector switch on the SP-2 provides two channel mixing. A 20' remote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



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

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Turntable quality with fully automatic features! A unique "turntable pause" allows record to fall gently into place while turntable is stopped. The tone arm engages the motionless record, and a friction clutch assures smooth start. Automatic speed selector plays mixed 33 1/3 and 45 RPM records regardless of sequence. Four speeds available: 16, 33 1/3, 45 and 78 RPM. Changer complete with GE-VR-11 cartridge with diamond LP and sapphire 78 stylus, changer base, stylus pressure gauge and 45 RPM spindle. Shpg. Wt. 19 lbs.

### "EXTRA PERFORMANCE" 55 WATT HI-FI AMPLIFIER KIT

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



MODEL W7-M **\$54.95**



**"BOOKSHELF" 12 WATT AMPLIFIER KIT**  
**MODEL EA-2 \$28<sup>95</sup>**

There are many reasons why this attractive amplifier is such a tremendous dollar value. You get rich, full range, high fidelity sound reproduction with low distortion and noise . . . plus "modern styling". The many features include full range frequency response 20 to 20,000 CPS  $\pm 1$  db with less than 1% distortion over this range at full 12 watt output—its own built-in preamplifier with provision for three separate inputs, mag phono, crystal phono, and tuner—RIAA equalization—separate bass and treble tone controls—special hum control and it's easy-to-build. Complete instructions and pictorial diagrams show where every part goes. Cabinet shell has smooth leather texture in black with inlaid gold design. Shpg. Wt. 15 lbs.

**"MASTER CONTROL" PREAMPLIFIER KIT**  
**MODEL WA-P2 \$19<sup>75</sup>**

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



**HIGH FIDELITY TAPE RECORDER KIT**  
**MODEL TR-1A \$99<sup>95</sup>**

Includes tape deck assembly, pre-amplifier and roll of tape.

The model TR-1A provides monaural record/playback with fast forward and rewind functions.  $7\frac{1}{2}$  and  $3\frac{3}{4}$  IPS tape speeds are selected by changing belt drive. Flutter and wow are held to less than 0.35%. Frequency response at  $7\frac{1}{2}$  IPS  $\pm 2.0$  db 50-10,000 CPS, at  $3\frac{3}{4}$  IPS  $\pm 2.0$  db 50-6,500 CPS. The model TE-1 record/playback tape preamplifier, supplied with the mechanical assembly, provides NARTB playback equalization. A two-position selector switch provides for mike or line input. Separate record and playback gain controls. Cathode follower output. Complete instructions provided for easy assembly. Signal-to-noise ratio is better than 45 db below normal recording level with less than 1% total harmonic distortion. (Tape mechanism not sold separately). Shpg. Wt. 24 lbs.



**MODEL TE-1 \$39<sup>95</sup>**  
 Shpg. Wt. 10 lbs. (Tape Preamplifier Only)



**HIGH FIDELITY AM TUNER KIT**  
**MODEL BC-1A \$26<sup>95</sup>**

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

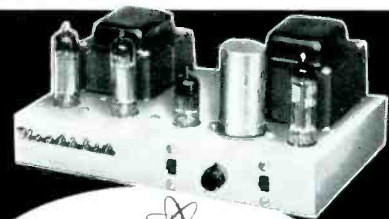


**HIGH FIDELITY FM TUNER KIT**  
**MODEL FM-3A \$26<sup>95</sup>**

For noise and static-free sound reception, this FM tuner is your least expensive source of high fidelity material. Efficient circuit design features stabilized oscillator circuit and broadband IF circuits for full fidelity with high sensitivity. All tunable components are prealigned before shipment. Edge-illuminated slide rule dial. Covers complete FM band from 88 to 108 mc. Shpg. Wt. 8 lbs.

**"UNIVERSAL" 12 WATT AMPLIFIER KIT**  
**MODEL UA-1 \$21<sup>95</sup>**

Ideal for stereo or monaural applications, this 12-watt power package features less than 2% total harmonic distortion throughout the entire audio range (20 to 20,000 CPS) at full 12-watt output. Use with preamplifier models WA-P2 or SP-1 & 2. Taps for 4, 8 and 16 ohm speakers. Shpg. Wt. 13 lbs.



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

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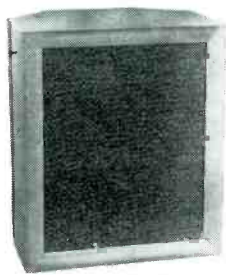
**DIAMOND STYLUS HI-FI  
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Replace your present pickup with the MF-1 and enjoy the fullest fidelity your library of LP's has to offer. Designed to Heath specifications to offer you one of the finest cartridges available today. Nominally flat response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

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

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



MODEL SS-1B  
\$99<sup>95</sup>



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

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

The modest cost of this basic speaker system makes it a spectacular buy for any hi-fi enthusiast. Uses an 8" mid-range woofer and a compression-type tweeter to cover the frequency range of 50 to 12,000 CPS. Crossover circuit is built in with balance control. Impedance is 16 ohms. Power rating 25 watts. Tweeter horn rotates so that the speaker may be used in either an upright or horizontal position. Cabinet is made of veneer-surfaced furniture-grade plywood suitable for light or dark finish. All wood parts are pre-cut and pre-drilled for easy assembly. Shpg. Wt. 26 lbs.



MODEL SS-2 \$39<sup>95</sup>  
Legs: No. 91-26 Shpg. Wt. 3 lb. \$4.95

**LEGATO HI-FI SPEAKER SYSTEM KIT**

MODEL HH-1 \$299<sup>95</sup>

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



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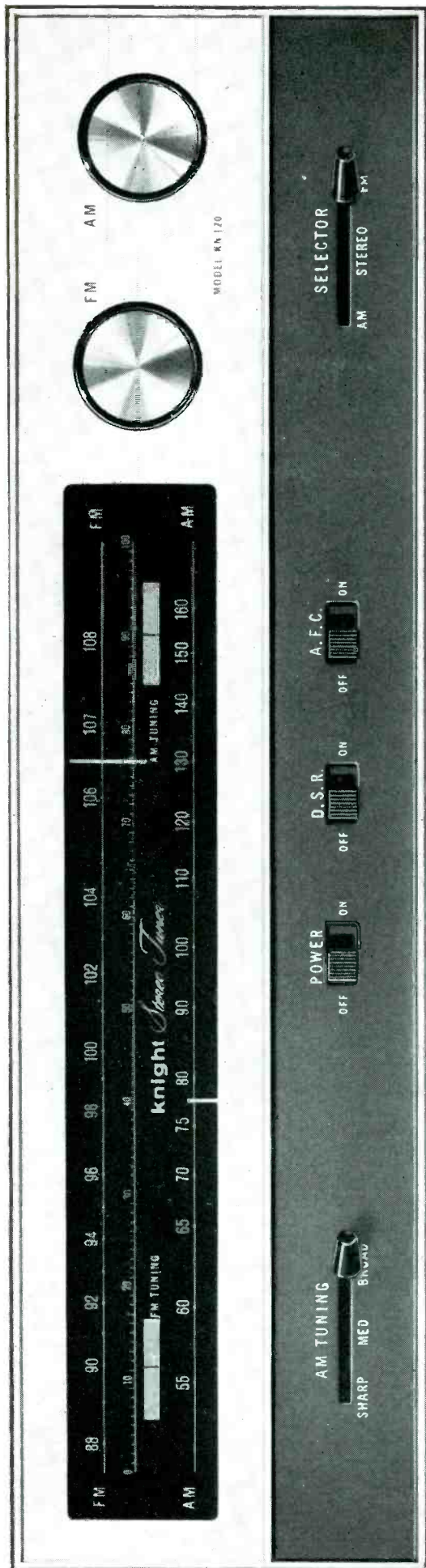
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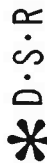


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## LETTERS

(from page 6)

the challenge and produce a badly needed device, with features beyond the wildest expectations. The article stirred much excitement among the members of our engineering staff. We wish to compliment Mr. Mahkmit and the Steampax Corporation on their revolutionary contribution to audio art.

We have acquired one of these machines and have been using it the past weeks with gratifying results. We have, however, incorporated a few changes to make the unit more efficient. The biggest improvement was that of changing the method of steam generation. We used a special generator utilizing photosynthesis as a means of subliming ice into steam without the addition of heat. (A rigorous mathematical treatment of this method appeared in the *Journal of the Hawk Run Chowder and Marching Society* in February, 1953.)

This is a very efficient system—41.65 ergs input delivers 43.9 db of usable output; this conforms to an efficiency of  $1.05 \times 10^3$  per cent. The unit is small, about the size of a sewing thimble, but quite heavy relative to its size. The weight arises through the necessity of making the combustion chamber from neutrons to withstand the tremendous pressures. This is the same generator as used on our Model BlaT-4 combination calliope and stern-wheeler steamboat.

The other changes made were small ones, such as utilization of an extra handle to make the apparatus completely portable, and the addition of a 1-farad capacitor across the original .0004-ohm resistor in the flyball governor feedback system to stop a slight tendency of the governor to oscillate.

We wish the Steampax Corporation success in their venture, because this is truly a great step forward in science.

WOLFGANG LUDWIG GLUCK, President  
Gluck Loudspeaker, Paddlewheel, and  
Calliope Company,  
Tuskatawny, Pennsylvania

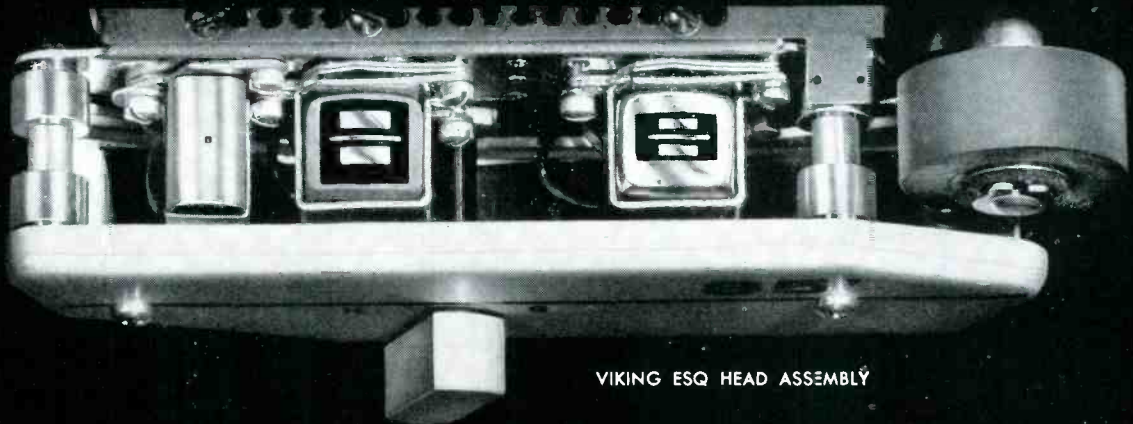
## Industry People...

**PEOPLE AND THINGS.** Herbert H. Borchardt, president of the Recoton Corporation, announces the resignation of Jack Karns as vice-president. Alfred Wish, formerly secretary, has been elected vice-president, and Hank Miller, midwest sales manager, has been elevated to national sales manager. . . . Stephanie Sass, formerly girl Friday to the late, beloved Adolph Gross, has joined Avnet Electronics Corp. as new products manager. . . . James Molr, who contributes with fair regularity to the pages of AUDIO, is the new technical director for Goodmans Industries—he assures us that his new position will do nothing to modify his rate of contribution to AUDIO.

Lawrence J. Epstein has resigned as director of sales and merchandising for University Loudspeakers, Inc., to accept the post of vice-president in charge of sales and promotion with United Audio Products, Inc. . . . Syd Wimple has resigned the presidency of Rockbar Corporation to organize S. Wimpie Associates, Inc., at Mamaroneck, N. Y. The firm will act as sales and engineering representatives for a group of manufacturers in the electronics field. . . . Stanley Neufeld, formerly jobber sales manager, for Rockbar Corporation, has been appointed vice-president in charge of sales for Brand Products, Inc. . . . The entire record and hi-fi industry was shocked to learn of the death on January 1 of well-known well-liked Neil F. Harrison, publisher of "Record and Sound Retailing."

# HALF TRACK? QUARTER TRACK?

## The Choice is Yours!



VIKING ESQ HEAD ASSEMBLY

We believe it is time for a factual statement on quarter track tapes and tape recording. As a novelty, and in keeping with the constant trend toward miniaturization, there is today a considerable interest in home recording of quarter track (four track) tapes.

The laminated quarter track heads used on Viking decks may be used interchangeably with the half track heads for recording, and will provide for proper bias and equalization at 3¾ ips tape speed. On special order, Viking will provide quarter track erase heads, permitting monaural and stereo erase and recording of four track tapes.

*However, the serious audio recordist will weigh these factors:*

*Quarter track heads provide a track width of only 43 mils as compared to eighty mils—equivalent to almost six db of absolute signal-to-noise ratio.\**

*Reduction of tape speed to 3¾ ips, instead of 7½ ips, does not result in again halving the maximum possible tape output, but does necessitate a shorter head gap to produce equivalent frequency response. Such a head is less suitable for recording applications.*

These are the reasons why you will find full-size, maximum-performance, half track heads on Viking recording models. Use the quarter track heads for the one thing they are designed to do best—playback of quarter track (or half track music tapes).

For your own serious music recording we recommend consistent use of the half track heads available on Viking recording decks, permitting maximum frequency response and dynamic range. Your added tape cost (for raw tape) is your best insurance of professional recording performance.

\*Based on residual system hum, tube noise, etc.

*Viking tape components are sold through high fidelity dealers exclusively. Further technical information may be obtained by writing directly to Viking's Customer Service Department.*



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# AUDIO *ETC.*

Edward Tatnall Canby

## MERCHANDISE

### Trio

I have been falling all over myself in respect to the Harman Kardon "Trio" stereo amplifier, one of the very first of its breed to reach the market and the first that I received myself, for home use. It seems as though it came to me years ago, but it was only last summer. I've been putting it to work off and on ever since, and my silence concerning it probably has H. and K. mildly baffled, if they had hoped for an early response from me. After all, I did ask to try the machine.

But, you see, last summer I did not yet realize (who did?) that early stereo disc playing was going to be so complicated—so tricky, indeed, that, as readers will remember, I found myself very soon floundering in a sea of confusions concerning those very factors by which we must judge good sound-in-the-round, matters like hum, distortion, rumble, etc. Sure, I can "judge" them, if you mean by that, judging their presence or absence! No problem there. The big trouble was figuring out where?

I simply did not have the nerve (in the usual and deliberate Canby absence of test instruments) to go around judging individual pieces of equipment (or even individual records) when such over-all doubts existed as to values here and values there.

To tell you the truth, I still am loath to speak out strongly pro or con any individual piece of stereo *matériel* and this for excellent reasons. Good stereo performance, as we now fully understand, depends on a working relationship and a practical balance between a whole series of factors, of components, from start to finish. A perfectly "good" stereo cartridge may be bad in effect, because its output, or its compliance, or what-have-you, is not "mated" to an associated stereo element—the record it plays, or the amplifier into which it feeds. Is it the record, the amplifier, or the cartridge that is "wrong"? Not easy to say. The important fact is that they are not mated.

We have had enormous troubles of the mis-matching sort this year and it is only as these problems begin to sort themselves out into a species of practical standardization that I so much as dare begin talking about individual stereo elements—such as the Harman Kardon "Trio." So I ask H. and K. for indulgence, the situation being what it is.

In any case, though my own early-production "Trio" is probably slightly obsolete by now, I hear favorable rumors concerning its current production. There are many other stereo amplifiers around now and, were I to seek a "representative" model at this moment, I'd find myself buried knee deep in stereo amplifiers all worthy of consideration. More power to

Harman Kardon, then, for having put out virtually the first of the inexpensive breed of dual stereo amplifier. That was why it interested me in the first place, 'way back.

I'll say merely that the "Trio" has facilities of control which when I first got hold of it were quite new to me, and now are almost standard in the industry, hardly needing any description. There is, of course, the joint volume control—about which I opined in advance last summer (I don't enjoy separate volume controls for my two stereo channels); there is the clearly necessary balance control, shifting the balance of power all the way from right-channel-only to left-channel-only, with anything in between you may wish (and you will, too); there is the now-standard function switch that provides stereo, reversed stereo (a useful and practical switch position, I insist—saving much time and patience in cases of accidental reversed wiring or reversed stereo tracks)—and the equally useful right-channel-only and left-channel-only positions, feeding both speakers, giving you a basis for comparative listening that you'll find worthwhile.

This last position on the "Trio", is useful for varying inputs, since the amplifier has a complete dual panel of inputs so that anything and everything may be fed into the machine in dual format. When only one radio input is used, for instance, it feeds into either the right or left channel input—take yr choice; the "right-only" or "left-only" switch on the front panel then feeds it out to *both* amplifier systems. Just switch the third knob, the one that selects between types of input, to the proper position—radio in this case. Same with tape recorder, etc.

Yep, it sounds complex, but it really isn't. Most newer stereo dual amplifiers have these same switching facilities. This was one of the earliest, and probably helped to set up the standard formats now becoming familiar to stereo users. I found, in sum, that there really wasn't much I couldn't do with these controls.

There were some things I didn't bother to try, though. Harman Kardon has some sort of dual output system that allows for stereo speakers A and speakers B, the second pair presumably somewhere upstairs in the front bedroom. I found, for myself, that one pair of stereo speakers at a time kept me very thoroughly busy and so I let speakers B go untried. A pair of extra switches and extra connections that, for my cash, could have been left off—but then I might not represent the Vast Majority of stereo buyers.

There is one other facility, however, that is potentially more useful (and is found, too, on other more recently introduced amplifiers)—the tandem teaming-up of the two channels to make a single 24-watt amplifier out of the pair of 12-watters. Just flip a switch. I had no immediate

need for this, though I tried it now and then out of curiosity, but those who are converting to stereo in calculated steps will find this feature temporarily very important. Use the amplifier first as a mono unit, 24-watt, with your single mono channel. When you're ready for a try at full stereo, with the rest of the necessary equipment on hand and in place, flip the switch and your single amp becomes two, of the same total output wattage.

Or if you have a 20-watt (more or less) single amplifier already in use, you can put the "Trio" to work as a second full-power channel, using the two power amplifiers again in tandem; the dual preamp can then serve for both channels. That's where the name "Trio" came in—three modes of operation.

I wouldn't want to offer much criticism of this pioneer amplifier on the basis of its earliest production, as of last summer, but I can safely observe a few points which possibly apply to current production of the model. As to maintenance of proper phasing between the two channels in all this complexity of switching, the less said the better! My current belief (I use the word deliberately) is that Harman Kardon are beyond reproach straight through from input to output, though for awhile I wasn't too sure. There's only one lack, as I see it; I'd like to see a speaker phasing switch somewhere on the chassis, preferably out in front and handy for quick change. It is still very much needed, to take care of the inevitable phasing inconsistencies that still continue to crop up in all aspects of stereo reproduction, straight from the original microphones down to inadvertently wrong speaker connections in the home. Also, I might add, for the very practical purpose of direct AB phasing comparisons. We all, every one of us, should learn to know what right and wrong phasing sounds like, in a hundred circumstances.

Take out that "Speakers A and B" business and put in a phasing switch instead, would be my idea. Maybe it has already been done.

I have one major observation concerning this amplifier that is important to mention because it surely applies to many another model in the inexpensive category, where production costs must be kept rigidly under control. That is the power transformer, which radiates a powerful amount of incipient hum, to an appalling distance.

I say "incipient" because, obviously, the hum that you don't pick up doesn't exist. This particular transformer, its particular location and the way it is used, are no doubt quite conventional in terms of familiar practice. In monophonic situations, as of the past, with single audio circuits, no complications of the ground loop category, with mono magnetic cartridges of high output, hum-bucking coils and no vertical signal output, this transformer would be just fine. No troubles to pile on troubles.

But in all too many stereo applications, it could end up as a liability, though not necessarily through its own fault. What if your stereo low-level circuitry is highly susceptible to hum? It shouldn't be, and Harman-Kardon can't be blamed if it is; but the hum is generated just the same and is unpleasant wherever the fault lies.

You should have heard the roar of hum I got when I moved the two well-shielded German pickup transformers in the ESL cartridge system near to this power transformer! Whose fault? Who knows? But the hum was there and it wasn't my fault, bless me. The same in other circumstances, notably in the case of various stereo pickups with total output noticeably lower than



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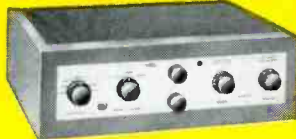
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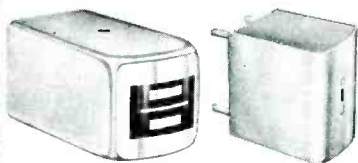
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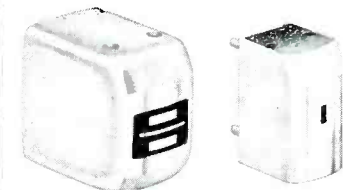


## TLD-L

The TLD-L is a quarter-track stereo record/playback head. Laminated pole construction, long life, 0.1 mil gap, and extended frequency response; 30-12,000 cps  $\pm$  2 db. at 3.75 ips. Flush-ground and polished face results in superior hum shielding and reduced oxide loading. Net \$21.60.

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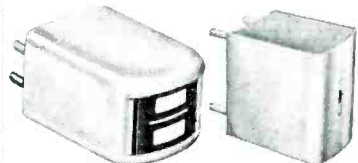


## TLD-M

The TLD-M quarter-track laminated record/playback head is designed for recorders using the new RCA tape cartridge. Electrical characteristics are identical to those of TLD-L head. Net \$21.60.

## SE-50M

The SE-50M quarter-track stacked stereo erase head serves as a companion to the TLD-M record head for cartridge machines. Net \$12.50.

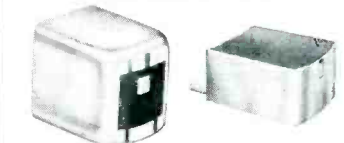


## TLD-S

The TLD-S is a high quality half-track stereo record/playback head for all half-track stereo applications. It is well shielded, has a high output, and is capable of a frequency response of 30-12,000 cps.  $\pm$  2 db. at 7.5 ips. Net \$19.50.

## SE-100

The SE-100 half-track stacked-stereo erase head may be used in conjunction with the TLD-S for stereo recording. Net \$12.50.



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The SLS is a half-track monaural record/playback head for all single head applications. It has high output, excellent frequency response, and is well shielded. Net \$8.10.

## ME-100

The ME-100 is a half-track monaural erase head. Net \$7.50.

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in earlier mono equivalents and/or without the useful hum-bucking coil arrangement of the mono magnetics. Also there's likely to be more trouble—adding up to more last straws on the consumer's back—with many a three-wire stereo system still in active stereo use.

As I say, let's not try to pin blame on any one aspect or unit. Just let's have a better match all around, improvements throughout stereo. Each improvement "improves" all the other components. By this time, my original "Trio" power transformer, without any change at all, is far less of a liability to me than it was at first, simply because other aspects of stereo (including such seemingly remote factors as recorded level on stereo discs) have been improved.

## M3D Dynetic

I was almost ready to give up the idea of comment on individual stereo cartridges, so tough is the problem of over-all system matching, in which the cartridge is only one element. But I have come to realize that in these first months of stereo disc the cartridge has been the really crucial element—even more than speaker or amplifier performance, or than stereo disc cutting. (Cutters, after all, cost in the thousands of dollars and are apt to be good.) The cartridge will remain the most crucial element in stereo sound until performance is a lot more standardized than it is yet. So, perforce, I think I'd better comment on cartridges as well as I can.

I'll say outright, first, that the most satisfactory cartridge I've used so far (and I have not tried a number reported to be excellent) is the Shure M3D Dynetic. First and foremost, that satisfaction is not so much because of its innate, ideal, ultimate quality as, very simply, its relatively high output. That's enough.

This baby had the biggest wallop of any cartridge I had tried up to the time I received it, and for that reason alone it instantly put every other cartridge I had on hand into the shade. It became my immediate favorite.

So simple! Just plug in this Shure, then turn down the volume control. With that easy motion, down goes virtually every major form of unpleasantness in the way of unwanted noise in my two so-so stereo systems. (Not rumble; that is unaffected.) Sounds silly here on paper, but you wouldn't snort if you could hear what this does for noisy stereo.

So, you see, stereo improvement is easy enough in practice. Don't throw out that sloppy amplifier, don't buy new transformers, don't get rid of your entire wiring system for something new. Just go out and buy a high-output stereo cartridge. My congratulations to Shure for the most utterly elemental improvement in the entire short history of stereo disc reproduction via magnetic cartridge! (And the same to anyone else who has done as much in any other cartridge, untried by me.)

Beyond the vital fact of effectively high output, the Shure is smooth and pliant in sound, almost fully equal to the very best mono magnetic sound I've heard. I say "almost" mainly to keep a safety factor in reserve, for future reference, but also because in this sound, clean and lovely on any mono record, I think I still detect a slight bit of break-down in the loudest recorded passage as compared to the very top sort of sound from the best (several) mono cartridges on the same record.

I put this dramatically to the test on the air a few weeks ago. I edited together three slices of mono Mozart, via tape, the first two played by top-level mono mag-

netics, the third by the Shure M3D stereo, the outputs paralleled. The difference was so minor that I did not even mention it on the air—nobody would have been able to hear it. I mention it here as a less-than-one-per-cent sort of perfectionism, for those with extremely analytical ears. I suspect it applies to other top-flight stereo cartridges too. But I would guess that within the year even this small difference will have vanished, via minute improvements.

Beyond this, I'll only say that the Shure stylus is sturdy as well as highly compliant, with the very desirable "square" compliance ratio between vertical and lateral (same in both), that stylus changing is extremely simple and the stylus very positive in the seating (like many nowadays, the stylus rides in a special insert holder), that the entire M3D unit is so very light in weight that your arm is likely to ride dizzily up in the air unless you redistribute the weight system (note that most early stereo cartridges were abnormally heavy) and, finally, that after several months of use not a shade of trouble has developed. 'Nuff said, except that an alternative model, somewhat sturdier and less compliant, is now offered primarily for stereo changer use—the M7D.

## Pickerings

I got two Pickerings though I asked for only one, and Pickering & Co. are about to experience a good pay-off for their gamble with me. You see, I had some reservations about that fancy Pickering arm-and-cartridge combo, the Unipoise, when I got the original mono version some time back, so decided I wouldn't suggest that the company send me the stereo version. I didn't, but they did. And I now am pleased to find that the Unipoise arm has been thoughtfully revamped for a heartening improvement in over-all performance, quite aside from stereo itself.

The biggest immediate difference is a tricky plastic insert in that deadly needle point, upward-aiming, upon which the arm "poises". You may think that the main purpose of this was to avoid serious bodily stabbings, when the arm slid off the point—which was often. That purpose is fulfilled, because now the needle point itself is afloat on its spindle and quite flexible. You'd have a time trying to hurt yourself with it. Impossible, I'd say, whereas before there really was quite a serious hazard involved for those of us who are habitually hasty in our movements, or have hasty children.

But a much sounder purpose was involved as well. The new "damped" point suspension seems to have removed my biggest objection to the old arm, namely that though it tracked beautifully in a solid situation, it jumped handfuls of grooves at the slightest bit of a vibration or inadvertent jar from the outside. Now, to my astonishment, I can tread the famed Canby loose floor boards at will and the Unipoise stays put in the grooves as well as the best of them.

I seem to note a more compact and sturdier look to the arm itself, but don't have the old one with me at the moment to compare shapes. Not important; the main point is that the Unipoise, still admittedly a precision arm and not to be handled with pick-and-shovel tactics, is now a more useful model that can take practical advantage of the undoubted theoretical value in the one-point suspension principle. Good.

The internal stereo cartridge element, I gather, is the same as in the standard Pickering stereo cartridge, which was for many months the lowest-priced quality

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magnetic on the books by a good many dollars. The price in itself makes Pickering a cartridge that everyone should investigate before jumping up the price ladder towards the top.

My judgment of the fine Pickering sound quality has been impeded, as usual, by those diabolical outside complications. The darned thing gives out with what has been more or less a standard level in the stereo cartridge field—but is still a lot too low for entirely too many so-so stereo installations.

I suggest that basically this is a criticism of the rest of the stereo system, which continues too often too sensitive to hum and the like for any low-level stereo cartridge, of any make or type. I suppose it is technically also the "fault" of the cartridge makers, who, however, may be quite rightly designing their cartridges for the ideally best in sound, assuming that the rest of the industry will design associated stereo equipment that is up to their standards. It should be, of course.

Well, darn it, it isn't—yet. And so here is a fine cartridge that may, or may not, be practical in *your* home system, depending entirely on the configurations of the rest of the stereo disc circuitry. Frankly, this cartridge has suffered along with others in my own all-too-typical early stereo systems. I suffer, too, but deliberately because I am mainly interested in what the current problems are likely to be for the customer—not on having the ultimate best for my privileged and lucky self. My systems are for the most part average and, so far, the Pickering has given gorgeous stereo sound, at the expense of too much indefensible hum. I'm using my Pickerings just the same, hum or no, for their clean, sharp sound (as clean as any I've yet heard) and I expect shortly to try them for a change in a top-drawer, humless system, just to have the full pleasure of them, unalloyed. It'll be great, I assure you.

I'm intrigued, by the way, at the manner in which Pickering (i.e., Walter Stanton, President) has adapted the well known "T" stylus insert system of the old mono Pickering to the needs of stereo. The "T" unit by its nature had very little vertical compliance and to my unimaginative mind seemed utterly un-convertible to stereo, which requires vertical movement. Well, it was converted and most effectively. The "T" insert still slips in horizontally in a jiffy but the point now moves up and down as well as sidewise. Engineering ingenuity did it, adapting a good practical design feature to tricky new technical requirements.

### Mystery Ceramic

I have several ceramics to report on, eventually, but I've been much too immersed in stereo listening, in magnetic stereo, to get time to try them out critically. Again, apologies for the delay, along with an observation that the ceramic stereo cartridge is inherently a pretty darned good idea, and a stereo "natural" more than the magnetic, to begin with. I suspect that ceramic sound should edge up a bit higher in the stereo ceramic-*vs.*-magnetic scale than it was able to in the older mono era. Keep an eye on ceramic stereo. No hum pickup, you know.

I have a fine mystery cartridge on hand that must be mentioned, though it is still untried—because it has no label on it, came in an unidentified box (from the vicinity of Cleveland) and I can't even identify it positively as either magnetic or ceramic, at this point. I've put it off, due to pressure of other commitments, but one of these days I'm going to have fun trying

to evaluate this interesting oddity, nameless and typeless. We'll try it as though it were a magnetic; we'll run it into ceramic inputs. We'll speculate too as to whether it might be a ceramic adjusted for magnetic preamp inputs—a likelihood, these days. Thanks to its carefully covered-up outer construction and its utter anonymity, we may never find out at all what it actually is. If it turns out to be my best cartridge to date, there'll really be a joke.

N.B. It's black, dull finish, streamlined, looks like a magnetic; I thought it was a Shure but it isn't—I guess. Who knows? Imagine being so modest as to forget to put your trade name on your cartridge! Like the jazz hi-fi record I reviewed a few years back (Good Time Jazz, wasn't it?) which had no titles and no performers indicated. Just hi-fi. What more do you want? They got so excited over the fi they forgot to put a label on the disc. (It was good, too.)

### Allied AM and FM

For these many years—back into the dim days before the war—I've been an admirer of the great Allied Radio Corporation out in Chicago and hail it, along with such others as Lafayette in New York, as practically the original promoter of the original home hi-fi. But to date I've never had an actual piece of Allied hi-fi equipment around for evaluation. (Used to get their stuff for my own uses 'way back yonder.) Now I have on hand an important sample of their latest product line, a typical AM-FM tuner out of the current crop, and I find it interesting both in itself and as a type, with a long historical series of earlier "Knight" units figuratively stretching out behind it in the mail-order area, mass produced, low priced, sold straight to ye customer without the old-time "middle-man."

Phew, what an old institution is this mail order business! I bought my first mail order merchandise from Montgomery Ward at the age of nine and I'm still at it—bought two complete bed outfits from Sears by mail (truck, to be exact) just last week.

Anyhow, this is a medium-fancy FM-AM "stereo" tuner from Allied, and it surely represents a solid current type of enlightened medium-price home hi-fi. The likes of it even come in kit form, in Allied's newly expanding kit division; but this Knight of mine is the ready-made version. Name of KN-120, and it goes for around \$130, which is cheap for the top of the line, two complete tuners on one chassis.

Now y'all know I don't think much of AM-FM stereo. My experience to date with the same, as tuned via this model, is about as usual. One lovely, clean stereo speaker, the other full of blats and swishes and sputters and fades, for a stereo blend that is mostly non-existent. This isn't Allied's fault, and anyhow, you can use these two tuners very neatly for many another purpose, AM-FM stereo quite aside. I've had a lot of fun with them.

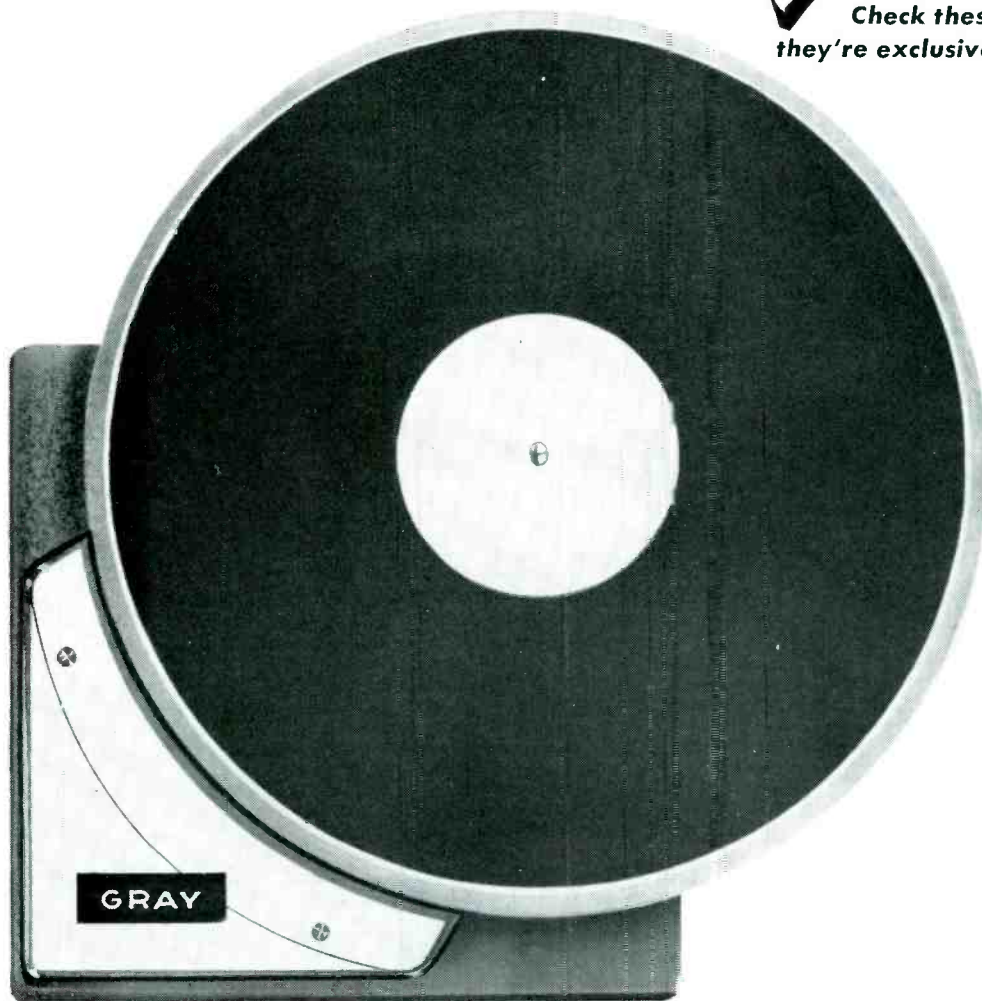
You see, two tuners is only part of the value. (And, of course, it is good to have two independent systems minus the compromise inherent in many AM-FM Siamese-twin tuners.) There's much value too in the intelligent control and connecting circuitry used in this model.

For instance, there are four outputs in the rear, which at first had me confused like crazy—and, indeed, there is a problem in terminology, considering that there's room for only one syllable under each output. You'll read AMP, TAPE, TAPE, AMP. And above, the first two are called OUTPUT and the other two FM. No mention of AM or

(Continued on page 82)

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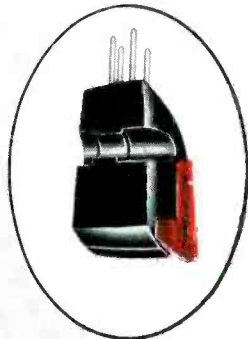
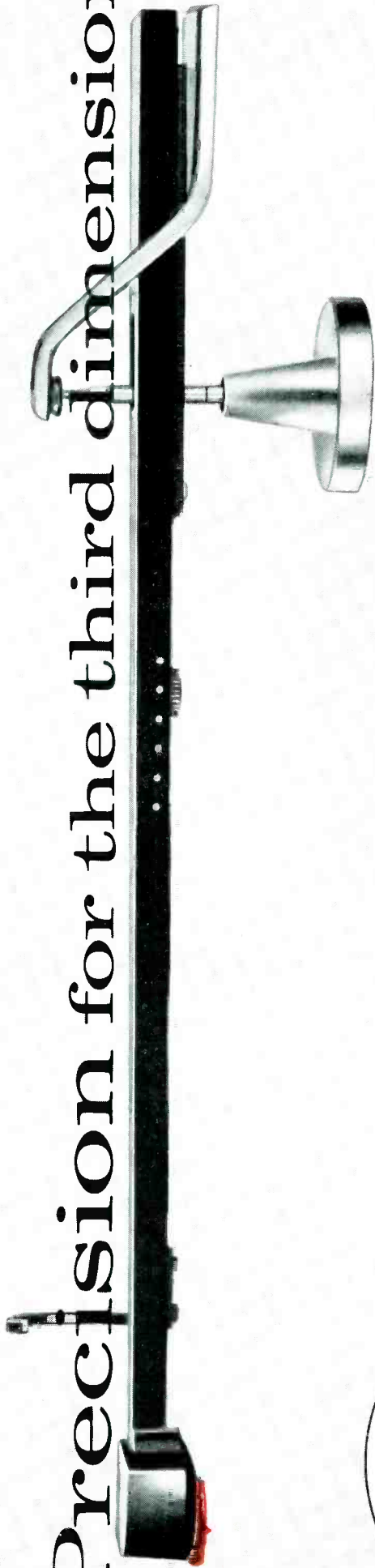
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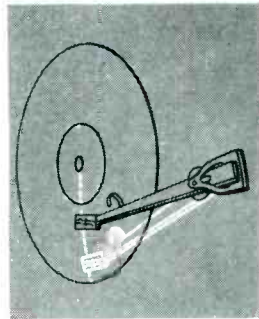
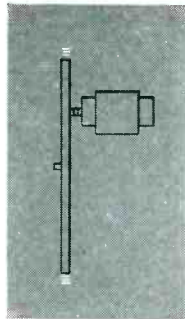


FLUXVALVE, T-GUARD, GYROPOISE, STEREO-TABLE, UNIPOISE ARE TRADEMARKS USED TO DENOTE THE QUALITY OF PICKERING & COMPANY INVENTIONS.

**T**RUE STEREO depends upon *accuracy* in three dimensions. Since the very first development of the phonograph, more than half century ago, only two *dimensions* were required in the mechanical system of a reproducer. Now, with the development of the *stereo record*, a *third dimension*, more meaningful and important, is not only required... *it is essential!*

**1** **The first dimension** In a record reproducing system is the linear movement of the record groove under the stylus in the cartridge... **accurately** related by a quality changer or turntable, such as the STANTON Gyropoise 800 Stereotable. Its **only** contribution to the system must be **precise** motion, **accurate** to within 2/1000 of the correct record speed... with absolute silence and freedom from vibration. Virtually, it must revolve on a **bearing of air!**

**2** **The second dimension** in a record reproducing system is the horizontal angle of the phonograph cartridge in relation to the record groove. **Horizontal Tracking Accuracy** is determined by the angle between the axis of the cartridge and a tangent to the record groove. **Any significant deviation in Horizontal Tracking Accuracy results in distortion and increased wear of record and stylus.** This deviation is called — **Horizontal Tracking Error.** While it is not possible to fully reduce **Horizontal Tracking Error** to zero... the offset angle of the STANTON UNIPOISE Arm reduces this error to a negligible factor.

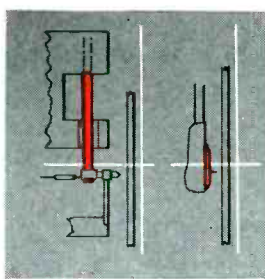


## 3

**The third dimension** in a record reproducing system... is the **dimension which makes stereo possible!** Since the stereo record also has **vertical information**, a new requirement — **Vertical Tracking Accuracy** has become **absolutely essential** to the performance of a stereo cartridge. In order to provide the proper relationship between recording and reproducing styli, the angle of correspondence between the two must be near 0 degrees. Any deviation in this angle of correspondence is called **Vertical Tracking Error.**

To avoid **Vertical Tracking Error** and accurately simulate the original recording process, the reproducing element in the pickup must be almost parallel to the record surface!

Only the Stereo-FLUXVALVE has the parallel reproducing element contained in the exclusive **"T-GUARD"** Stylus Assembly, a proprietary product of Pickering & Co. It assures proper correspondence between recording and playback styli with **maximum** Vertical Tracking Accuracy and **minimum** Vertical Tracking Error.



When a record master is made (top, right) the cutting stylus bar of most stereo recording heads is virtually parallel to the record surface. Ideally, to reproduce the vertical information in the stereo recording with full fidelity, the stylus bar of a stereo playback cartridge must be similarly parallel to the record surface, and at an angle corresponding to that of the cutting stylus bar. Only the STANTON Stereo-FLUXVALVE (bottom, right) has the parallel bar reproducing element contained in the **"T-GUARD"** Stylus Assembly to assure proper correspondence between the recording and playback styli. Actually, it is the vertical information which contributes the **added dimension** to high fidelity for true stereo. **Unless the stylus bar of a stereo cartridge is similarly parallel and at a corresponding angle to the cutting stylus bar... vertical tracking error will be introduced, generating a distortion of the same kind produced by horizontal tracking error!** The amount of this distortion increases with any increase in Vertical Tracking Error.

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*"For those who can hear the difference"* FINE QUALITY HIGH FIDELITY PRODUCTS BY  
**PICKERING & COMPANY, INC., Plainview, N. Y.**

NEWLY REVISED — IT TAKES TWO TO STEREO — ADDRESS DEPT. A-29 FOR YOUR FREE COPY.

# EDITOR'S REVIEW

## AUDIO FIDELITY WEEK IN NEW YORK

**A**LTHOUGH NOT OFFICIALLY proclaimed by New York's Mayor Wagner, January 12 to 18 will long live in our memory as Audio Fidelity Week. On the occasion of the opening of the Dukes of Dixieland, for a two-week engagement at The Roundtable, a plush night spot, Sidney Frey, president of Audio Fidelity, gave a cocktail party to the press and an assemblage of disc jockeys. What with celebrating, dining, and listening to the now famous Dukes alternating with a jazz combo headed by Peter Appleyard, the entire evening was somewhat of a success.

Barely recuperating from one such evening, we were catapulted into another two days later—a joint affair staged by Audio Fidelity and Stanley Warner Cinerama Corporation—on the occasion of AF's release of the record with the music of South Seas Cinerama covering its two shiny sides. This event



started with a showing of the picture, followed by a chartered bus ride to the Hawaiian Room of the Lexington Hotel for a midnight luau, and the almost inevitable trek over to The Roundtable to hear the Dukes again.

Not satisfied with that much entertainment, Sunday night brought an affair at the Friars Club, where boy genius Sidney Frey received a plaque which reads:

Mr. Stereo Award to Friar Sidney Frey as Music Man of the Year for his vision, enterprise, and ingenuity in creating the world's first commercial stereo record.

The plaque was presented by Harry Delf, Dean of the Friars, and pictured are he and Sid (right) at the time of the presentation. Following this,

Jack Barry took over as master of ceremonies and entertainment continued for several hours. Then—it being Sunday and The Roundtable being closed—the Dukes and several others migrated to Nick's in Greenwich Village to listen to more Dixieland music with considerable infiltration of the Dukes into the group already playing.

We remember being told many years ago that one could not burn the candle at both ends for a long time. Our reaction to this admonition has always been, however, that as long as you can keep it up you *do* get a much brighter light. Most of us Dixieland cats have enjoyed the Dukes for a long time now, and we are pleased to join in celebrations for them and for the man who brought them to us.

Sid has accumulated a number of other honors during the past year. Last August he became an Honorary Admiral of the Texas Navy, and just before Christmas, during a visit to New Orleans he became: Colonel-in-Staff of Governor Long, Honorary Citizen of New Orleans, Honorary Deputy Sheriff of the Parish of Jefferson, La., and an Honorary Member of the New Orleans Jazz Club, in addition to receiving the Mayor's Certificate of Merit. New Orleans is the home of the Dukes, and the renewed interest in Dixieland has reflected glory on their home town.

## LOUDSPEAKER TESTING COMMENTS

Reactions to our comments on this page in the December issue are grouped at two opposite ends of the scale—very few being describable as mild. By and large, industry was unanimous in agreeing with us—not about the fact that someone had engaged in tests, but rather that the methods and the conclusions drawn therefrom were, perhaps, unreal. Similarly, many of our regular readers who are not in the industry agree that *no* listening test by a given group of people is valid with respect to the likes or dislikes of any particular individual.

On the other hand, some readers disagreed with us most heartily. They base their opinions on the idea that what sounds good to a group of presumably well trained listeners should therefore sound good to everyone. One objection—and we must consider this one valid—is that not everyone is so situated that he can drop into an audio showroom and listen for himself and that furthermore—and here we have to agree also, though we deplore the fact—even when he can, the demonstration facilities are often not ideal, to say the least. To this objection, we might suggest a cure: tell your dealer you will buy a speaker in a specified price range, but that you must be satisfied with the quality; try to persuade him to let you try out a few in your own home with your own specific listening habits—one at a time if necessary—but that you will keep one of those you try out. Naturally the ones you select for a home trial would be those you liked best in the store, with only the final decision coming from a more leisurely listening. Some dealers might go for it, others might not. But for a *bona fide* sale, we think it would be good business. At least, there is no harm in asking, and then you would end up with a speaker you liked and were sure you liked it.

From Bell Telephone Laboratories . . .

# Brainpower

for the brawny

## Nike-Hercules

The Army's newest surface-to-air guided missile—the lethal Nike-Hercules—is now operational. Because it is, no unfriendly plane will be able to fly sufficiently high, fast or evasively to escape a fatal rendezvous with it.

For Hercules has a “brain” — an intellect that makes it a prodigy among today's electronic robots. Bell Telephone Laboratories developed it. Western Electric (prime contractor for the entire missile system) is producing it. Douglas Aircraft Company is giving it its body.

This “brain” is a fully integrated guidance system, almost entirely land-based. Only the vital signal-receiving apparatus is expendable within the missile itself. Other highly practical features: it defies “jamming,” is completely mobile, is designed in separate “building block” units which are replaceable in seconds—and is deadly accurate.

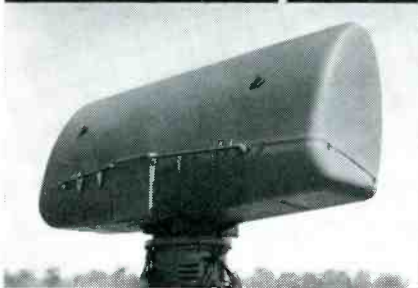
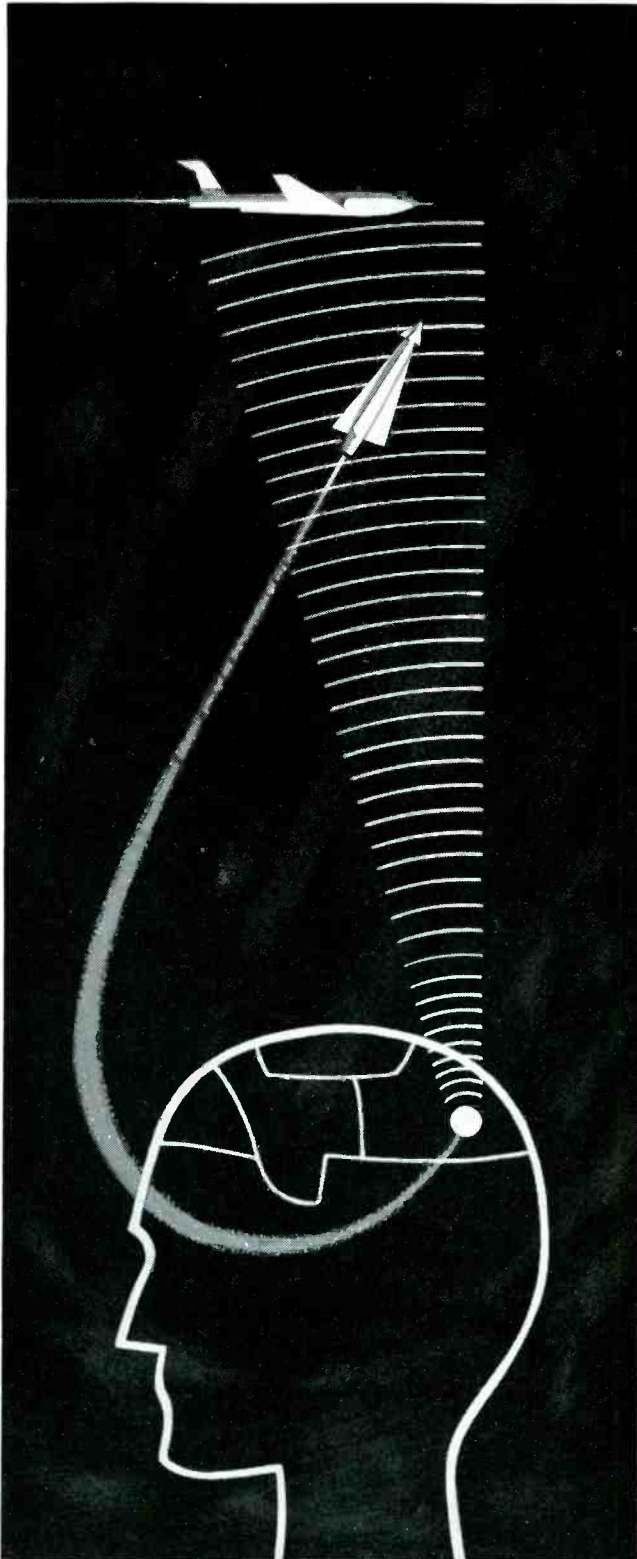
Bell Labs scientists and engineers designed the world's largest and most intricate telephone communications network for the Bell System. They developed about half of the Armed Forces' radar equipment during World War II. And they pioneered the nation's *first* successful air defense guided missile system—Nike-Ajax.

They were eminently qualified to give Hercules the brainpower it needed.



**BELL TELEPHONE LABORATORIES**

World center of communications research and development



Vigilant acquisition radar for Nike-Hercules first detects approach of distant aircraft, pinpoints its location and instantly signals to battery control.



Two tracking-radar antennas, housed in radomes, take over. One feeds target azimuth, elevation, range data to computers; other tracks Hercules.



Two sets of radar data are electronically computed and plotted. Hercules is “steered” by radio signals, then detonated at precise point of interception.



# Realistic Bass Without "Boom"

BRUNO STAFFEN\*

The search for adequate bass has long occupied the interest of audiofans. One solution which appears to have considerable merit is presented by this author, and should be quite simple to try out.

**T**HIS REPORT on a design and construction project is intended for the audio-knowing music listener who has a tonal-range-balance memory. He has a reproducer system with all currently known elements potentially able to create live-sound illusion, and a latent interest in a possible important refinement. The purpose of this refinement is to obtain a truly noble bass sound without need for ear-splitting volume and, most important, without coloring the lower ranges of other instruments or voices. The power-handling capabilities and efficiency will allow him, if he must, to rattle windows.

Because we were concerned, in this project, with faithful tonal-range-hearing impression only, the work was done on a monophonic system. At the present state of the art, the performance of this system is at the best levels obtainable. We were after a result that did not depend on such critical elements as interaction and room effects. We also were after a result that could be duplicated by others. The "we" are George Sellers of Altadena, California, and the writer. After much theoretical discussion of possible approaches, Mr. Sellers decided to underwrite the construction and cost of the elements needed, with the writer supplying technical guidance.

Have you had the experience of standing within a few feet of an open door

\* 377 W. Inverness Dr., Pasadena 3, California.

and being absolutely sure you were hearing a person talking and upon entering the room, found it to be a sound reproduction? If so, you've heard a truly superb reproducer, capable of faithful sound by the most critical standards. During my seventeen years of association with the engineering department of a loudspeaker manufacturing company, which maintains highest acoustic research and development standards and is generous with equipment and facilities, I've heard only a few. This includes all kinds and makes. If your instrument can be adjusted to obtain this kind of absolute realism, your pride is justifiable.

Now, leave all settings undisturbed and try the second part of the test. Play a recording with a representative group of music instruments. Does the bass sound have the permeating vitality and impact like the last live performance you've heard? In these tests we are not using loudness extremes where ear audibility curves make enough of a difference to account for what is heard. Rather than confuse the issue with technicalities of recordings, levels, and microphones, I submit to you that at a given loudness range, as done in this test, our ears do not juggle tone controls with different live sound material content. If your sound has the impact of live bass with the above test, this article has nothing to offer. If not, I'm about to describe preliminary thinking and completion of a recent electro-acoustic project which

gave highly satisfactory subjective results that you can surely duplicate.

## The Problem

First, let me outline the problem so you can follow what we are trying to do. Many of us, with at least vestigial tonal-balance memory, upon return home after a live music performance, have thoughtfully twiddled with the bass lift knob on the music reproducer. We also wondered about getting the family or rooming-mate to hold still for a bigger corner horn. Having experienced this live chest-thumping bass, we twiddle the knobs in the hope that through electronic-circuits magic the same effect can be simulated at home. When the low bass begins to balance up about right, we become aware of a secondary(?) problem. Now, some of the instruments have acquired a changed tonal personality. The piano sounds "different." A viola becomes a hybrid cello. Instruments in what could be called alto or contralto range have acquired a baritone coloring. Let us assume our hero has returned home after an inspiring performance of the "Messiah." He's heard a choral group with perhaps a 30 or so instrument orchestra. The organ pedal plus perhaps two or three bass viols made a noble ground for the rest. With the reproducer, by the time he has electronically lifted his bass to approximate the impact heard at the hall, the human voices no longer

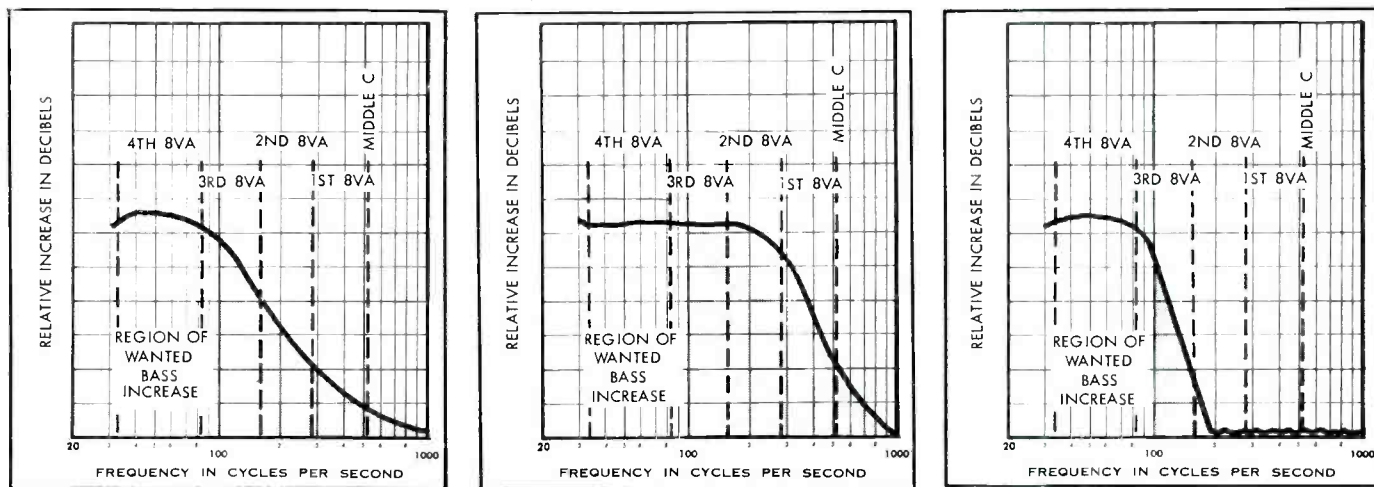


Fig. 1 (left) Typical electronic bass-lift curve. Fig. 2. (center) Acoustic output of typical enclosure-speaker with electrical bass lift of Fig. 1. Fig. 3 (right) Acoustic output of combined system. Main system adjusted for minimum coloration and bass lift provided by auxiliary amplifier and speaker. Shaded areas show increase which adds unwanted coloration.

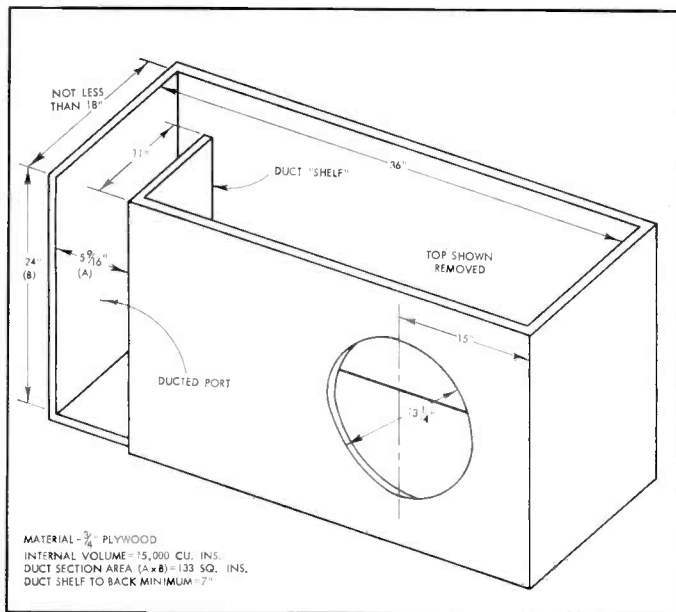


Fig. 4. Suggested arrangement of bass speaker. See text for general description.

sound clear and crisp. What happens? To explain what happens, I must resort to technical language and some illustrative charts. With a minimum of specialized jargon and gobbledegook, the intelligent audio hobbyist will understand. The sophisticate is asked to be tolerant.

Electronic lift and cut controls do not affect just a restricted tone range of the spectrum. They're designed to give a maximum effect over a specified tone range; but in operation, they also affect adjacent tonal ranges. This adjacent range influence gradually diminishes to zero about 3 or 4 octaves away from the range of prime interest. All commercially available preamps have this typical variable control behavior. See Fig. 1.

Based on the previously mentioned years of electro-acoustic work, the writer has found that the tonal range needing acoustic output increase to obtain live bass impact corresponds roughly to the 3rd and 4th octaves below middle C. In practicable scientific numbers this is 35 to 100 cps. When the electronic-circuit "boost" in this range is enough to get the desirable hearing impact, because of the adjacent-range increase inevitable with these circuits, the first and second octaves below middle C have also been appreciably "boosted."

It is this first-, second-, and some of the third-octave range boosting that imparts the "barrel" qualities to human voices and adds unnatural coloration or "formant" to various other instruments. In scientific numbers again, this unwanted increase is had over a range of 120 to 400 cps. Now the chart showing the electronic lift obtained applies to electrical signal only. Acoustically, if the speaker system has an ideally linear response over this range, the increase as shown on the chart applies closely. But the acoustic output of almost all enclosure-speaker combinations is stronger over this 120 to 400 cps range than the

adjacent octaves above and below. A few really carefully designed systems for "Laboratory Reference" use and some theatre systems are smooth through this range. So you can appreciate that enclosure speaker systems of less than top-level performance aggravate the coloration problem with electronic bass lift. For what this means in terms of acoustic output see Fig. 2.

We can't rebuild our loudspeakers, so what we need is an electronic method way to adjust or compensate the 120- to 400-cps range for no coloration of sound and increase the acoustic output below 100 cps to where the low-bass impact is satisfactory. To obtain a big bass sound, the air around a listener has to be shaken vigorously. With the main system low-frequency electrical signal adjusted for least coloration, the bass speaker can put out just so much acoustic energy. So the idea becomes to have it operate thus and use an auxiliary bass reproducer and amplifier in addition to the original system. We can now obtain a bigger total "bite" on the air to impart a larger movement to the acoustic wavefront for chest thumping impact.

The bass auxiliary is to have negligible contribution above 120 cps, so the auxiliary amplifier is "custom" modified to minimize its electrical output at all frequencies above 100 cps. It now drives the

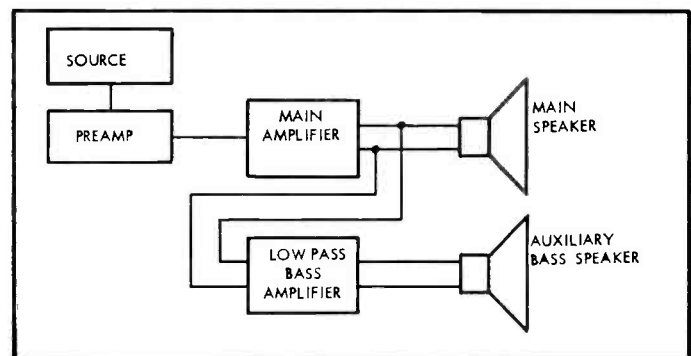
bass speaker at low-bass tones only, so the low-bass reproducer can add any amount of acoustic energy in the 35- to 100-cps range on top of and in phase with the original low-frequency speaker. Since the auxiliary system contribution is negligible above 120-cps, it introduces no coloration effects on instruments being reproduced by the electronically compensated main system.

These are the elements we used. For the auxiliary bass amplifier, a Heath UA1 with a simple non-destructive modification for low pass response. A Jensen P15LL large-magnet speaker was mounted in a solidly built ducted-port enclosure of 15,500 cubic inches volume designed to be resonant at 45-cps. The combination puts out a good 35-cps fundamental tone.

### The Low-Bass Speaker

This is not going to be a detailed constructional article on the speaker enclosure. I propose to point out the important particulars in internal dimensions and arrangement and allow you to adapt the design to your particular case and styling wants. The prototype enclosure was styled and built to harmonize with the rest of the furnishings in this friend's particular house. The basic enclosure illustrated in Fig. 4 gives a set of dimensions to use as a point of departure. You can juggle the given internal shape to suit your furniture design, but maintain the 15,500 cubic-inch volume, and the duct cross section area as shown. Where a firm dimension is shown, do not change it at the risk of being unhappy with the results and having to discard costly wood panels. Firm dimensions are 11-in. for duct length and a 7-in. minimum dimension for the space between the enclosure back and duct shelf. If you change the proportions suggested, the duct or tunnel spacing must be changed to keep the cross-section area at the specified 133 square inches. Yes, it's not small, but we're after real bass and not a quasi-bass. A former colleague summed it up perfectly when he asked a speaker-size critic, "Did you ever see a small bass drum?" All the classic construction requirements apply. These are described in all thorough enclosure articles and include rigid panels,

Fig. 5. Block diagram of connections between main system and bass-lift auxiliary system.



tightly sealed joints, and judicious use of bracing to reduce vibration modes.

For grille cloth or covering over the auxiliary speaker openings, the usual factors do not apply. Hi-Fi grille coverings usually are chosen to have minimum effect on extreme high frequencies. But we want a maximum effect even though there might be only vestigial amounts present. At last, decorative considerations can have precedence over acoustic effects. But it is especially important that the movement of air at the ducted reflex port not be constricted. We still want to impart a really good shake. But blocking or absorbing "highs" is no factor here. The prototype has wood "shutters" which are tilted, as shown in *Fig. 5*. They would roughen up high-frequency response but offer no air flow resistance for bass.

Any amplifier with 10 to 15 watts undistorted output at 30 cps will work fine. The Heath UA1 was chosen because of simplicity and low cost with entirely adequate performance. Since all it has to do is to drive the auxiliary enclosure-speaker at 100-cps and below, the input signal can be picked off the main amplifier after a voltage amplifier tube, or connected to the speaker terminals of the original amplifier. If you're one of our sophisticates, I won't presume to tell you how to obtain the low-pass response needed. For the rest of us who have no engineering background, a simple modification which is entirely adequate will be described. We will install a capacitor in the amplifier at a point where it will combine electrically with the original UA1 design to shunt out frequencies above 100-cps. From about 90-cps going up in frequency, the amplifier output will gradually drop at 6 decibels per octave. This means that each time the frequency is doubled, the output voltage drops 50 per cent. When we reach the frequency of one octave above middle C (523 cps) the output is only one hundredth that of the wanted fourth octave below. So the combined system can be adjusted to give an acoustic balance like that shown in the curve of *Fig. 3*.

The capacitor used is a 0.22- $\mu$ f 400-volt paper unit. On the UA1 amplifier, it connects from pin #6 of  $V_1$  (6AN8) to any convenient ground. We used a grounding lug on the filter-capacitor mounting wafer. Because of crowded wires it would be desirable to use thin "spaghetti" insulating tubing on the added capacitor leads to eliminate possible unwanted shorting. To restore your amplifier to original wide-range operation, merely cut out the 0.22- $\mu$ f added capacitor. A simple SPST switch could be installed to make the change painless.

#### Auxiliary Amplifier Connection

Input to the auxiliary amplifier is simply taken from the 16-ohm terminals



*Fig. 6.* Complete bass-lift system enclosed in cabinet which does double duty as storage for tapes and discs.

of your present main amplifier, as shown in *Fig. 6*. The half-megohm auxiliary amplifier input will not even be noticed by the 16-ohm tap of your main amplifier. If your present amplifier has appreciable hum content, the auxiliary amplifier will boost this. If your added bass-speaker hum is troublesome, try two tests. First turn your preamp volume control to least loudness. If hum is still there, it is coming from somewhere after the preamp. Next disconnect the input terminal to the auxiliary amplifier. If it is gone, then your main amplifier needs attention. If not, then look into the auxiliary amplifier. The reason this hum subject is brought up is that we now have much electrical and acoustic power at lower bass frequencies. This is bound to magnify unwanted hum problems, but can be reduced to near vanishing levels. Unless your phono turntable is first rate, it too can become a rumble contributor. With this combined system, the peak power rating at low bass frequencies is your main amplifier power plus the auxiliary amplifier. The prototype uses a nominal 25-watt amplifier for the main system, which together with the 12 watts of the auxiliary equals 37 watts of low-bass electrical power. The two speakers used are both of high conversion efficiency so you can imagine the air shaking at low bass tones can be made quite fearsome!

Because there is no directivity problem with low bass tones source, the auxiliary speaker can be located anywhere in the room relative to the more critical main speaker system. The ideal position

is, of course, in a corner. In fact if there is a normally open doorway or archway into an adjoining room, use the adjoining room for the auxiliary speaker enclosure. Run just the speaker connecting wires and keep the modified amplifier at the master control or equipment place. For this enclosure one thing is important. Weight the enclosure or wedge it some way to prevent "dancing" at low frequencies. Remember, we want it to shake air rather than itself!

Before "buttoning up" the installation, check the acoustic phasing of the combined system. At your favorite listening area, make sure the combined bass outputs add instead of cancel.

To check the phasing of acoustic energy, have an assistant hold the auxiliary speaker wires on the auxiliary amplifier output terminals. There will be an absolute maximum of about 15 volts at these terminals, so the shock hazard is slight. With bass tone input of say 50-cps or music content, listen in your favorite listening area. At your signal, the assistant is to do a quick wires reversal while you listen for change in bass level. Use the connection "polarity" which gives the best bass.

To balance the system, set the preamp controls to give you the sound with least colorations from the main speaker system. Then turn up the gain on the auxiliary amplifier to obtain the bass fill-in you want. Now the preamp controls will give you over-all loudness control and will allow trim-up on response balance. You're ready to start enjoyment of your

(Continued on page 86)

# Converting the Revere or Wollensak Recorders to Stereo

JOSEPH F. DUNDOVIC\*

This simple conversion makes it possible to perform both stereo and monophonic recording and playback using the new quarter-track system. Similar conversion techniques can be used on many other machines.

**T**HE FIELD OF TAPE RECORDING has been marked by numerous advances. From the original wire recorders it has progressed to full-track tape, then to half-track monophonic, staggered stereo, and about two years ago to "in-line" stereo. Recently a new step has been taken which is just as revolutionary. The quarter-track "four-channel" system was introduced, which permits stereo tapes to be played in both directions.

Four tracks are recorded on the tape, two being used for one direction of travel, and two for the other direction. See Fig. 2 for track dimensions and spacing. The quarter-track recording head still has two channels, but the track width is approximately half that of the old system. Alternate pairs of tracks are used at a time: 1 and 3, or 2 and 4. By turning over the reels (similar to playing the reverse side of record disc) the second pair of tracks may be selected. Some recorders possess two pickup heads and reverse the direction of tape travel to accomplish this selection.

In the RCA Victor system of quarter-track stereo, the tape is completely enclosed in a compact plastic case which

\* The Nortronics Company, Inc., 1015 S. Sixth St., Minneapolis 4, Minn.



Fig. 1. Stereo recording setup, with AM-FM stereo tuner and additional recording amplifier used with converted Wollensak tape recorder.

is easily slipped in and out of place on the recorder, a specially designed and constructed machine which is not compatible with standard reels. Reel type recorders also will not accept the RCA magazine. Most major recorder manufacturers have magazine-type machines in production.

Advanced techniques in the manufacture of heads and tapes have resulted in such improvement in the high-frequency response that 3.75 inches per second has been selected as the standard tape speed for the quarter-track stereo

system. The finer gaps (0.1 mil) and laminated-core construction of the quarter-track heads actually produce a frequency range out to 15,000 cps at the lower tape speed. Signal output from the new heads averages 2 millivolts at 1000 cps.

The combination of thinner tapes, half-speed, and the quarter-track system, permit the almost unbelievable amount of over four hours of stereo music on one 7-inch reel of tape. Needless to say, the price of stereo tapes has taken a tremendous drop, making

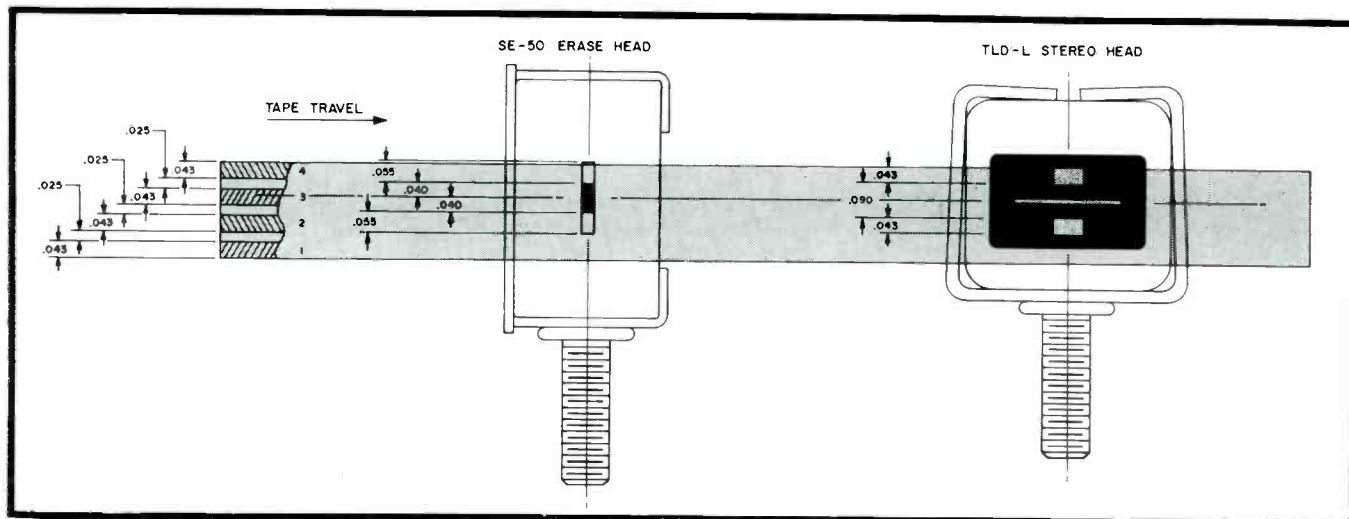


Fig. 2. Quarter-track system of track spacing in relation to the erase and the record/playback stereo heads.

them fully competitive with the stereo discs. Tapes also have the advantages of allowing repeated playings with no deterioration of quality.

Quarter-track stereo recorded tapes on reels are now available in plentiful supply through retail outlets. Magazines for the RCA machines are also on dealers' shelves. Owners of quarter-track players with reels can remove the tape from the magazines and rewind onto reels.

Thousands of owners of monophonic and two-track stereo tape machines are now faced with the problem of obsolescence. It is, of course, impractical to try to convert older tape recorders to accept the new magazines. However, it is a rather simple matter to install one of the new quarter-track stereo heads so that the reel-type tapes can be played. In fact, by the substitution of stereo

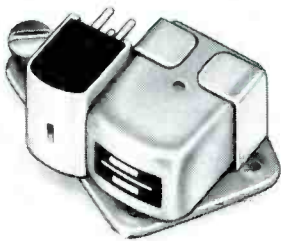


Fig. 3. Quarter-track erase and recording heads as mounted on supporting plate. The screw to the left of the erase head is used for azimuth adjustment.

erase and record heads, and the addition of a recording amplifier, stereo recordings may be made in the home directly from the radio, stereo discs, or live programs. The ability to record stereo is the tremendous advantage tape has over discs.

#### Conversion of Revere and Wollensak

This article will describe a representative conversion of the Revere and Wollensak recorders to stereo recording and playback. Similar techniques may be applied to other machines, some of which are easier to convert, and others more difficult.

Both the Revere and the Wollensak have a similar head nest construction. The monophonic machines use a combination record/erase head (Shure TR-5). This head is mounted on a brass base-plate which pivots on a pair of brass pins, and is held down by a spring clip.

The half-track (two-channel) stereo machines differ in that they use the Shure 1/2-track record/playback stereo head in combination with a separate single-channel erase head which erases the top track for monophonic recording. The same basic mounting plate is used in the stereo machine, which has a built-

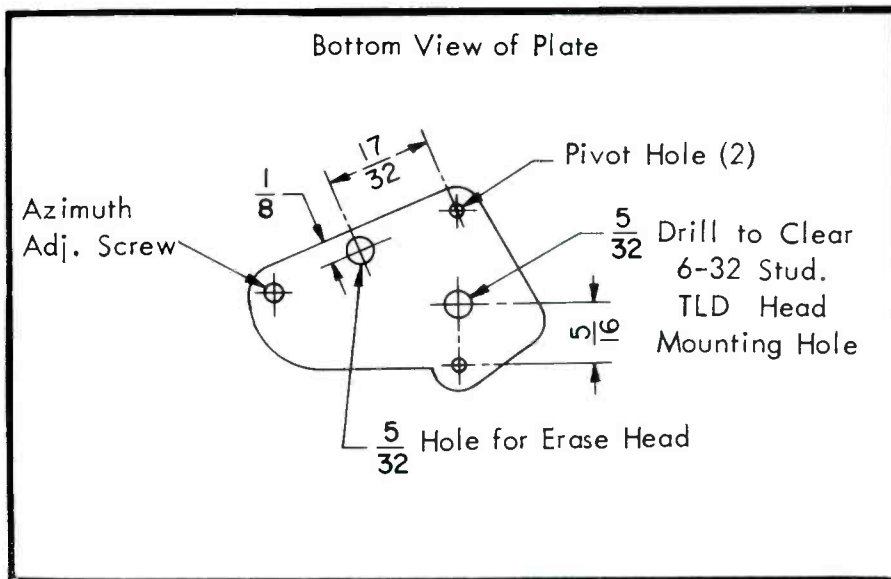


Fig. 4. Full-scale template for locating the new head mounting holes in the removable base plate.

in preamplifier for the second channel.

Fundamentally there are two steps in the conversion.

They are:

1. Conversion to 1/4-track stereo playback.
2. Conversion to 1/4-track stereo recording.

These two steps must be taken in the above order, but not necessarily at the same time. Stereo recording may be added at any later time after the playback function has been acquired.

A stereo erase head is recommended for step one since it is as easy to install as the monophonic erase head and the

progression to step 2, for stereo recording, is accomplished with a minimum of effort.

Figure 3 shows the new quarter-track erase head (left) and record head (right) mounted on the brass base plate from the recorder. The stacked erase head pictured is the Nortronics Model SE-50-WR. The record/playback head is also made by Nortronics and is the Model TLD-L1-WR, having laminated cores and a smooth, flush type face. These heads may be ordered through your local dealer at \$12.50 for the erase head and \$21.60 for the record head.

(Continued on page 68)

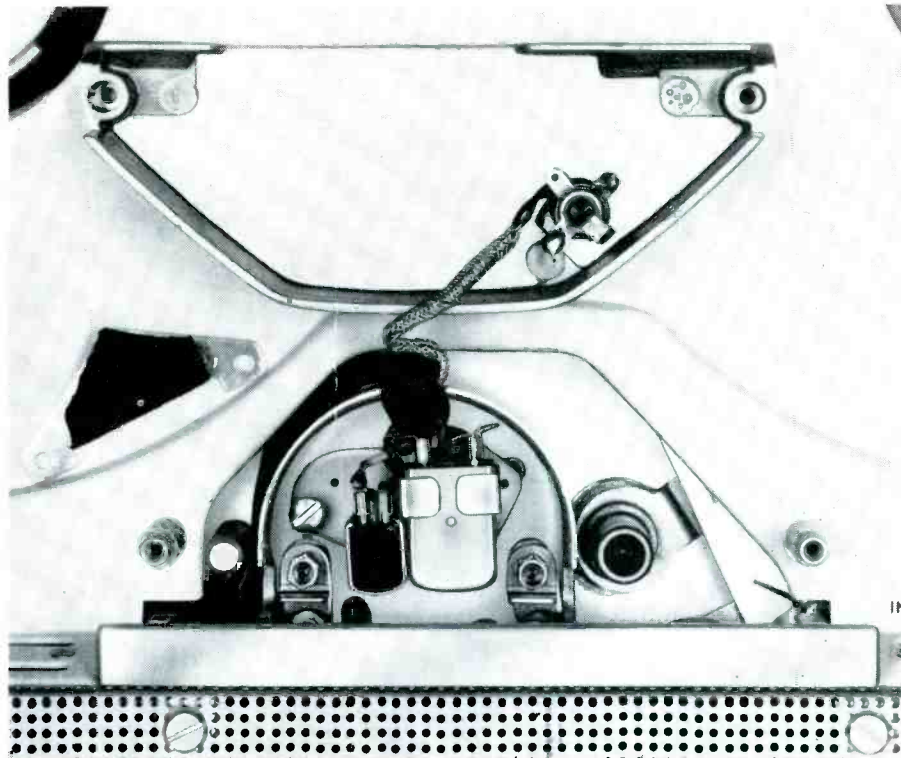


Fig. 5. View showing new head assembly mounted in place on Wollensak T-1500. Head cover piece is upside down, with miniature jack mounted. To left is spring clip with rubber pad cemented to underside.

# Sound Distribution at the Brussels Exhibition

A. V. J. MARTIN\*

Differing from most sound transmission systems, the distribution throughout the exposition area is accomplished by FM radio links, with separate receivers being employed at each loudspeaker outlet.

**A**N EVENT OF INTERNATIONAL IMPORTANCE, like the Brussels Exhibition, had to have a sound distribution system capable of creating a musical background of a quality which suited the high cultural achievement it intended to display. The problem was not easy, if only because of the variety of environments scattered over a distance largely exceeding one mile. After careful planning, it was decided that four simultaneous programs would be necessary. They could be broadcast either from a specially provided studio, or from several points on the Exhibition grounds, and could originate from microphones, records, magnetic tapes, radio programs, and telephone lines.

The total area was divided into several zones, each receiving a different program.

However, provision had to be made for instantaneous connection of all sound sources to a common program, so that announcements of a general interest or emergency messages could be heard everywhere.

\* 4916 Forbes St., Pittsburgh 13, Pa.

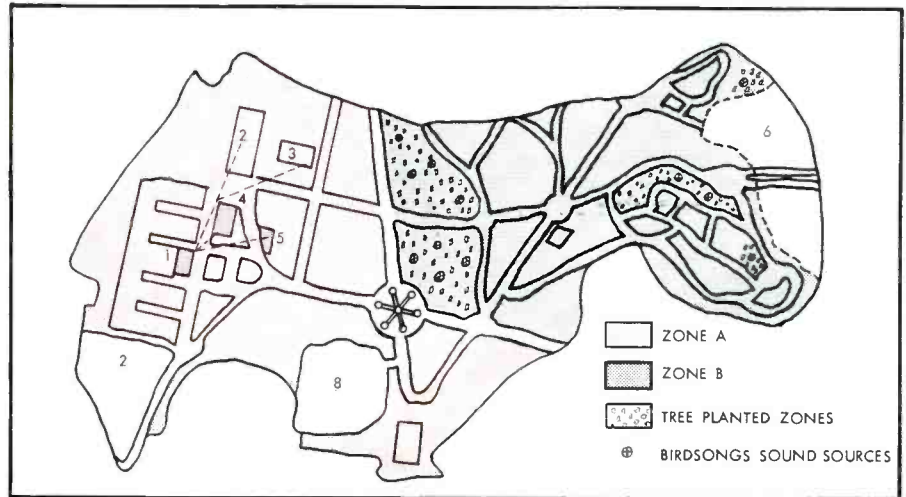


Fig. 1. Map of the Brussels Exhibition. 1: Central Control Room. 2: Great Square. 3: Garden. 4: Auditorium. 5: Elegance Pavilion. 6: Silent Zone. 7: Amusement Park, independent sound. 8: Joyous Belgium, independent sound.

This ambitious project met with a number of difficulties. It was soon apparent that the use of underground cables was impractical, and that a radio link was necessary. Then the high-quality requirement and immunity to

the numerous interferences pointed to the use of frequency modulation, and consequently to short wavelengths in the VHF range. When the specifications were finally frozen, less than one year was left to design, test, and install the system. The final design, due to SBR, uses five 250-watt FM transmitters, feeding some 450 sound sources, each



General view, showing the Atomium and the cable carriers.



Model of the MBL (Belgian tube manufacturer) pavilion.

made of one receiver and four loud-speakers. A few cable links have been provided over short distances, mainly to pipe to the control room signals received in two special pavilions nearby. *Figure 1* shows the different zones in the Exhibition. Roughly speaking, the left half receives program A, and the right half receives program B, with the exception of the wooded zones, where a special program of birdsongs is received. Also, at the extreme right, a silent zone 6 is provided, where peace-lovers can take refuge and relax.

The control room, in 1, is cable-linked to the four points 2, 3, 4, and 5, the last two being the Grand Auditorium and the Elegance Pavilion.

Zones 7 and 8 are respectively the Amusement Park and the Joyous Belgium Fair, and have an independent sound distribution.

### Transmitters

The rather stringent main specifications for the transmitters were

Pre-accentuation: 50  $\mu$ s.

Frequency stability: without modulation  $\pm 0.002$  per cent; with  $\pm 75$  kc/s modulation  $\pm 0.001$  per cent.

Frequency accuracy:  $\pm 0.0003$  per cent.

Temperature range: +15 to +35° C.

FM noise: better than 55 db below the full modulation level.

AM noise: better than 50 db below 100 per cent modulation level.

AF distortion: better than 2 per cent from 30 to 15,000 eps.

They have been largely met by the design shown in block form in *Fig. 2*. It uses the Marconi system, where the crystal-controlled oscillator is frequency modulated by a reactance tube.

The a.f. signal enters a cathode-follower, whose cathode load embodies the RC filter for pre-accentuation. Then there is a balanced modulator, to drive the reactance tube, shunt-connected across the oscillator.

The oscillator is controlled by a quartz crystal, which is part of a filter coupled to the plate circuit. Thanks to a special cut, the crystal can follow, between limits, the frequency variation due to the modulation, while at the same time controlling the central frequency of 4 mc approximately. Feedback to maintain the oscillation is provided by the grid winding coupled to the plate circuit. The grid is AGC-controlled to eliminate amplitude modulation.

The oscillator is followed by an r.f. amplifier, the output of which is rectified by a diode to provide the AGC voltage. Then come four frequency-multiplying stages, the last one symmetrical and doubling as a 5-watt driver for the final 250-watt push-pull output.

A variety of control instruments is included: a.f. test oscillator, frequency

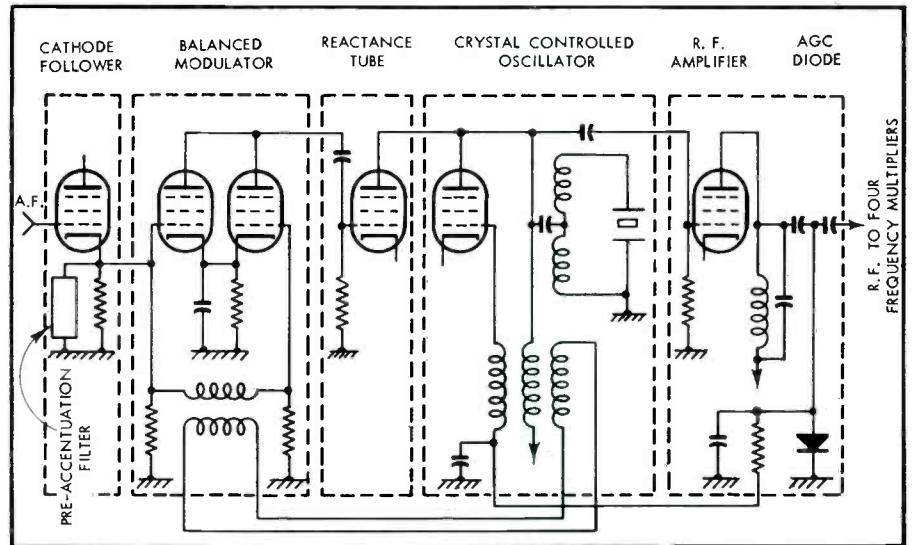


Fig. 2. Block diagram of the transmitters.

deviation indicator, calibrating quartz-controlled oscillator, and monitor.

Each transmitter is made up of four separate shielded units: modulator, frequency multipliers, output stage, power supplies. These units in turn are mounted in metallic closets with only the

grams have been received several hundred miles away.

The aerials are simple dipoles on the roof of the building.

A control bay receives all program inputs and distributes them to the various transmitters, at a standard level.

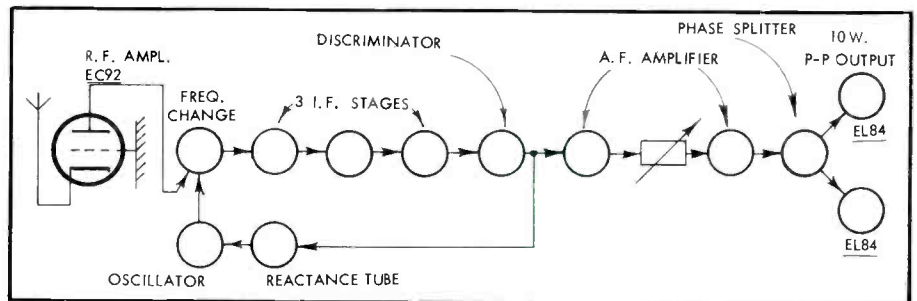


Fig. 3. Block diagram of the receivers.

necessary forced ventilation openings. Radiation is thus kept to a low level, less than 100  $\mu$ v/m in the building.

The chosen frequencies are 76.60, 76.95, 77.65, 78, and 78.35 mc outside band II to avoid interfering with the radio programs. Despite the limited frequency range the Exhibition pro-

Another bay insures monitoring both of the a.f. and the r.f. signals.

### Reception

The 450 or so receivers are all of the same type, represented in block form *Fig. 3*. The r.f. amplifier is a grounded grid EC92/6AB4, followed by a fre-

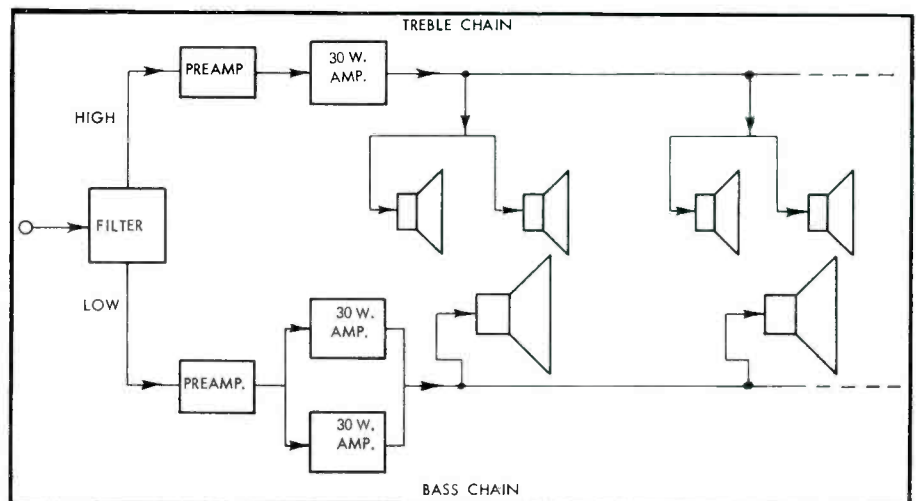
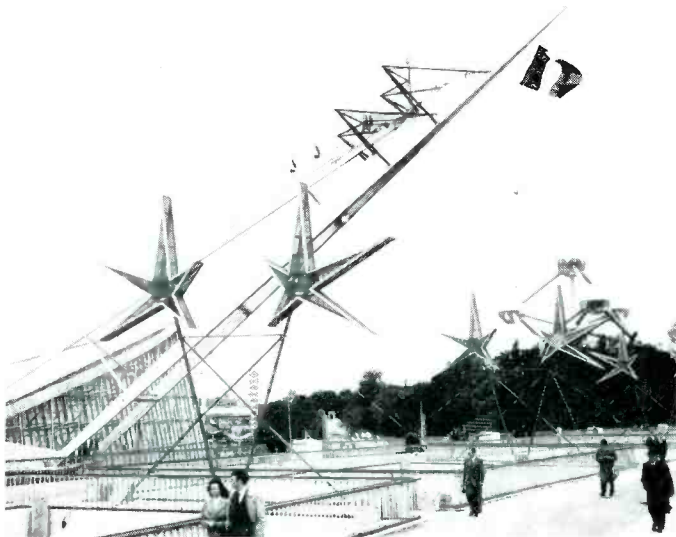


Fig. 4. Block diagram of the high fidelity system.



The French Pavilion. Notice the loudspeakers in the star-shaped objects and the microwave relays on the oblique beam.

quency changer and three i.f. amplifying-limiting stages. Then comes a discriminator, a first a.f. amplifier followed by an adjustable correcting filter, a second a.f. amplifier, a phase splitter, and a pair of EL84's in a 10-watt push-pull output stage. Each receiver can be tuned and locked on any of the five transmitted frequencies.

The design stems directly from the specifications. In particular, an output variation of no more than 3 db was indicated for a variation of input level of 10  $\mu\text{v}/\text{m}$  to 0.1  $\text{v}/\text{m}$ . This could only be met with two limiting stages. The specified signal to noise ratio was 20 db minimum for r.f. signal of 2  $\mu\text{v}/\text{m}$  with a deviation of 24 ke at 400 cps. This dictated the use of the r.f. stage.

The small frequency spacing between channels made compulsory a high stability of the local oscillator. This was obtained by an automatic frequency control, hence the symmetrical discriminator, to drive the reactance tube.

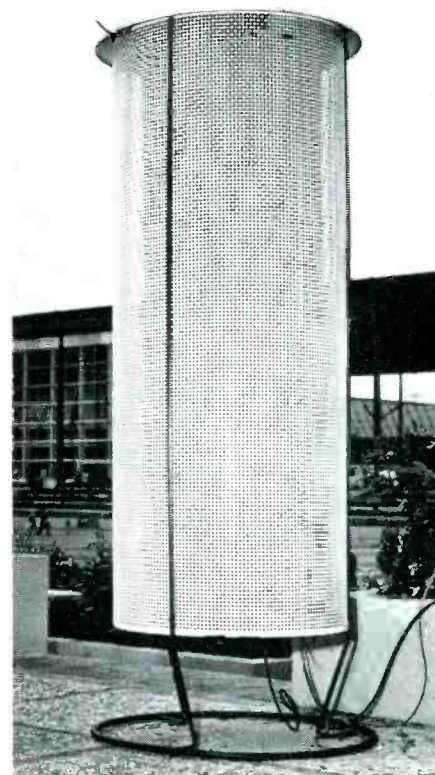
It was also necessary to mute the receiver in the absence of an r.f. carrier,

to eliminate unwanted noises. A squelch circuit was then added, which cuts-off the a.f. for input signals below 5  $\mu\text{v}$ .

The output stage feeds a cluster of four loudspeakers, each of 8-in. diameter, to ensure a good sound diffusion. Two of the loudspeakers resonate at 60 cps and two at 80 cps, to provide a certain amount of low-frequency equalization.

Since the receivers work in the open, they had to be designed for a wide range of climatic conditions, including in particular temperature variations of 40° C. Actually, during the first nights the temperature went down to 0° C, and during hot summer afternoons, some of the receivers were exposed to the sun, with the results that one could almost fry eggs on the cabinets. Still, they carried on undisturbed.

Each receiver has a closed metallic cabinet and is placed in a metallic box used as an acoustical enclosure for the loudspeakers. A rudimentary aerial is provided. The design varies according to the location.



Portable additional sound source.

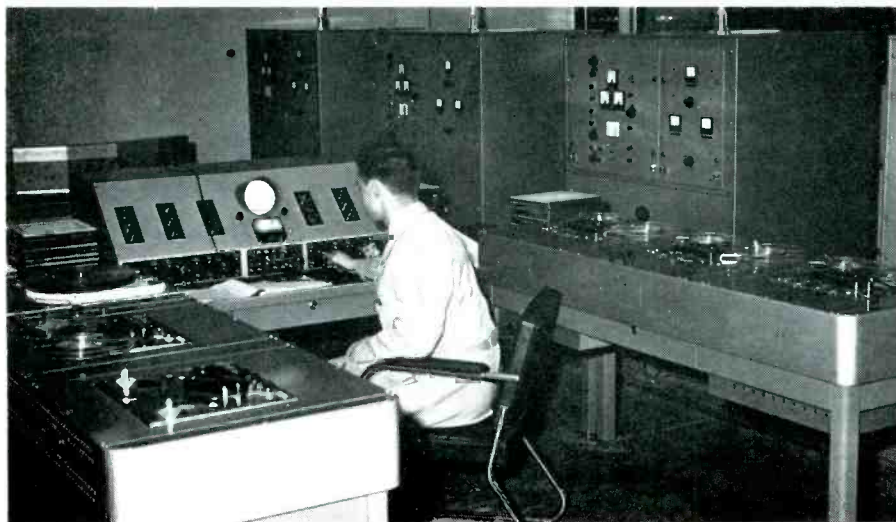
#### Special Zones

Cables have been used to link the control room 1 to the Great Square, 2, and the garden, 3.

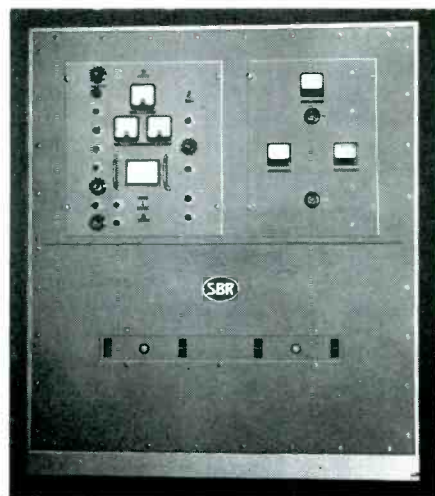
The Great Square (Grande Esplanade) is frequently used for sport or folklore shows, and it is necessary then that its loudspeakers be used for the appropriate commentary.

The Garden (Jardin des 4 Saisons) deserves a special mention. It is believed to be the first serious attempt to present hi-fi in the open. The equipment comprises three Williamson-type 60-watt amplifiers. Figure 4 shows how the signal program, coming by cable from the control room, is split between two pre-amplifiers, one for treble and one for

(Continued on page 78)



Control room, showing three of the FM transmitters, five tape-playback machines, and the patch panels and monitoring console.



One of the FM transmitters.



**Model EL 3516/G53  
Technical Specifications**

Three Tape Speeds—7½, 3¾, and 1⅞ ips

Tracks—Dual

Heads—Stacked

Head-Gap—0.0002 inches

Frequency Response—at 7½ ips; 50 to 16,000 cps  
at 3¾ ips; 60 to 10,000 cps  
at 1⅞ ips; 60 to 5,000 cps

Wow and Flutter—0.15% at 7½ ips  
0.2% at 3¾ ips  
0.35% at 1⅞ ips

Volume Indicator—Magic Eye (Type EM-84)

Loudspeaker—Integrated, heavy magnet,  
wide range

Controls—Piano-key pushbutton



Fast Forward and Reverse—Less than 2 minutes for  
1200 ft. of tape

Automatic Stop—At ends of reel (with metalized  
strips)

Program Indicator—Built-in, adjustable

Inputs—(1) radio/phono; (1) microphone (with mixing  
facilities)

Outputs—(1) for external speaker; (2) for external  
amplifiers with controls; (1) for external amplifier  
without controls; (1) for headphone monitoring  
recording circuit

Microphone—High-Impedance Dynamic

Tubes—EF-86 (2), ECC83 (2), ECL82 (1), EZ90 (1),  
EM84 (1)

Line Voltage—117 volts AC 60 cycles

Power Consumption—80 watts

Dimensions—15¾" x 13" x 8"

Weight—32 lbs.

Case—Rugged, European-designed, portable carrying  
case (internally designed for optimum acoustic  
baffling)

A matching companion piece, identical in ap-  
pearance, containing a second amplifier and  
speaker, is available to those who seek the  
convenience of a complete portable stereo-  
tape playback system

YOU  
ARE LOOKING  
AT A  
*Modern*  
Dutch  
Masterpiece

The  
STEREO  
version of the  
*Norelco 'Continental'*  
TAPE RECORDER  
Developed & Guild-Crafted  
by  
Philips  
of the  
Netherlands

We feel that the Stereo version of the Norelco 'Continental' is the ideal tape recorder for those recordists, high fidelity enthusiasts and music lovers who seek a professional quality machine at a truly modest price. The data listed here, represent painstaking, conservative and substantiated laboratory measurements. If you find that these data satisfy your technical requirements, and reflect those qualities that you consider mandatory in *your* stereo equipment, by all means listen to the Stereo version of the Norelco 'Continental' at your favorite HI-FI center or Camera store. There, we feel sure, you will agree with us that the Norelco Stereo 'Continental' is, indeed, a modern masterpiece . . .

For further descriptive literature write to:  
NORTH AMERICAN PHILIPS CO., INC.  
High Fidelity Products Division  
230 Duffy Avenue, Hicksville, L. I., N. Y.

*Norelco*



# Double-Duty Disc-Hop Consolette

JOHN WHITACRE\*

When you can't find the sort of equipment you want on the market, build it yourself. Then you can be sure that it will do exactly what you want it to do—as one station did. A real multipurpose device!

**W**HAT IS A Disc-Hop Consolette? At our station the name has come to mean: A complete audio consolette designed primarily for use by a disc-jockey to "spin records" for a crowd of dancers.

It is logical to assume a Double-Duty Disc-Hop Consolette can do another job besides the one mentioned above. At our station it is used to provide excellent facilities in the auxiliary control room.

A disc-jockey playing records for dances instead of a band or orchestra, is this a new idea? The idea has been popular in the Central Michigan area for some time. No doubt some parts of the country have been doing this longer than we have.

There are a few of you big-station engineers who are going to read this and say: "Why build a special unit just to play records over a P.A. system? We just grab a transcription turntable, a

public-address amplifier, a handful of wire, and we're in business."

That's fine for you fellows who like hard work. However, I'm sure the unit to be described will run circles around you for ease of setting up, convenience in operating, and professional appearance. Besides, it works beautifully as a standby unit at the studio.

## The Original Idea

Until two years ago our station borrowed a couple of transcription turntables from the auxiliary control room, borrowed a public-address system, and used a Collins 12Z-2 Remote Amplifier, as our portable unit. It worked fine, but we found it to be time consuming to move and hook up for a show. Our way was old fashioned and expensive. Possibly it could be improved.

With this thought in mind, I called on our company president. Since he was formerly our chief engineer, I antici-

pated a sympathetic ear. After hearing me out, the program director and the publicity director were summoned into his office. Three meetings later plans were complete for giving our station a Double-Duty Disc-Hop Consolette.

Right away it had been decided not to restrict its use for just doing disc-jockey dances. It would be constructed to allow its full use at the studio when not on remotes or dances. This meant it should have provisions for not only programming but auditioning as well. Our mixer amplifier would need at least two microphone channels, two phono channels, and a 600-ohm line-level input channel. A way must be provided to mute speakers when used at the studio, but still allow them to be on all the time when doing dances. A cue amplifier should be included so we could cue records prior to broadcasting, listen to the cue on the 600-ohm input channel, or listen to the program on a pair of earphones. Earphones were to be used on the cue amplifier because experience had taught us cue material could not be heard above the public address speaker at some dances.

To make it even more convenient for doing dances, it must be light in weight and easily moved through doors and up stairs. Building everything into an attractive desk seemed like a good idea. Certainly it must have showmanship without being "gaudy." A minimum amount of time must be spent moving it and making ready for a broadcast or dance.

From the announcers' and operators' standpoint, it must be simple to operate. The engineers said reliability was a necessity.

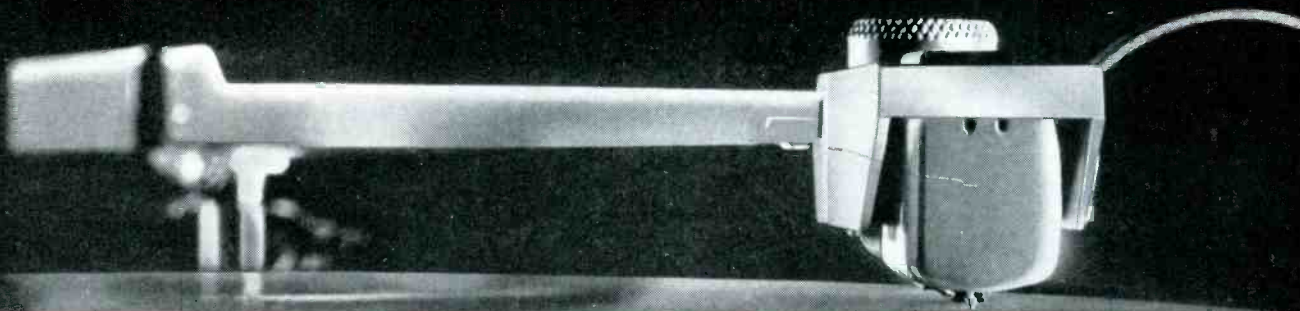
A twenty-five watt public-address amplifier and a speaker with its floor stand would be the only items we couldn't get into the desk.

Past experience had taught us two-speed, twelve-inch turntables with viscous damped tone arms were fine companions for doing record dances. If we were content to play 16-inch transcriptions on another turntable when the



Fig. 1. Front view of the Disc-Hop Consolette. The desk is 24 in. wide, 48 in. long, and 32 in. high.

# Reduce record wear...

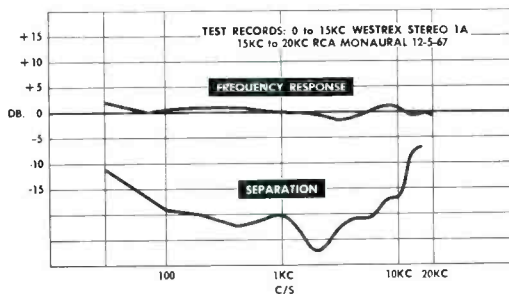


## Less mass, higher compliance with G.E.'s "Golden Classic" stereo-magnetic cartridge

The more moving parts, the more resistance to groove motion. General Electric's "Golden Classic" has only one moving part—the stylus—which "floats" freely in special-formula damping cushions. This means freer motion in the record groove. You get less wear on records and stylus, and superior sound at all frequencies. Hear the "Golden Classic" GC-5 or GC-7 soon. You'll agree they are a fitting climax to the famous General Electric cartridge tradition.

- Plays both stereo and monaural records
- Frequency response, 20 through 20,000 cycles
- Output 8 mv
- Effective mass of stylus about 2 milligrams
- Lateral compliance  $4 \times 10^{-6}$  cm/dyne; vertical compliance  $2.5 \times 10^{-6}$  cm/dyne
- Recommended tracking force with professional-type tone arm 2 to 4 grams. (Specifications for Model GC-5.)

Model GC-5 (shown) with .5 mil diamond stylus, **\$26.95**. Model GC-7 with .7 mil diamond stylus, **\$23.95**. Model CL-7 with .7 mil synthetic sapphire stylus **\$16.95** (Manufacturer's suggested resale prices).



Smooth response on both stereo and monaural records. Consistently high channel separation, because the stylus is magnetically linked to the coils.

## TM-2G "Stereo Classic" tone arm



A professional-type tone arm designed for use with G-E stereo cartridges as an integrated pickup system. Unusual two-step adjustment permits precise setting of tracking force from 0 to 6 grams. Lightweight, brushed aluminum construction minimizes inertia. Statically balanced for minimum friction, reduced stylus and record wear **\$29.95** (Manufacturer's suggested resale price).



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See and hear the G-E "Stereo Classic" cartridges and tone arm at your Hi-Fi dealer's now. For more information and the name of your nearest dealer, write General Electric Company, Specialty Electronic Components Dept., 44A2, W. Genesee St., Auburn, New York.



Fig. 2. Back and top view of the desk. Note drawers for parts storage and compartments for records. The p.a. amplifier rests on the shelf between the two pedestals.

unit was used at the studio, the two twelve-inch turntables would work well for everything else.

Now we knew what we needed. After a diligent search was made to locate a unit similar to what we wanted, an amazing fact was evident! There was nothing on the market that even resembled our proposed unit. Maybe we could buy individual units and make it ourselves.

When you want something and can't buy it, for one reason or another, what do you do? Today many stations operating with a limited budget, build some of their equipment. That seemed to be our case. The project was started immediately.

#### Build it Yourself

A birch plywood desk measuring 24" wide, 48" long, and 26" high, was built for us by a local lumber company. To take away the "boxey" appearance, both ends of the desk were slanted inward at the bottom. Six inch maple legs were mounted under the desk. This raised the desk top to 32 in. We have found this to be a comfortable operating height when seated. Three-quarter inch plywood was used for the desk top and one-quarter inch plywood was used on the front of the desk. The rest of the desk was made from one-half inch plywood (see Figs. 1 and 2).

Two compartments for record storage and two drawers for parts storage were provided. The drawers were equipped with magnetic catches so they wouldn't fall out when the desk was being moved (see Fig. 2).

Inside the desk, near the front, a shelf

was made to hold the public address amplifier.

After the desk was completely assembled, it was given two coats of outdoor spar varnish. It was well sanded before the first coat of varnish was applied and rubbed thoroughly with steel wool after the first coat was dry. When the second coat of varnish was thoroughly dry, a good grade of furniture wax was applied.

On the left side of the knee-opening in the desk, an a.c. switch and three duplex outlets were mounted. This switch controls all the power distribution for all the units mounted in the desk.

A housing for the mixer-amplifier was constructed by a tinsmith from #18 gauge sheet metal. Its dimensions are 10 $\frac{1}{4}$ " deep, 18" long, and 8" high. Inside the housing a pair of slides are welded, one on each side near the bottom. These serve as guides to aid the serviceman in removing and replacing the mixer-amplifier into the housing with a minimum of difficulty. An opening was left in the back of the housing 3" high and 17" long so jacks and plugs could be easily inserted or removed from the mixer-amplifier chassis. The housing was primed and given two coats of black automotive enamel, after which it was treated with a coat of automotive wax.

For the mixer-amplifier, an aluminum chassis 3" x 17" x 10" was used. Steel chassis-mounting brackets were used to hold the front panel to the chassis.

The front panel for the mixer-amplifier was cut from a sheet of 1/16" aluminum. After all holes and cutouts were made in the panel, we had it anodized gold. As a finishing touch, two handles were provided for lifting the amplifier

from its housing. Engraved plastic labels were attached to the panel to identify the control functions.

Presto, Model T-2, two-speed, turntables were mounted on the desk top along with Gray viscous-damped transcription arms. It was necessary to place a one-half-inch block of plywood under each transcription arm to bring the arm up to the height of the turntable.

The transcription arms are equipped with Pickering Model D-140 phono cartridges. Very little trouble is experienced with the cartridges skipping or jumping when they are jarred. We attribute this feature to the viscous-damped transcription arms.

#### Circuitry

Referring to the schematic diagram of the mixer-amplifier Fig. 3, it is quickly recognized as a miniature audio console.

To keep the cost down, we employed as few transformers in our circuitry as possible. Then too, since all units would be housed in the desk, it was felt there should be no drawbacks to using high-impedance mixing. Using two 12AY7 tubes for our program amplifier may seem a little strange to you, but my reason for using them will be outlined later.

Both phono preamplifiers employ a 12AY7 tube in a "losser-type" equalized preamplifier circuit. They were used because they had lower hum level, less microphonics, and showed evidence of more stage gain than any tube we had tried previously. These stages give us plus or minus 1 $\frac{1}{2}$  db variation from 30 to 10,000 cps when using the Columbia Standard RIAA test record. A "scratch filter" is provided by inserting the .05- $\mu$ f. capacitor and the 5100-ohm resistor across the input to each stage with the switch  $Sw_1$  or  $Sw_2$ . Using the filter causes a rapid loss of high frequencies above 4000 cps.

In the intermediate program amplifier stage, one-half of  $V_5$ , another 12AY7 tube was used. This stage was thought of more as another preamplifier stage than as a driver for the program amplifier. With this reasoning, the 12AY7 tube was selected here for the same reasons it was used in the phono preamplifier stages.

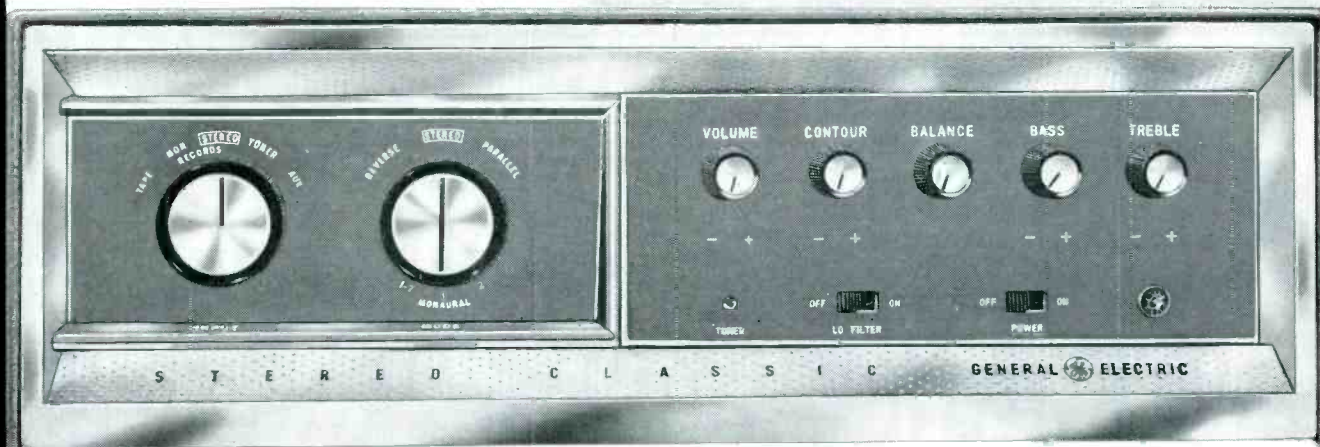
For microphone preamplifier tubes, we chose the 12AX7. It meets all demands for low noise and excellent frequency response. A 3 db rise in frequency response is noted at 30 cps over what it is from 70 to 20,000 cps. In other words, the preamplifier is flat from 70 to 20,000 cps within 1 db. Most microphones have a drop in their response below 70 cps, so we accepted the 3 db rise at 30 cps without reservation.

Some years ago the United Transformer Co. developed a portable remote

# A complete, versatile stereo control system



G-E "Stereo Classic"  
Amplifier Model MS-4000



## G-E "Stereo Classic"—40 watts of clean, balanced power

General Electric's MS-4000 "Stereo Classic" Amplifier provides every useful variation in stereo and monaural amplification, quickly and easily controlled by a single set of knobs.

The balance control gives you maximum stereo effect—without overloading one channel when the other is cut down. A new contour control provides smooth, gradual bass boost, while the speaker phasing switch

saves manual phasing. Be sure to see and hear the MS-4000 soon.

### OUTSTANDING PERFORMANCE FEATURES

- Full, balanced 20-watt output from each channel (28 watts per channel music power)
- Flat response within 0.5 db from 20 to 20,000 cycles
- High sensitivity, extremely low hum and noise
- MS-4000 **\$169.95\***
- MS-2000 (28-watt Amplifier) **\$129.95\***

### New G-E Remote Control RG-1000



Now you can get the best stereo perspective without moving from your chair! Two knobs permit adjustment of channel balance and volume up to 30 feet from the amplifier. Especially useful in stereo because of individual preferences for channel balance and audio variations. May also be used as volume control with monaural amplifier. 30-foot cord included. **\$14.95\***

\*Manufacturer's suggested resale prices.



### FM-AM Tuner FA-12

Receives even weak signals with unusually low distortion, hum and noise level. No audible drift. Visual meter provides FM center channel tuning and maximum AM signal tuning. RF amplifier stage in both FM and AM increases sensitivity. FM multiplex jack for stereo adaptor. Built-in AM antenna; folded FM dipole included. **\$129.95\***

See and hear the G-E "Stereo Classic" Amplifier and Tuner at your Hi-Fi dealer's now. For more information and the name of your nearest dealer, write General Electric Company, Specialty Electronic Components Dept., 47A2, W. Genesee St., Auburn, New York.

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# Get big-speaker performance in a "stereo-compact" enclosure



General Electric's LH-12 "Stereo Classic" Speaker System combines enclosure compactness with full, smooth response over the entire audio frequency range. The complete unit — with woofer, tweeter and crossover network — occupies only two cubic feet of space.

But small size is gained through no sacrifice in sound. G.E.'s new Extended Bass design puts out *four times* as much power (+6db) at low frequencies as standard 12" speakers in the same enclosure. For superb stereo sound, we invite you to compare this system with all others, *regardless of size*.

Complete LH-12 Speaker System in four most wanted finishes at **\$129.95\***. LC-12 and LK-12 Speakers available for separate mounting at **\$89.95\***.

## OUTSTANDING NEW BASS PERFORMANCE

The woofer's high excursion cone and long voice coil *quadruple* power-handling ability. Treated cloth cone suspension increases compliance. Aluminum base voice coil for fast, efficient heat dissipation. All-steel welded construction.



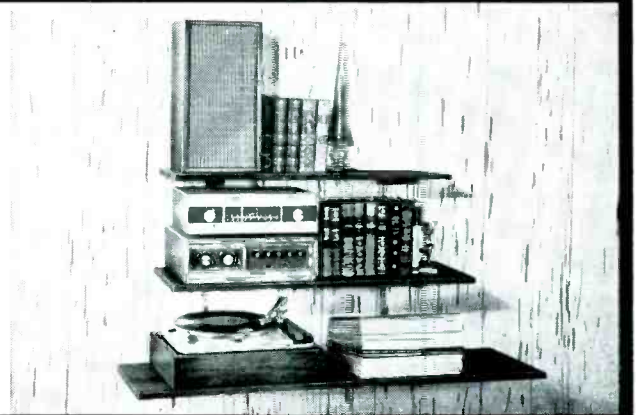
## LH-6 Bookshelf Speaker System

Only 9" high, 17<sup>5</sup>/<sub>8</sub>" wide and 8<sup>3</sup>/<sub>8</sub>" deep, yet provides better low-frequency response than speakers tested in enclosures up to twice the size. Perfect solution to problem of getting high quality performance in a limited space. May be positioned on side or end, as shown at right. Also offered as kit without enclosure. From **\$49.95 to \$57.50\*** (Kit form, **\$29.95**).

New EN-50 5-cu. ft. enclosure for 12" speakers available in four finishes. **\$69.95\***

There's a full line of General Electric speakers at your High Fidelity dealer's. Finest performance—sensibly priced.

\*Manufacturer's suggested resale prices.



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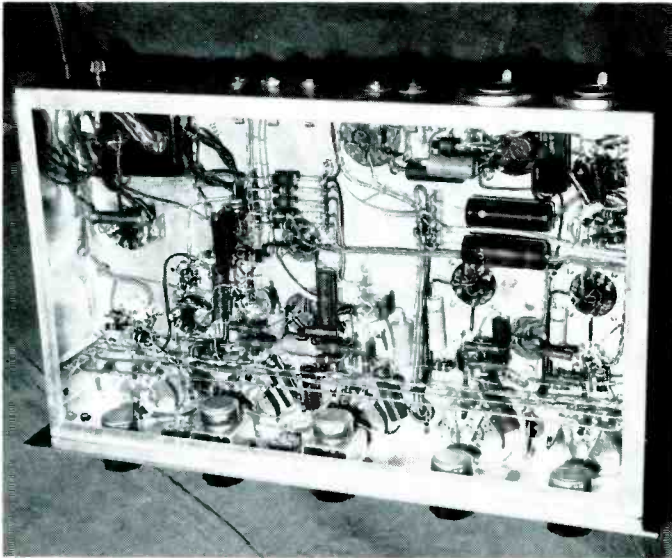


Fig. 4. Bottom view of the mixer-amplifier showing the cue pots and details of the part locations.

one volt to the input of the public address amplifier through the volume control  $R_6$ .  $Sw_8$  is a three-position lever switch which selects program, audition, or an external input, for the public address amplifier. We use a radio tuner to feed the external input when doing remotes with this unit.

One-half of a 12AU7 is used for the cue monitor. A three-position lever switch selects program, phono cue buss, or the auxiliary input channel, to be amplified and fed to a pair of earphones. This switch,  $Sw_9$ , has a spring-return and upon releasing it, it always comes back to monitoring the program buss. A voltage-divider is connected across the amplifier line-output terminals. We chose this method of monitoring the program so that when the unit was used on broadcast remotes, the operator would be able to hear cue on the remote line. All audio levels appearing on the earphones from the cue amplifier are well balanced from the three sources.

The VU meter is connected across the amplifier output through a 10,000-ohm resistor. It indicates 100 per cent or zero VU when the amplifier is actually putting out plus 4 db.

A 4-db "O" pad is placed between the amplifier output and the line terminals. Its purpose being to cause the amplifier output and remote line to "look into" a nearly constant 600-ohm load at all times. It also keeps the VU meter from being damaged if someone feeds excessive cue level down the remote line from the studio.

With the VU meter indicating zero when the amplifier is putting out plus 4 db into the pad, this means we are feeding the remote line zero db.

In our power-supply circuit, we used a 20-ohm Global resistor in series with one side of the primary winding. For those of you who might have had unpleasant experiences with the Global resistor in television sets, may I suggest using a regular 20-ohm, 20-watt wire-wound resistor. However, at the time of this writing, the original Global resistor is still operating perfectly.

By using the Global resistor, we eliminate the voltage surge when the amplifier is first switched on. This will prolong the tube filaments. It reduces transformer heating by lowering the primary voltage. It reduces the available filament and plate voltages. The former was de-

sirable and the latter was no disadvantage. The amplifier filament voltage is 6.0 volts to prolong its tube life. We had plenty of available plate voltage to spare, so inserting the resistor in the primary of the power transformer was to our advantage.

On the filament winding of the power transformer, the center tap has been brought out to a voltage divider in the plate-supply circuit. This was as a precaution against hum originating in the filament circuit of the preamplifier stages.

Both phono channels are equipped with "cue-switches." This was done as an experiment to see what could be accomplished along this line in high-impedance mixing circuits. Then too, it was a necessity if we were to listen to cue from four sources with a three-position, spring-return lever switch. We wanted to retain the spring-return feature so that upon releasing the cue switch, it would always return to monitoring the program circuit.

The "cue-pots" were constructed by mounting each phono-channel potentiometer on a small sub-chassis and then fastening a small Microswitch under the extended potentiometer shaft (see Fig. 4). A flat spot was filed into the potentiometer shaft where the microswitch lever would rest when the potentiometer was closed. A normally-closed Microswitch was selected for the purpose. When the potentiometer is in the closed position, the Microswitch is making continuity and when the potentiometer is in any position other than closed, the Microswitch is not making continuity. After assembling the two parts on their sub-chassis, the completed unit was mounted to the back side of the front panel with countersunk machine screws.

Our "cue-pots" have worked very well and without a failure for some time now. They are noiseless from an electrical and mechanical viewpoint. In fact, it wouldn't surprise us to see some manufacturer come out with this idea in the near future.

Carbon-deposited potentiometers (Ohmite) with a linear taper were used for all mixing and volume controls except the public address volume control where an audio taper was used.

Building-out resistors for the program and audition busses are 100,000 ohms. Very little interaction is experienced between mixing controls. Using 470,000-ohm building-out resistors would have given us even less interaction between controls.

Buss-bar was used to make the mixer busses. The program and audition busses are physically separated by about one inch. Cross-talk is down about 50 db between the two busses. However, the

(Continued on page 72)

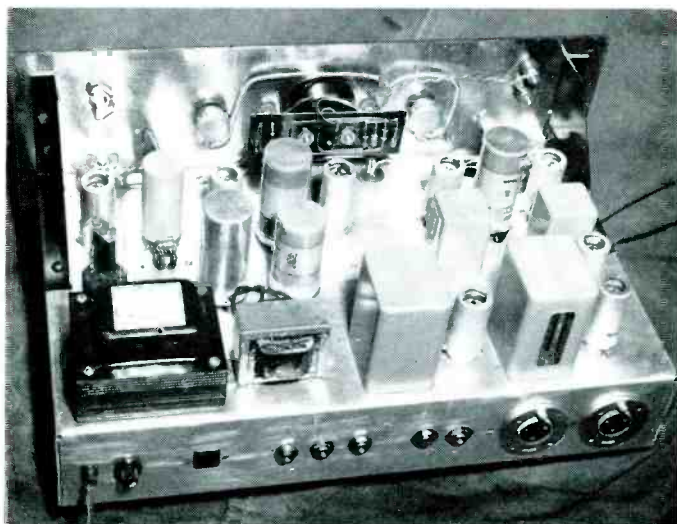


Fig. 5. Top view of the mixer-amplifier showing transformers used and placement of other parts.



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The SP-210 is housed in a modern, low silhouette metal cabinet with brass control panel. It is matched to, and powered by the Pilot

SA-232 or SA-260 amplifier. The Pilot SP-210 is \$89.50, complete.

Both the SA-232 and SA-260 basic stereo amplifiers consist of two identical power amplifiers. The SA-232 delivers a total of 40 watts undistorted (80 watts peak). Distortion: harmonic 1%; intermodulation 1.5%. Hum, 90 db below rated output. Total output of the SA-260 is 70 watts undistorted (140 watts peak). Distortion: harmonic ½%; IM 1%. Hum, 90 db below rated output. Each amplifier has power tap-off for the SP-210.

The SA-232 is priced at \$89.50, and the SA-260 at \$129.50. Both are supplied with brass finished metal covers. (Slightly higher in the western states.)

Complete specifications at your high fidelity dealer or write to Pilot Radio Corporation, 37-04 36th Street, Long Island City 1, N. Y.

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# Transformer Distortion

DUNFORD KELLY\*

The causes of distortion in transformers are fairly well known to transformer engineers, but there is little the user can do to avoid it. However, a thorough understanding of the parameters which cause distortion and the effect of core material, size, stacking, and operating conditions will help engineer and experimenter alike in their choice and use of transformers.

**A**UDIO TRANSFORMERS produce severe distortion at low frequencies, frequently more than the associated vacuum tubes create. Despite this fact, transformer distortion information is practically non-existent. One obstacle has been the requirement for an extremely pure sine wave for such measurements.

The data to follow may be applied, with simple calculations, to any transformer not carrying direct current, with known flux density, low-frequency impedance relations, and type of core material. Even without design information, distortion approximations are possible. Commercially available core materials have permeability tolerances as high as two or three to one in the better core materials. This reduces the possible accuracy of transformer calculations, but the results can still be very useful.

## Distortion Source

Distortion is caused by the ferromagnetic core material, which is required in an audio-frequency transformer to produce sufficiently high electrical impedance. The value of the core material is its high magnetic permeability compared to the permeability of space. Available permeabilities range from slightly above unity to hundreds of thousands. Unfortunately, in a general way, the higher the permeability the lower the power handling capacity and the lower the maximum frequency at which the core material is suitable. All ferromagnetic

materials are non-linear and therefore generate distortion. The distortion produced in a transformer depends on the relative circuit impedances, the type of core material and the flux density; not at all on coil configuration, shunt capacitance, and the other factors that determine high-frequency characteristics.

## Ferromagnetic Theory

Ferromagnetism is complex<sup>1</sup> but some of the properties may be considered in an elementary manner. Ordinary ferromagnetic materials are composed of many crystals. These have no definite arrangement. Each crystal, even though unmagnetized, consists of many very small magnets, called domains. These have a random arrangement. Therefore they produce no over-all magnetism. When an external magnetic force is applied, the first effect is thought to be the enlargement of the domains originally aligned in the general direction of the applied field, at the expense of the other domains. This slightly increases the flux density in the material. With greater applied magnetic force, the domains begin to realign themselves to the crystal axis nearest the direction of the applied field. They do not do this by moving bodily, but by a realignment of the axes of rotation of the individual electrons within the domain. The entirety of one domain orients simultaneously. Each reoriented domain increases the flux density, which therefore changes by extremely small but finite

steps. This mechanism produces the region of highest permeability. A third effect further increases the flux density. With sufficient applied field, the domains smoothly shift direction from the crystal axes to which they had previously aligned, to the direction of the applied field. When this third effect is completed, the magnetic material is fully magnetized, or saturated, and can carry no additional flux. The space which surrounds the magnetic material can carry more flux, but because the permeability of space is only unity, this contribution to the total flux is generally negligible.

Magnetization involves the mechanical activity just described, and it requires the expenditure of energy. When the magnetized material is demagnetized, not all of the expended energy is recovered. The lost portion is converted to heat. This loss is termed hysteresis loss and is common to all ferromagnetic materials. At very low flux densities this loss disappears, because the physical reaction ceases. The resultant distortion also ceases.

## Measurement Technique

Only the strongest harmonics were recorded in these measurements because they are the important ones, but the higher odd-numbered harmonics continued uniformly down the graphs at the highest flux densities. The even numbered harmonics were not present because no direct current was present. These measurements were made with a conventional assembly of laminations of ordinary size, rather than the long strips used in standard transformer core metal tests. The results, therefore, closely approximate actual transformers.

An exceedingly pure sine-wave voltage was impressed on a resistor and the test coil in series as diagrammed later. (See Appendix.) The only important departure from usual practice was in the use of higher series resistance which increased the transformer insertion loss and increased the harmonic percentages. This was done to allow measurements over a wider range of signal level. Variations in series resistance alter the har-

\* 4638 10th Ave., Los Angeles 43, California.

<sup>1</sup> Richard M. Bozorth, "Ferromagnetism." D. Van Nostrand, 1951.

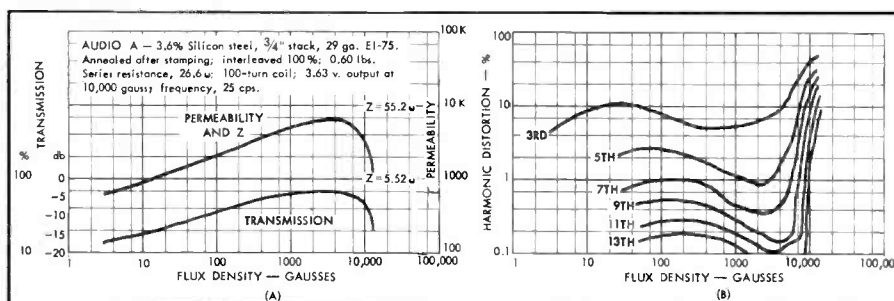


Fig. 1. Curves of transmission, permeability, distortion, and impedance vs. flux density for Audio A core material.



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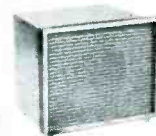
This can be achieved in two ways, depending upon the kind of woofer you have. A conventional woofer—with a single voice coil—can receive these frequencies only after they are combined by the special stereo adapter network Model A-1. However, with University's exclusive DUAL VOICE COIL WOOFER† . . . containing two electrically separate voice coils . . . no such network is required. Instead, the stereo amplifiers can simply be connected one to each voice coil, thus feeding the full bass directly to this unique woofer.

Starting from scratch, another attractive and flexible approach would be to use a dual voice coil woofer in an enclosure along with one "add-on," the combination making a very fine monophonic speaker system. Later, you can convert to stereo with a duplicate "add-on," as shown at left. Now, since the woofer's position for stereo is not critical, you can place it almost anywhere in the room . . . and the two compact "add-ons" can easily be positioned for perfect decor and stereo effects . . . regardless of where the woofer has been placed.

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†University woofers having dual voice coils are models: C-15W, C-12SW, C-13HC and C-12HC. These are employed in speaker systems: Debonaire-12 S-3, S-3S; Senior S-5S; Master S-6, S-6S; Dean S-7, S-7S; Classic S-8, S-8S; S-9, S-9S; Ultra Linear S-10, S-10S; S-11, S-11S; Troubadour S-12, S-12S. (System models in light type are fully stereo adapted. System models in bold type, or any home built system with a dual voice coil woofer, can be easily and inexpensively prepared for stereo with kit SK-1. User net: \$5.95)

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monic percentages in approximately the ratio of the total shunt impedance at the coil terminals. More accurate calculation involves the exact phase angle of the transformer reactance which is less than 90 deg. due to core losses. This phase angle can be determined graphically from the series resistance, the coil impedance, and the transmission. All of these are shown on the curves. As a practical matter, in comparing transformers, the assumption that both have 90 deg. phase angles does not seriously reduce the accuracy of the comparison.

Coil resistance was completely accounted for in the measurements by adding the coil resistance to the series resistance and measuring the developed voltages across an unloaded secondary coil.

### Ordinary Silicon Steel

Figure 1 concerns the most widely used transformer core material, non-oriented silicon steel in lamination form. This particular core<sup>2</sup> is one of the best available grades. Many factors must be controlled to produce good laminations. These laminations were annealed after stamping to remove the metal strains which degrade magnetic properties. They are very flat and free from burrs, fitting together with a minimum air gap, and allowing a maximum of material to fit in the available space. Beside the obvious requirement of good permeability, the resistivity should be high to minimize the eddy current losses which result from circulating currents in the core. Eddy current losses are proportional to the conductivity of the core material and to the square of the lamination thickness. The 3.6 per cent silicon in the core increases the resistivity about five fold, affording a corresponding reduction in eddy losses. The use of 29 gauge .014" laminations instead of the cheaper 26 gauge .0188" results in about 5/9 as much eddy current loss. If the laminations are not insulated from each other, the advantage of subdivision is lost. These laminations have an oxide coating produced in the annealing oven furnishing useful insulation. Eddy losses waste power, and reduce permeability. They do not contribute distortion. The other major core loss, hysteresis, depends on the composition and treatment of the core material. The non-linearity of the magnetization curve, often shown as the hysteresis loop, is the cause of the distortion produced in a transformer.

In Fig. 1, the third harmonic curve has two maxima. The one at the highest flux density results from the well known fact that the high power level nearly saturates the core material, causing very

low permeability at the peaks of the excitation cycle. The broad maximum in the 25-gauss region is surprising. The reason is the decrease in the permeability of the core material with dropping voltage, which is also shown in Fig. 1. As the permeability of the core drops, the transformer impedance drops proportionately, impressing an increasing part of the core distortion on the circuit.

These curves were not plotted below a few gauss because of the limits of this particular measuring arrangement, but other measurements on this grade of core material show that below the one-gauss territory the permeability becomes nearly constant regardless of how low the flux density drops. This constant and low permeability region is the initial permeability plateau. Hysteresis losses and varying permeability, both of which are shown by the hysteresis loop, together cause core distortion. In the initial permeability region hysteresis losses disappear and the permeability ceases to vary. Therefore at sufficiently low flux densities ferromagnetic core distortion disappears. Below the 25-gauss peak, the third harmonic distortion decreases. Another set of measurements on this type of core material shows a smooth drop from the low-level distortion peak to 0.25 per cent at 1/10 gauss. In all probability the distortion completely vanishes at extremely low levels, too low to have practical significance.

Transformer flux density is proportional to signal voltage and inversely proportional to frequency. Therefore the highest flux densities occur only at the lowest frequencies. Flux density is also inversely proportional to coil turns and cross-sectional core area.

Above the 25-gauss region the permeability curve is a straight line with almost uniform slope up to about 3000 gauss. The distortion curve shows only moderate variation in this region. This is to be expected when there are no abrupt changes in permeability.

The maximum permeability is about 7700 at 4000 gauss. This is an excellent permeability for non-oriented silicon steel laminations. It indicates that the iron is at least average for its class in permeability and that the air gaps in the magnetic circuit are small.

Above the region of maximum permeability, the permeability curve drops rapidly. At 15,000 gauss the permeability is about 1/10 of the maximum. The impedance of the transformer accordingly drops very abruptly in this part of the excitation cycle, producing severe distortion.

The higher the flux density, the greater the level, but the more objectionable the distortion and the lower the developed impedance. In many applications it is the diminishing permeability that limits the permissible flux density. For example, the output transformer in a negative feedback amplifier may be surrounded by sufficient degeneration to reduce the effect of the core distortion to a suitable level, and to provide uniform frequency response, but the power available from the output tubes at low frequencies may be severely limited by the low value of shunt impedance of the transformer at high flux densities. This impedance is largely reactive, a particularly undesirable load for power tubes. Negative feedback does not alter this situation. Fortunately high flux densities are encountered only at the lowest frequencies in the design spectrum.

The crowded harmonic spectrum of ferromagnetic material results from a peculiar kind of non-linearity. It is possible to have a large third-harmonic generation with negligible higher harmonics, if for example, the change in gain is proportional to the instantaneous signal voltage. The non-linearity in magnetic core material is not of this nature. Instead it is characterized by several regions with markedly different slopes, and fairly abrupt transitions between them.

### Variable Frequency Response

The transmission curve of Fig. 1 illustrates a fact often ignored in transformer considerations. Frequency response depends on flux density or signal voltage. In this case transmission varies from 13 per cent at 3 gauss to 70 per cent at 4000 gauss, or in decibels from about -18 db to -3 db. This is at a constant low frequency. The only variable is the signal voltage. In a high-quality transformer the low-frequency loss might be

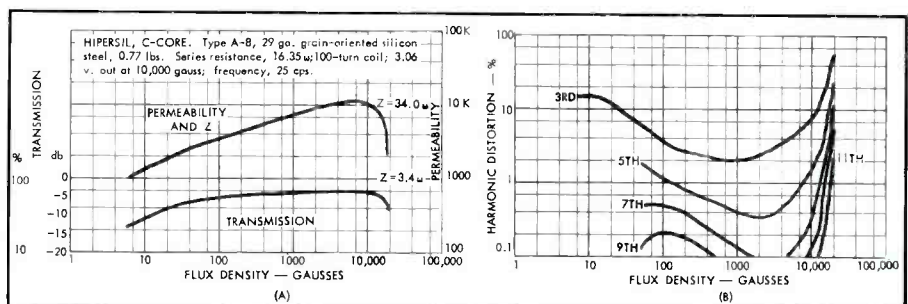


Fig. 2. Curves of transmission, permeability, distortion, and impedance vs. flux density for Hipersil C-core materials.

<sup>2</sup> Technical Bulletin EM-21, "Electrical Steel Sheets and Coiled Electrical Steel Strip." Allegheny Ludlum Steel Corp., Pittsburgh 22, Pa.

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limited to 3 db at a few gauss. Under those conditions the loss at 4000 gauss might be about 0.5 db. The advertised frequency-response curve could show a low-frequency loss of anywhere from 0.5 db to 3 db and be technically correct.

Transformers surrounded by substantial negative feedback do not cause this type of variable-frequency response in a serious degree, but line matching and input transformers do not usually have the benefit of negative feedback. When several of such transformers are included in one system, the effect on the bass response is to transmit the strong bass tones and drop out the weak ones. Even if equalization is used, it cannot overcome this handicap. For this reason alone it is advisable that all transformers have excellent bass response. Transformer alterations that improve the bass response usually decrease the distortion as well.

### Grain-Oriented Silicon

Figure 2 is of grain-oriented silicon steel.<sup>3,4</sup> This material is made in ribbon form, and wound on a mandrel. The resulting loop is bonded and cut into two parts, each of C shape. When reassembled, these are the transformer core. The rolling of silicon steel produces a partial crystal alignment, making the magnetic properties best in the rolling direction. This property is accentuated in grain-oriented core material. It is of limited value in laminations, where the magnetic flux travels both with the grain and across the grain, but in the tape wound core all of the flux travels with the grain, taking full advantage of the preferred magnetic direction. As a result of the grain orientation, the core losses are lower and the permeability is higher than in non-oriented silicon steel.

Circuit values were chosen making Fig. 2 directly comparable to Fig. 1. Obviously the oriented core is better in several respects than the non-oriented core. The permeability is higher, the dis-

tortion is lower, and most important, the maximum flux density is much higher.

Hipersil saturates very abruptly. Driving such a core at very high level, through a series resistance, causes the peak flux density to be less than the terminal fundamental voltage would indicate, because the core material saturates for only a small portion of the cycle, reducing the fundamental voltage only slightly, but reducing the peak flux density materially. This effect is important only with a sharp saturation point, and only at the very highest magnetic field. It results in Fig. 2 being somewhat optimistic regarding the saturation flux density. The error is negligible at 15,000 gauss but the end of the curve is an actual peak flux density of about 17,500 gauss instead of the 20,000 shown. Fundamental voltage is the usual consideration in audio transformers, therefore these measurements were based on voltage.

The disadvantages of the oriented core are higher initial cost and less flexibility than laminations which can be used in various stack heights to vary the core size. But the oriented steel has as good characteristics at 15,000 gauss as the other steel at 10,000. This is a power of 2½ to 1, a tremendous improvement.

A useful comparison between the two types of materials is the distortion ratio at a particular flux density. This indicates the effect of substituting cores in a transformer. In the region of 1000 gauss the grain-oriented core produces only about half as much distortion as the other core. At 10,000 gauss the differences are greater, the oriented core producing about one fifth the distortion of the other core. At the same time, the improvement in permeability is about four fold. For these reasons Hipersil is often chosen for high-quality output transformers.

At very low flux densities the distortion from the grain-oriented core is slightly higher than from the non-oriented core and the permeability improvement is slight. Therefore the oriented core is not advantageous at low flux densities.

Above 100 gauss the transmission curve for Hipersil is higher and flatter than the Audio A curve, and it extends

farther into the high-density region.

A transformer to do a particular job at low frequencies will be considerably smaller with an oriented core than with a non-oriented core. At high frequencies the small transformer with the oriented core will be superior, because leakage inductance and capacitance increase with coil size.

### 50% Nickel Alloy

Figure 3 is of 50-50 nickel alloy.<sup>5,6</sup> This material saturates at a flux density only moderately lower than for non-oriented silicon steel, while the permeability is much higher. The initial permeability is about five fold better, and the maximum permeability is three or four fold better for this particular sample. This material is especially suitable for high-level line transformers and also makes good output transformers but expense limits the latter application. This type of nickel iron is available with comparable permeability from several sources, but that known as Hipernik is particularly suitable for power applications because it is given a hydrogen purification that reduces the hysteresis loss to a very low value, resulting in a total core loss at 10,000 gauss and 60 eps of 0.24 watts per pound for 29-gauge sheet. This may be compared to 0.52 watts per pound for 29-gauge non-oriented AA silicon and 0.29 watts per pound for 29-gauge grain oriented silicon.

At low and moderate flux densities the 50-50 nickel iron produces considerably lower distortion than Audio A. As the flux density increases, the improvement diminishes. At 10,000 gauss the nickel iron produces about ⅔ as much distortion as the non-oriented silicon steel.

The signal transmission curve for the 50-50 nickel iron is flatter than for either type of silicon steel, and the percent transmission is better at all flux densities up to 10,000 gauss. This makes it generally superior except at extreme flux densities.

### Cheap Silicon Steel

A fourth material used for these applications is silicon steel of low cost, indefinite pedigree, and poor qualities. It contains less silicon and more impurities. The main specification is the price. The variations between materials of different manufacture, and even between successive batches, will be very great. Although the curves are not shown, be-

(Continued on page 73)

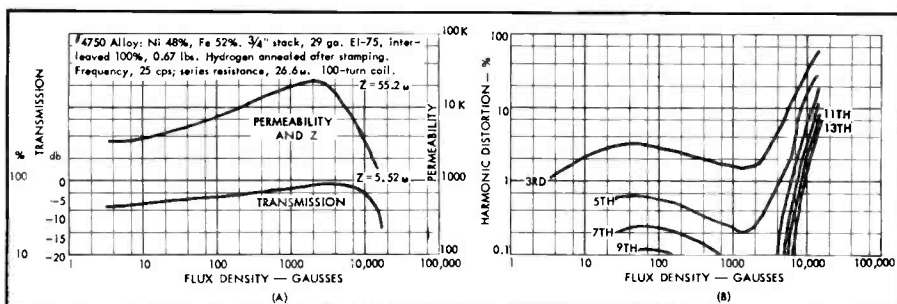


Fig. 3. Curves of transmission, permeability, distortion, and impedance vs. flux density for No. 4750 alloy core material.



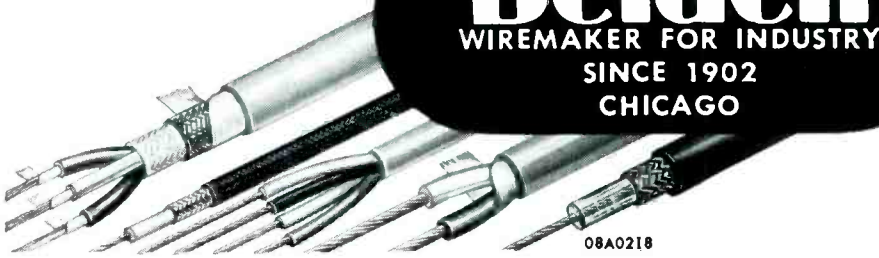
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# Stereo Without Bankruptcy

ARTHUR W. SEAR\*

In proposing a hypothetical system, the author has described one which is used in several forms commercially—but which has not yet been adopted by the home listener. Maybe it should be.

**A**T AUDIO SHOWS and similar demonstrations I have been intrigued by the music and audio effects that come from the new stereophonic sound reproducing systems. Then, when I look at the price tags, I am almost completely disenchanted.

It is not just the cost of the equipment that frightens me: where in my home can I find space for two sound systems that will give me the full audio range that I have been enjoying with my present monophonic system. A medium priced stereophonic system would probably fit into my home satisfactorily but the medium spatial effects of these and their somewhat limited bass response leaves much to be desired.

Over the years my monophonic system has grown by easy stages from a simple beginning to a four-way system with a dividing network between the preamplifier and four output amplifiers, one for each speaker. I like the big clean audio that I can get with this set, with nice round bass notes at any reasonable energy level. In fact, my present system is good enough so that I hesitate to discard it for a lesser system even though it would have the advantage of stereo "spaciousness." I have also toyed with the idea of converting my monophonic system to stereo but even if I could afford another Klipsch horn, where in an ordinary room can one find place for two!

There may be many other hi fi fans

\* 1724 S. Mountain Ave., Duarte, Calif.

who are in the same predicament that I find myself and maybe we can find a way out of our dilemma if we can benefit from some of the characteristics of sound and the methods we use for reproducing it.

First, we cannot sense the direction of sound sources of frequencies below about 300 cps, except for the transients that may accompany the low frequencies.

Second, loudspeakers that radiate low frequencies are generally larger and more costly than speakers that only have to radiate mid-range and high-frequency sounds.

Third, most of the sound energy is concentrated in the low-frequency end of the sound spectrum so that amplifiers for producing high-frequency sounds are comparatively smaller and cost less.

These three facts point out the desirability of using a single low-frequency amplifier and speaker for a stereophonic sound system if it is possible to do so and still keep the over-all system symmetrical.

In addition, there are characteristics inherent in the recording process that tend to simplify the problem of designing a system having a single low-frequency channel. Low-frequency sounds have long wave-lengths in air so that low-frequency tones picked up by the microphones are likely to be nearly in phase. Placing the low-frequency instruments of an orchestra near the center of the stage, so that the distances to the stereophonic microphones are nearly

equal, aids in keeping the low frequency energy in the two channels in phase. In the Westrex 45/45 recording system it is desirable to keep the low-frequency energy in the two channels in phase since in-phase components result in lateral motion of the cutter.

It is these same low-frequency components that require a large amplitude of the cutter and when voltages at these frequencies are in phase the vertical excursion of the cutter, or hill-and-dale effect, is likewise kept desirably small. The low-frequency signals for the two channels could be kept completely in phase if this part of the pick-up were taken from a third microphone placed midway between the two side microphones, and added equally to both channels. Since it is already standard practice to use three microphones when making a stereophonic recording, this proposed method of recording would not require a great change in procedure. A block diagram of how this could be done is shown in Fig. 1.

A stereophonic reproducing system that makes use of the in-phase low-frequency sound energy would have two mid-range and high-frequency amplifiers and speakers. A single amplifier and woofer would supply the nondirectional low-frequency sound energy for both channels.

Since electric wave filters are not completely effective in eliminating transient voltages, some provision must be made for removing any directional effect that may come from the transient response of the low-frequency speaker. This can be done by taking advantage of the Haas effect.

A simplified statement of the Haas effect is that if a sound reaches a listener over more than one path, the source of sound seems to be in the direction indicated by the path over which the sound energy arrived first. Thus if we excite two speakers spaced some distance apart with the same signal, but delay the signal going to one speaker, all of the sound energy seems to emanate from the speaker which does not have the delay.

This can be further illustrated by the fact that we are not confused in our directional sense when standing in front of a wall and can tell exactly where a

(Continued on page 81)

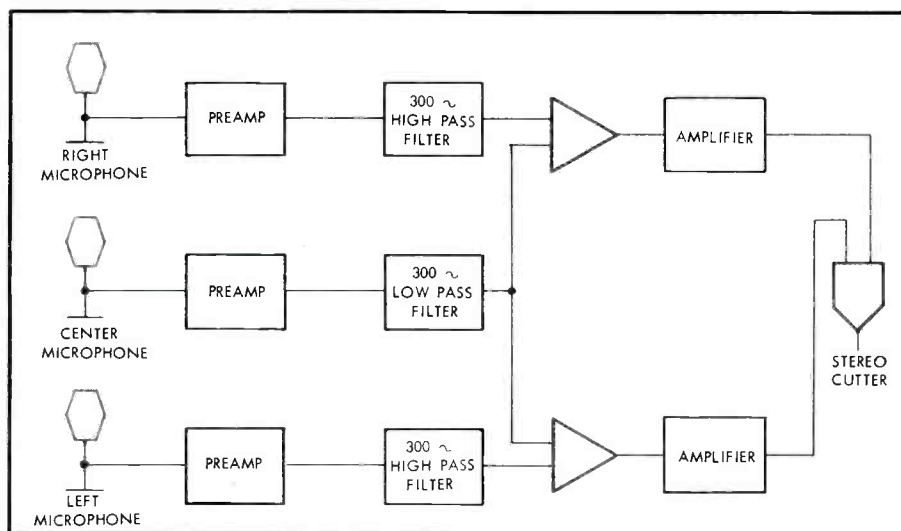
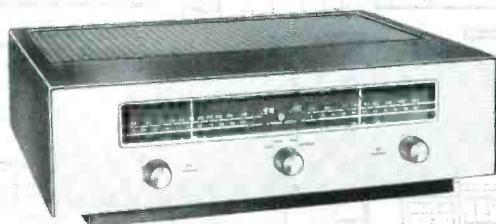


Fig. 1. Block diagram of recording system.



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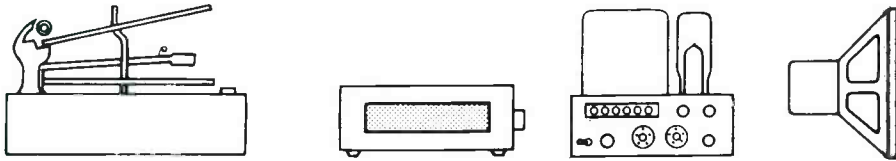
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# EQUIPMENT



# PROFILE

## Dynakit Stereo Control—Blonder-Tongue "Audio Baton"— Telectrosonic Series 900 Tape Deck

### DYNAKIT STEREO CONTROL

The Dynakit Stereo Control (DSC-1) is an inexpensive, easy-to-build kit—one evening's work—intended for adapting two conventional monophonic preamplifiers to stereo use. It is a passive unit (no tubes), so that it introduces no distortion, consumes no power, and has very little that can go wrong. Being a passive unit, it cannot supply signal gain; at the same time, it has very little insertion loss, so that there is little chance of other components having to work significantly harder at higher distortion in order to compensate for such insertion loss.

Primarily, the DSC-1 is meant to be used with preamplifiers that contain a tape-monitor switch. In such a preamplifier, the gain control is connected by this switch either to the selector switch or to the tape input jack (for accepting a signal from a tape playback machine). The tape output jack (for making a tape recording) is linked to the selector switch. The DSC-1 is inserted between the tape output jack and the tape input jack, with the tape-monitor switch in "tape" position, which causes the gain control to be connected to the tape input jack. Hence an incoming signal (tuner, phono, etc.) is routed through the selector switch to the tape output jack, through the DSC-1, into the tape input jack, and to the gain control.

The DSC-1 can also be used between the output of a preamplifier and a power amplifier. In this case, the preamplifier will always operate at a relatively high level, since gain is controlled by the DSC-1 after the preamplifier. Consequently, it may be necessary to exercise care that the DSC-1 is operated with the master gain control quite well advanced, allowing the preamplifier to operate at a reduced level in order to avoid significant distortion.

Another alternative, where the monophonic preamplifier does not contain a tape-monitor switch, is for the handy audio fan or a technician to interrupt the signal path between the selector switch and the following stage, and to insert the DSC-1 in this path.

The manufacturer further points out that the DSC-1 can be connected between a signal source (such as a tape playback machine), and a power amplifier, without an intervening preamplifier. In this case one would not have the tone controls and other facilities afforded by a preamplifier. However, a source such as a tape machine or tuner would usually provide at least a gain control.

Despite its outward simplicity, the DSC-1 reflects a good deal of sophisticated thinking about the problems entailed in controlling and coordinating two stereo channels, and it provides in a logical manner most of the stereo functions that are desirable. Let us consider these functions one by one.

1. *Master Gain Control.* The vital requirement of such a control is that it have low tracking error; in other words, throughout its rotation this control should provide about the same attenuation for each channel. Thus if the two channels are balanced when the master gain control is at maximum, then they should stay balanced as gain is reduced. When tracking error is kept within  $\pm 3$  db—that is, no more than 3 db deviation between channels—it may be considered satisfactory; within  $\pm 1$  db is considered excellent. Following are the writer's measurements on the DSC-1 he assembled. Using the left channel as a reference at various gain settings, deviations of the right channel with respect to the left channel were as follows:

Reduction in Gain of the Left Channel	Right Channel Gain Relative to Left Channel Gain
0 db	0 db
-5	-2
-10	-4
-15	-4
-20	-1
-25	0
-30	+1
-35	+0
-40	-2
-45	-2
-50	-3
-55	-5

It may be seen that the deviation ranged from 1 db to -5 db, which is equivalent to  $\pm 3$  db. If one were to set the balance control so as to favor the right channel by 2 db, then the tracking error would actually be  $\pm 3$  db within most of the range of the master gain control.

2. *Channel Reverse.* In addition to serving the usual function of allowing the left channel to be fed to the right speaker and the right channel to the left speaker, this switch facilitates balancing one's equipment for stereo. An accepted technique for such balancing is to feed the same signal alternately to each speaker, meanwhile manipulating the balance control or other controls (such as input level sets on the power amplifiers), until the sound from each speaker appears equally loud. To do so, one may feed a signal into just one channel (from a disc, tape, tuner, oscillator, etc.), and by flicking the channel reverse switch up and down one may hear the sound alternately from each speaker.

3. *Balance Control.* When the balance control knob on the writer's unit was pointed to 12 o'clock, exact balance between channels was obtained, so far as the DSC-1 was concerned. The setting for close balance is not at all critical; very little change in balance occurred between the 11 o'clock and 1 o'clock position of the control.

When the control is turned, say, to the left, this lowers the gain of the left channel without appreciably raising the gain of the right one. The writer measured about 15 db maximum attenuation of the left channel when the control was turned fully counter-clockwise from mid-position, with the gain of the right channel being increased only about 0.5 db. (The same of course applies to the right channel.)

4. *Blend Control.* This is quite a clever device, consisting actually of three controls in one: (a) At maximum counter-clockwise position, the two channels are completely isolated, operating in true stereo fashion. (b) A slight clockwise turn of the knob actuates a switch, introducing a high-value resistance between the two channels, which causes a slight amount of blending; isolation between channels is then about 20 db. As the blend control is turned progressively clockwise, the resistance, and therefore the inter-channel isolation, decreases, eventually approaching zero when the control is almost fully clockwise. (c) When the control is turned completely clockwise, another switch is actuated, causing one signal to be cut out (whether the left or right signal is cut out depends upon the position of the channel reverse switch), while the other signal is fed to both channels. This permits a monophonic source to be fed to both speakers in pseudo-stereo fashion.

The advantages of the blend control—between the points at which either switch is actuated—are at least two: First, it aids in overcoming effect of excessive microphone spacing, excessive speaker spacing, or a combination of the two. Second, at maximum blend position it permits adding the signals produced by a stereo cartridge when playing a mono record, thereby causing the audio signals (lateral informa-

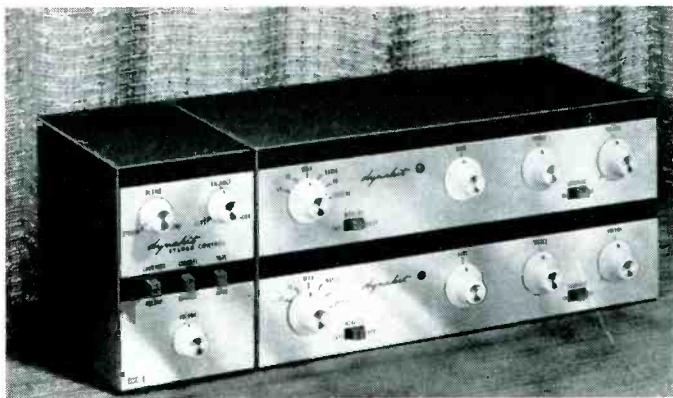


Fig. 1. Dynakit Stereo Control, shown at the left of two Dynakit preamplifiers, which it matches in appearance.

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tion) to add and the vertical rumble (vertical information) to cancel; vertical rumble is ordinarily a good deal more serious than lateral rumble.

By turning the blend control from maximum counterclockwise position to maximum clockwise, the experimentally-minded listener can make interesting comparisons among four modes of reproduction: true stereo, blended stereo, both speakers reproducing the same signal containing the total audio information and both speakers reproducing the same signal containing information only from one channel (either the left or the right, depending upon position of the channel reverse switch).

5. **Loudness Switch.** When the DSC-1 is used with two preamplifiers, the gain controls of the latter will ordinarily be at a highly advanced position, thereby allowing the gain control of the DSC-1 to cover a wide range of attenuation. In many or most cases, this will eliminate loudness compensation, which ordinarily takes place when a preamp's gain control is at a reduced setting. Therefore the DSC-1 allows bass boost to be switched in, the amount depending upon the setting of the master gain control. The writer measured about 1.25 db boost at 50 cps when gain was reduced 10 db below maximum; 5 db at 20 db below; 12.5 db at 30 db below; and 15 db at 40 below. No treble boost is provided. However, Fletcher-Munson compensation calls for relatively little, and the treble controls on the preamps are normally more than adequate for this purpose.

6. **Tape Input Switch.** When connected to preamps having a tape monitor switch, the DSC-1 pre-empts their tape output and tape input jacks, as explained earlier. Therefore the DSC-1 provides two substitute sets of tape output and tape input jacks to permit making a tape recording and playing back a recording. Pushing the tape input switch to "tape" permits one to hear the signal from a tape machine. In the "input" position, the DSC-1 feeds through the signal sources to which the preamps are connected.

Being a passive unit, the DSC-1 is a relatively high impedance affair in order to present a sufficiently high load resistance to signal sources. Hence preservation of high frequency response becomes a problem—a problem successfully met in this instance. To minimize losses due to cable capacitance, the DSC-1 is furnished with four low-capacitance cables of one-foot length—two for input and two for output.

With the master gain control full on and the channel balance control at mid-position, the writer found that frequency response was flat to at least 15,000 cps and no more than 1/2 db down at 30,000 cps. With the master gain control set for 6 db reduction

in gain, which is the position entailing the most severe high-frequency losses, response was still flat to 15,000 cps. With gain full on and the balance control set for 6 db reduction in one of the channels, there was about 1 db loss at 15,000 cps in this channel; with the balance control at extreme position (an unlikely state of affairs, involving about 15 db reduction in one channel), the loss was only about 2 db at 15,000 cps. These measurements were taken with the DSC-1 connected to a Dynakit preamp, which itself measured flat beyond 15,000 cps.

It should be added that the DSC-1 is a well-shielded unit, and the writer found that used in conjunction with the Dynakit preamp it introduced no hum problems.

B-24

## BLONDER-TONGUE "AUDIO BATON"

New amplifiers, new tuners, new preamps, and new speakers are constantly coming on the market, but this is a unique device which has functions not duplicated by any other device commonly available. To be sure, there are octave and half-octave filters, but all of them we have seen so far are of laboratory quality, and are much too sharp in the cutoff region to serve for any other purpose than making measurements.

The Audio Baton, however, while similar to an octave filter, is rather better described as a "super-duper tone control." Pictured in Fig. 3, it consists of seven separate amplifiers each tuned to a specific frequency, together with another stage which is followed by a high-pass filter in parallel with a low-pass filter, all with their outputs fed to separate level controls, nine in all. These controls are accessible from the front panel as knurled knobs, mounted horizontally below the slots located at each octave point under a reproduction of a piano keyboard. Through the slots may be seen an illuminated white column, on which a red spiral is marked; as the knob is turned, the red stripe serves as an indicator to show the amount of boost or cut that is applied at that point in the spectrum, in effect drawing a frequency response curve on the simulated scale background. Each control provides a boost of 13 db at its particular point in the spectrum, with a 13-db cut throughout the midrange, a 11-db cut at the 80- and 5120-cps points, and a 6-db cut at 40 and 10,240 cps. The controls are designated with their operating frequency, and appear at 40, 80, 160, 320, 640, 1280, 2560, 5120, and 10,240 cps.

Technically, the circuit arrangement is as shown in Fig. 4. An input level switch may be set for two ranges—0.1 to 0.6 volts,

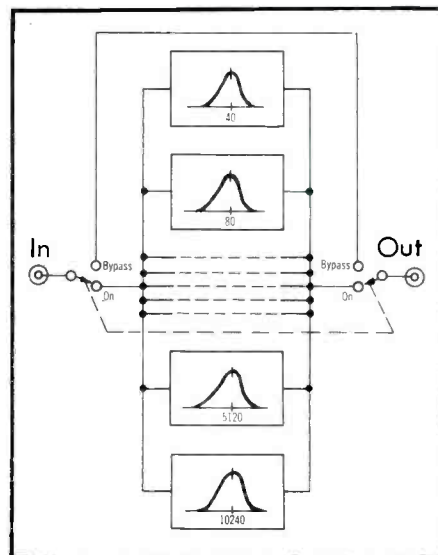


Fig. 4. Block diagram of the Audio Baton circuitry.

or 0.6 to 1.5 volts. The insertion loss of the complete instrument is zero when all controls are centered. The IN-OUT switch bypasses the frequency-correcting circuits and provides flat response ( $\pm 0.5$  db) through the two feedback-controlled output stages to an output level control. With the switch in the IN position, the equalizer section is in service, and with all controls set in the "0" position, response is essentially flat from 20 to 20,000 cps. Actually the response droops about 1.5 db between each of the "peaks" since the over-all response is the sum of the responses of the nine separate circuits, seven having responses which are essentially triangles with slopes of about 8 db per octave on either side of the center frequency, with the two filters—at the ends of the spectrum—having slopes of around 6 db per octave.

### Performance

Distortion of the instrument in the OUT position of the switch was measured at several points in the spectrum, and was constant at 0.2 per cent. In the IN position, distortion was somewhat higher, but still less than 2 per cent anywhere in the spectrum. Hum and noise measured 64 db below the rated output of 1.5 volts. Measuring the response with all controls except 1280 cps at the -14 db position, and with the 1280-cps control at the +14 db position gave an output 30-db down at 100 cps and at 18,000 cps, with practically straight sides to the curve, reaching the reference level at 1280 cps. Obviously there would be some effect on the adjacent octave controls with a slope of only 8 db per octave, but in actual listening it is unlikely that one would set adjacent controls at widely varying positions.

### Applications

The Audio Baton has a number of interesting applications other than the more obvious one of serving as an adjunct to a typical high fidelity music system. As a matter of fact, it is likely that the instrument will find its greatest popularity among recording studios—being considerably less expensive than equivalent devices produced for the professional field. We did some experimenting with dubbing tapes of unsatisfactory quality such as might be encountered from the garden-variety of camera-store tape recorder, and we would consider the device indispensable to anyone interested in dubbing from old records or

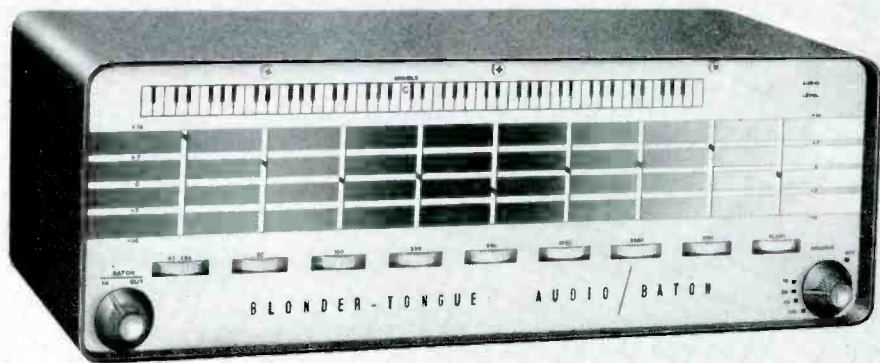


Fig. 3. The new Blonder-Tongue "Audio Baton"—an octave-band variable tone control of wide application.



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from tapes which are not quite satisfactory. There is no doubt that the Audio Baton can do an excellent job of correcting frequency response of the less serious types likely to be encountered in audio equipment. Rolloff of either lows or highs due to poor microphones or narrow-range amplifiers or recorders can be corrected easily, and response peaks can be smoothed out as desired.

For ordinary listening, it is possible to increase or decrease the presence effect, moving an instrument or a voice "out in front" or pushing it back at will. Telephone effects are readily obtained, as are a number of other special effects, and clarity of speech can be obtained by removing the chestiness occasioned by a bass control which extends too far up the scale. Similarly, screechiness can be eliminated completely.

One of the uses of rather great importance to PA system operators is in the elimination of acoustic feedback or "howl." By reducing the response at the howl frequency, it is possible to increase output level as much as 10 to 12 db without causing an appreciable deterioration of the sound quality as noticed by the human ear. As one howl frequency is corrected, another will crop out as the volume is increased, and with a few variations in setting of the controls the over-all output level can be increased very effectively.

With the Audio Baton it was easily possible to simulate the effect described by Staffen in the article commencing on page 21 of this issue. The advantage of the increase in very-low bass is quite readily apparent.

Another interesting application is in the direct comparison of two pieces of equipment—particularly loudspeakers in A-B testing. Switching from A to B while at the same time switching the Audio Baton in or out allows the listener to adjust the Baton so that both speakers sound as exactly alike as possible. The difference between them is then instantly observable on the scale of the device.

For those applications where the Audio Baton is continuously in circuit, there is one feature that would be considered desirable, even though unexpected. The nine slots through which the illuminated dial cylinders are seen are quite bright with a full 6.3 volts applied to the pilot lights. A three-position slide switch on the rear

apron makes it possible to insert resistance into the pilot-light circuit in two values, giving three degrees of illumination. We would prefer larger and more legible panel designations for frequency and degree of boost or cut, but after thorough familiarization it is likely that this deficiency would not be noticed. In general, we would recommend the Audio Baton very strongly to anyone who does much recording or dubbing of tapes or discs, and for any PA application where acoustic feedback might be encountered. While it is relatively simple to correct such troubles in permanent installations, there are many times when a PA system is set up for a one-night stand and it is not practicable from the standpoint of time and cost to effect a permanent cure. The Audio Baton could well be indispensable to the portable PA system operator.

B-25

## TELECTRO SERIES 900 TAPE DECKS

With the increasing use of preamps which are equipped with tape-head inputs, more and more music lovers are taking a good look at tape decks—as contrasted to complete tape recorders—for their home installations. One of the newest to appear on the market is the Telectro Series 900, which offers a variety of facilities in a simple tape-transport mechanism without electronic equipment. For those who wish a complete recording system, including record and play amplifiers and the necessary bias oscillators, the Telectro line includes the Model TRP-11 record/play amplifier, which provides for recording from low-level microphone input or from a high level source such as a tuner, and in the play mode has an output of approximately 5 volts which is adequate to drive a power amplifier directly. Controls include a record/play selector, equalization switch, noise balance, and gain control, and recording level is shown by a VU meter. Also available is the Model TP-12 play preamplifier which is similar to the playback portion of the TRP-11.

The tape transport itself is obtainable in five forms, depending on the head complement. Model 900-1 is equipped for monophonic recording and playback and for 2-

or 4-track stereo playback; 900-2 has three heads—monophonic erase and play/record heads, and a 4-track stereo head which may be used as a monitor during monophonic recording, or for playing back both 2- and 4-track stereo tapes; 900-3 has two heads, stereo erase and 4-track record/play; 900-4 is equipped only for playback, and has a single 4-track head which will play mono and stereo tapes; 900-5 has three stereo heads, making it possible to monitor a tape during recording. All models require amplifiers; when monitor facilities are provided, it is necessary to have playback amplifiers in addition to any recording amplifiers that may be necessary in order to avoid a lot of plug changing.

Physically, the Telectro decks consist of a 12×13 in. motor board which is covered by a dress plate which measures 13×14¾ in. This plate is satin finish stainless steel with slightly beveled edges, giving a professional appearance. The head and mechanism covers are molded plastic in a gray color. Five piano-type keys control the operation—STOP, REWIND, WIND, PLAY, and PAUSE. Above the mechanism cover are located the a.c. power switch, the speed control, and the digital tape counter. All models are arranged for 7½, 3¾, and 1⅞ ips. The mechanism employs a single motor, with belt drive to the reel hubs and to the capstan, the latter having a large flywheel for speed stability. The braking system is a single cord which rides in pulleys, and it results in an extremely smooth and effective braking action. In switching from fast wind or rewind to play, we could not perform the operation quickly enough to break the tape. Furthermore, brake action is sufficiently gentle that double-play tape is not stretched or broken. The deck requires a clearance of 1¼ in. above the motor-board, and 6½ in. below. The unit is said to be mountable either vertically or horizontally, but in the model tested there was no provision for retaining the tape reels on the hubs and we would not be satisfied with risking some of our unreplaceable tapes unless we were reasonably sure that the reels wouldn't fall off and wander around the room. However, a tilt of some 10 deg. should be sufficient to keep the reels in place. A solenoid-operated automatic stop releases the transport mechanism in the absence of tape in the slot, and does not depend on metallic strips on the tape.

### Performance

In tape handling, the mechanism proved efficient and relatively gentle. Fast forward and rewind time was measured at 1 minute 45 seconds for a 1200-foot reel of tape. The model tested was 900-3, and flutter and wow (at 7½ ips) was measured at 0.2 per cent, and in a 7-minute time test, the absolute speed was 6 seconds fast, which is within 1.5 per cent. Feeding the output of the heads to the TAPE HEAD input of a Pilot SP-215 preamp gave adequate output with the volume control at about one-quarter rotation, and at a measured signal-to-noise ratio of 53 db. Frequency response from Ampex Standard Tape #5563 played within 2 db of the 1000-cps level from 50 to 10,000 cps, and on tapes of our own recordings which have been checked against a professional machine, response was 3 db down at 15,000 cps. This testifies to the quality of the playback heads.

For installation in a home system where an attractive three-speed unit is wanted, the Telectro 900 Series appears to be well built, and to offer ease of operation together with good reproduction quality.

B-26

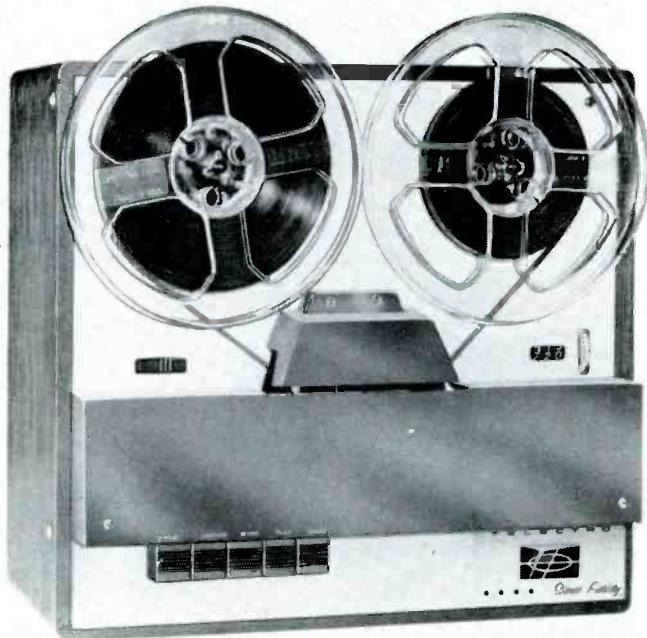


Fig. 5. Telectro 900 Series tape-transport deck.

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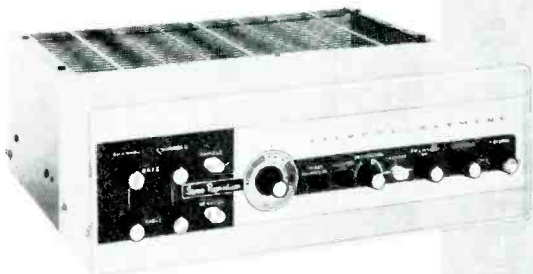
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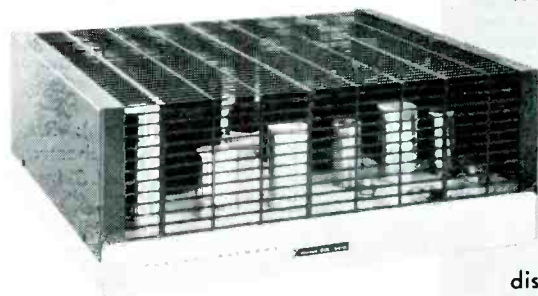
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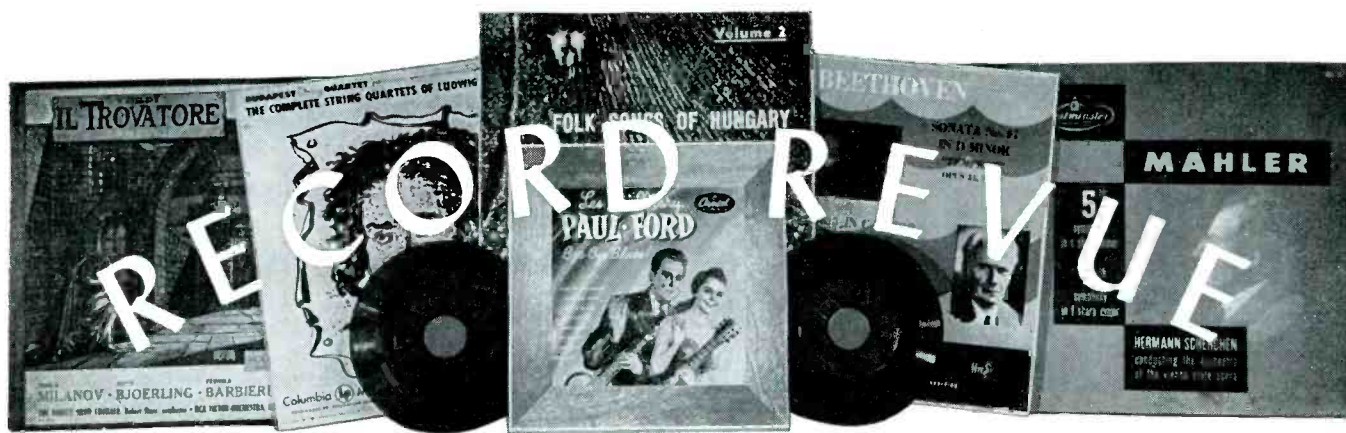
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## EDWARD TATNALL CANBY\*

### WINTER MISCELLANY

Piano Music of Chopin, Vols. 1, 2, 3.  
Wilhelm Kempff.

London CS 6040,-41,-42 (stereo)

This is unexpectedly great and profoundly pleasing Chopin from an absolutely top-notch German pianist. Unexpected to me, at least, because Kempff though a tremendous player of such as Beethoven (in a major series for Decca) seemed to me always a bit on the severe side. His Beethoven was extraordinary in every detail and in the grandeur of its conception, but he did not allow himself any "unbuttoning" of the sort that even such a big pianist as his colleague Wilhelm Backhaus can easily produce.

Yet in Chopin, Wilhelm Kempff is all grace, fluency, lyricism, with the most gorgeously luscious tones, a wholly open and expressive manner—and a shaping of nuance and phrase that is as fine as that in his Beethoven. You'll love it, as the ads say, and you'll like it whether you are a connoisseur or just a listener who loves good Chopin.

Ah—the big question: *why stereo?* One answer, of course, is that all Londons are stereo these days and a "mono" Chopin would be unthinkable. But that's no reason for us to feel like paying an extra buck per disc! So again—why? Does it add anything?

Well, not much at first, but definitely a lot more than you might expect, in the long listen. The stereo version is worth the cash, given—and this is important—a thoroughly adequate stereo system, with minimum problems in the way of hum and rumble. (Recorded level on stereo piano is necessarily low yet proper piano volume is quite high, the two combining to exaggerate hum and rumble.)

An AB-style stereo-mono listening test on these shows that stereo does add color and life to the sound of a solo piano, even without much positive right-and-left separation—of the piano itself. The space around the piano is what counts and stereo, making that space more real, makes the piano within it seem more natural and immediate. In fact, I seem to hear, or almost to feel, the length of the piano itself, the sounding instrument. Monophonically, it shrinks to a smaller scope; its sound shrinks somehow with it.

That's what stereo can do for the single sound source.

Incidentally, let me say that if your stereo is rightly phased and your speakers well placed in a good position you'll have no trouble with doubling of the piano image—a piano in each speaker. They should fuse completely. I happen to be sitting as I write with my back only a few feet in front of the two stereo speakers, one to each side of me (I am facing away from the sound source merely because I get a good light on my typewriter) and I hear no sense of duality or split. There is just one, big piano somewhere vaguely in the space behind me.

Of course, good stereo miking plays a part here. There are a good many ill-advised piano

stereos where the mikes are so grotesquely situated that you seem to hear the keyboard stretched out about ten feet with the pianist racing back and forth from side to side of your room! But this isn't stereo. At a sensible distance, two mikes will converge the piano in the proper middle position, between speakers, and will simultaneously pick up the room bounce, the echo reflections, to place the piano aurally in space. That's what London has done.

**Schubert: Symphony in C ("The Great").**  
(A) Bavarian Radio Symphony Orch.,  
Jochum.

Decca DL 79993 (stereo)

(B) Cento Soli Orch. of Paris, Argenta.

Omega OSL-12 (stereo)

(C) London Symphony, Krips.

London CS 6061 (stereo)

A glance at these duplications gives you an idea of the problems of record reviewing in stereo these days. London, last December, sent me well over fifty separate stereo discs for trial, of which (C), above, was merely one; but even that single disc had two rivals—and I am simply not able to play and absorb intelligently this huge and meaningful symphony more than, say, twice in a given day or week.

I got through the first two with my senses and intelligence intact, but London, the third to come along, was the last straw; the symphony now is coming out my ears and I am no longer honestly sure as to what is what about each version! Give me six months for contemplation and I'll write you a really informative comparison of all three.

Some judgment is surely better than none, so I suggest that as I hear them now the Decca version with the excellent Eugen Jochum is musically the most telling of these three, best in style and spirit, best especially in respect to many a lovely detail of phrasing and rhythm, best, all in all, in its projection of the dramatic moments of the work. London's with Krips comes very close behind, surely as fine in some parts, notably the slow movement. The Argenta version is noticeably less interesting, partly, I suspect, due to the all-French orchestra (oh, what a sad, wobbly, French French horn at the beginning, so unlike the German horn!)—but partly due also to inexperience in this sort of music by the young conductor. I don't go along in this case with the extravagant praise heaped up on Argenta (who died suddenly) by Omega's copy writers.

The Decca-Jochum version has excellent conservative stereo, a bit low in level and not exactly overpowering in the bass, but really fine for the music, even so. The London version is brighter, with sharper treble and heavier bass and a larger liveness; but it, too, is conservative in stereo with no very pronounced separation and mainly a heightened sense of room space to credit to the stereo aspect. The Omega-Argenta disc is somewhat like other Omegas of this series, rather sharply separated and fairly close-up, for an interesting if slightly forced effect.

**Grieg: Piano Concerto. Rachmaninoff: Rhapsody on a Theme of Paganini.**  
Philippe Entremont; Phila. Orch., Ormandy.

Columbia MS 6016 (stereo)

Boy, is Columbia's stereo getting slick nowadays! This has the suavest, most polished, massive, stacey stereo sound you can imagine: the piano is perfectly huge and auditorium-filling, the orchestra smoothly and vastly spread out around it.

Entremont is one of the new youthful prodigies of the more Romantic sort—he is in a loose competitive league with such as Cliburn and Glen Gould. He's good, this one, with all the power you could want yet a smooth, polished tone without the banging hardness of the last crop of virtuosos that came along after the war. Still, like the others in this group, Entremont will have to go on from these fine war horse works to a variety of other things—or risk stultification via endless repeats of the same music. That's the big danger for all new pianists, today. The bigger they are, the more restricted is their repertory. Until, that is, they get big enough to tell the bosses what they want to play—or else.

The familiar Grieg ripples along here in a thoroughly professional manner, nothing remarkable but, on the other hand, suffering from no noticeable boredom or falseness of feeling—which is saying a lot for a performance of this over-played piece. The Rachmaninoff, one of his very best works and the only well known one with a feeling of real modernity in it, is quite beautifully played, I'd say. The music is full of a sort of scary, witch-like electrical quality, emphasized by the quoting of the ominous *Dies Irae* melody, so often used in such music. (Cf. Berlioz' Fantastic Symphony.) The electricity is definitely in Entremont's concept, though at a lower voltage than in Rachmaninoff's own performance, as of years ago. The stuff is enjoyable in stereo.

**Copland: Billy the Kid (1938); Rodeo (1942).** Morton Gould & His Orchestra.

RCA Victor LM 2195 (mono)

A good record, this one! Here are the two Copland ballets that first launched the vogue for Western material in ballet form—they've since been followed by innumerable examples in ballet, in films, musical comedies, TV shows. Just as it took a German, Handel, to show the British how to write British oratorio, so it took the boy from Brooklyn, no cowboy himself, to write the first effective Western music for our own ballet stage.

The thing about Copland is that his stuff is strictly high-level, but it is strictly entertaining and strictly Western, without compromise. No highbrow effects here. There's a bar-room piano with thump tucks in its hammers to make it tinny enough, there's a low-down hoe-down and an old-style square dance—the titles of the parts run from Buckaroo Holiday to Corral Nocturne. But even so, the music is on a symphonic plane

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





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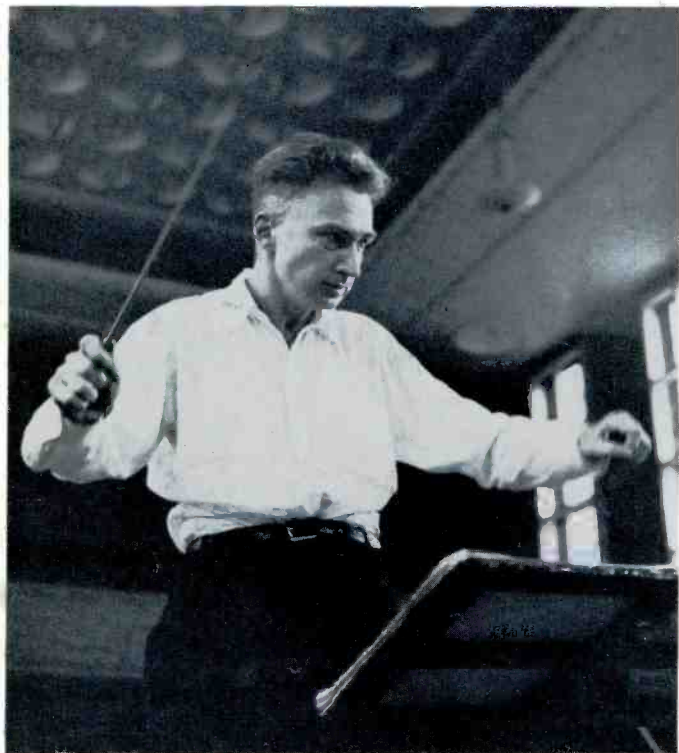
We do not recommend that you buy these records unless your equipment is of the first rank. If you are in doubt, the Audio Fidelity First Component Stereo Test Record (FCS 50,000) provides a ready means of determining the tracking ability of your high fidelity stereo equipment.

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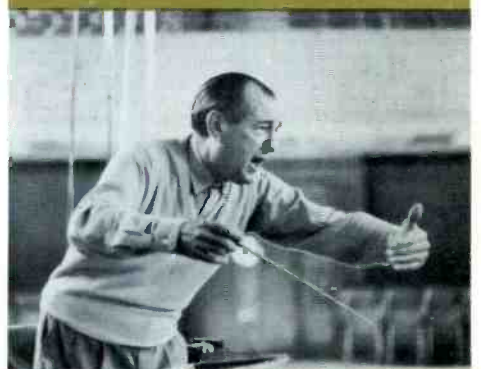
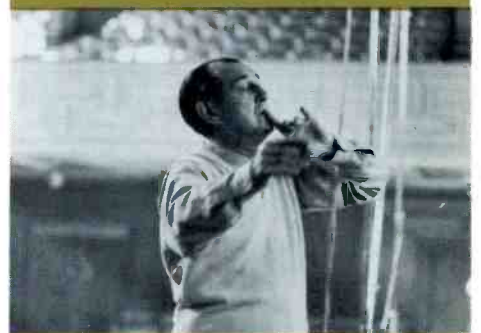


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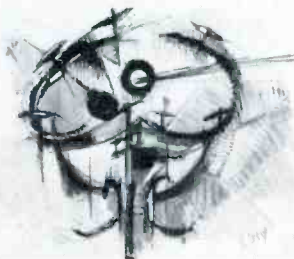
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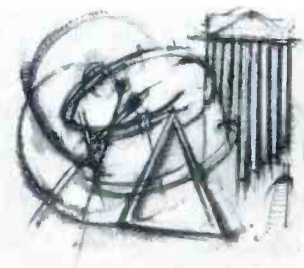
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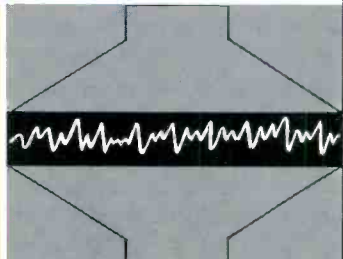
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and up to anybody's standards for "classical"; Copland showed how you could be classical and Western too and he's justly admired for it by all concerned. (Credit, too, goes to his dance colleagues, such as, here, Lincoln Kerstein, Agnes de Mille, Eugene Loring.)

It takes craftsmen like Aaron Copland to keep music alive and healthy—even if he isn't exactly a Mozart from New York. There are many such, and they are vital to musical development. I'm sure that in engineering and other sciences the same sort of men are equally admired—for the same superior skill, tenacity, imagination, inability to do a poor job no matter what. Copland is not the great American musical genius, but he is surely one of the best workers in American music ever to have put his services at our disposal. You can hear it, in his work, and you'll both respect and enjoy it.

Morton Gould was an excellent choice for these works—his playings are as fine as they come. His own orchestra is always crack-jack and though his own composing style is generally far from Copland's, he obviously appreciates the splendid new territories staked out in these ballets and his interpretation does them proud, with full understanding. You'll get the feeling he wished he'd written them himself.

**Copland: Appalachian Spring. Gould: Spirituals for String Choir and Orchestra.** London Symphony, Susskind.

**Everest SDBR 3002 (stereo)**

Lo, a new record company bursts upon the scene, and its initial offerings are just about as good as claimed, at least as here demonstrated. Everest is the offspring of the Belock Instrument Corp., via Belock Records; the parent company does fancy electronics of the ultra-secret military sort and its prime mover, Harry Belock, is a sound engineer who has designed film recorders and the like, has long had an itch to get into hi-fi records. Well, here he is (and in pops, too).

The Everest classical sound is undoubtedly top rank, with a clean, sharp effect that places it along with the best from the hi-fi specialist companies. The stereo itself is excellent for this music, projecting a large, wide symphony orchestra with clear rights and lefts (notably in groups of percussion) but with moderation, without excessive distortion of the natural perspective—definitely, stereo adds a lot here. The inner grooves of the Gould are about the loudest near-the-label sounds that have been got away with so far, and they track reasonably well, too.

Copland's sweet, cool, impersonal "Appalachian Spring" is very well played, with care and respect, by this European ensemble. My, how old fashioned this music sounds, already! It dates from 1944 and the mid-war period, but it has the feeling of the 'Thirties still; it conveys somehow the sense—so misleading—that those were the days of simplicity and directness, when life was easier. Far from it, in 1944! But even so, Copland has gone on to more complex matters now and the music of "Appalachian Spring" could never be written again. It is of a period that is irrevocably departed and as such it can't help but win the heart.

Gould's "Spirituals," from an earlier year (1941) and a younger man with deeper, more complex, more twisted emotions, is a powerfully mixed-up piece with some lovely writing in it, some agonized (and old fashioned) dissonance and a good deal of not very meaningful imitation, of Copland among others. Somehow, Gould never made the top as a classical composer; somehow, he was, and still is, a musical mind that is more than capable of the top, in that or any other field.

**Robert Prince: N. Y. Export: Op. Jazz (Ballets U.S.A.).**

**Bernstein: Ballet Music from West Side Story.**

**Warner Bros. B 1240 (mono)**

The jazz ballet with the utterly unpronounceable name—N. Y. Export: Op. Jazz—was one of the most exciting brief bits of stage show I've seen in years. The score is arranger's jazz, written-out and somewhat

self-conscious (with a passacaglia-style set of classic variations at the end) and the story is the familiar one of "teen-age frustration, expressed in intense dance pantomime. But the two together are really stunning in their impact and concentration, via the choreography of Jerome Robbins, who reaches his highest level of expression here in a field where he's been the leader for a long time. The ballet was part of a "package" sent to Europe last summer for cultural exchange, first with Menotti at the Festival of Two Worlds in Spoleto, Italy, then at the Brussels Fair. It then came back to New York, which is where I ran into it.

The recording is only the music, but even that is enough to give a sense of the American strength of this unique medium of expression. Prince is an "unknown"—or was—a working jazz arranger of the new and educated type.

Bernstein's similar West Side Story material seems oddly wishy-washy next to the "Export: Op." stuff.

**Giovanni Gabrieli: Processional and Ceremonial Music. Choirs and Orch. The Gabrieli Festival (Venice).**

**Vanguard BGS 5004 (stereo)**

Though this recording comes in both stereo and mono forms, the stereo version is by all odds the best, with greater musical reason than perhaps any recording so far done in stereo.

These are examples of the famous antiphonal music of St. Mark's Cathedral in Venice, written for two, sometimes three separate choirs and their accompanying instruments, spaced apart for an effect that is entirely and disastrously lost in any conceivable recorded version of the monophonic sort. For the first time, the original intentions of the music can begin to be realized, via stereo.

Stereo doesn't actually re-create the original, of course. That would be more than your living room could cope with. But even the moderate sense of spatial separation between two choruses, one on each side, two groups of instruments the same, and a third ensemble in the middle—plus a series of small, authentic 16th century organs similarly spaced here and there—is enough to bring musical authenticity of an extraordinary sort. No longer do we seem merely to hear endlessly repeated phrases, senselessly piled up one on top of the next. Now we discover that the repetitions come from one side and the other, a musical ping-pong game that most assuredly outdoes those famous early stereo ping-pong demonstrations we heard some years ago! Moreover, stereo fulfills its other major function here too, adding a much increased sense of room-space—a huge "hall" (cathedral?)—and bringing a new clarity of texture to the music.

The performance is done with unusually great care for authenticity, down to the old organs and the accompanying instruments, including some lovely typical Gabrieli brass. The players and singers, evidently mostly Swiss in origin along with the conductor, are earnest and persuasive. My only complaint is of the rather too march-like and metrical rhythm in a good deal of the singing, a fault, however, that is common in many renditions of the music of the 16th and early 17th centuries. Nothing to bother you.

Musicians will be especially interested in the several late Gabrieli works, from after 1600, with some remarkable harmonies and much of the feeling of Monteverdi and Schütz, Gabrieli's distinguished successors.

**Palestrina: Masses "Aeterna Christi Munera" and "Lauda Sion." Les Chantuners de Saint-Eustache, R. P. Emile Martin.**

**Westminster XWN 18693 (mono)**

We travel the world over in recorded music and we come to expect unusual sounds, customs, procedures, according to the local region we happen to be "visiting"; the differences are not great in the standard orchestras, for most ears, but when it comes to voices, the variety is often startling.

Here we are, then, in a Paris church, with

the local Choir of Parisian basses, tenors and boy sopranos. They are Parisian, if the music is Italian, and they don't sound at all like American singers, nor like British singers, nor like German or Austrian singers. Their tones are rich, brilliant and very wobbly with much vibrato. They sing slightly through the nose, as do all good French singers.

Still—music is the so-called universal language and these local practitioners are musical and dedicated to their task. The sound may be wobbly, the recorded balance rather too close in a vast space (the church) with two or three boy sopranos practically in the mike, but the music is alive and intelligently projected, with considerable discernment, taste and feeling. The pitch is generally good and the choral blend excellent (though there's some flattening now and then); above all, the mechanical sort of one-two beat so deadly in much Palestrina singing is clearly avoided, much to the good of the music.

If any choral singers, churchmen or just plain lovers of fine choral music happen to read this, they may take my assurance that this isn't a bad record at all and is worth a try, definitely. For the rest of you, I can suggest that the sound is almost as interesting as it might be if, one fine day in Paris, you should stick your head inside Saint-Eustache and hear these very singers, in the flesh. Could be.

**More of Kipling's Just So Stories. Read by Boris Karloff.**

**Caedmon TC 1088 (mono)**

Don't miss this, for kids of practically any age over two, and for you as well, if you want to be amused, delighted, thrilled, by Kipling's zany semi-parodies of evolution (a hot subject, of course, in his day). Learn here how the Elephant got his long trunk, the Leopard his spots, and of the beginning of the Armadillos, as well as the Sing-Song of Old Man Kangaroo, a swinging bit that anticipated our own Vachel Lindsay's "The Congo" by a long time. Marvellously funny reading, most sepulchral, by Boris Karloff.

**The Fading Giant (Sounds of Steam Railroading, Vol. 2).**

**O. Winston Link Railway Prods., (mono)**  
(58 E. 34th St., N. Y. 16)

A year ago I hailed Volume 1 in this Link series, made on the Norfolk & Western road just before the last steam locomotives were retired. This one, though somewhat different, is even better—good in sound, realistic, but most of all a surprisingly imaginative job of the sort that just isn't common in sound recording.

One entire side, for example, is a continuous, condensed sound journey behind a steam locomotive, without pause (except some quick transitions from one slice of steam "mileage" to another), travelling from end to end of the line including station stops, tunnels, bridges, mountain echoes and all the rest—no commentary, no explanation in sound. To clutch this unusual sequence, there is a "blow by blow" account on the jacket of the entire actual, geographical sequence of events, quite easily followed by ear as one listens to the recording. This is a superb idea, for it removes the railroad sounds from the general "noise" category into that of the specifically identified events.

Side 2 a brace of shorter excerpts, includes a winsome Christmas Eve sequence that really charmed me. In typical Link style, this one begins with the faint, random sounds of small village life, dogs, children, mothers, and in the distance a church plays carols on its bells—the printed comment even gives the name of the lady bell player. After the usual long settling-in time—most pleasurable in the listening via such fine, quiet recording—the inevitable steam train whistles in the distance, then roars past and into the station; people get on and off, there's talking, assorted station noises, then the train chuffs noisily off once more and away into the far, far distance—the sequence ending, as the train's noise dies away, with the same faint Christmas carols re-emerging from the background.

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DES INDUSTRIES ELECTRONIQUES (S.D.S.A.)  
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Lovely, just lovely, real Americana, and surely a steam bull's ticket to recorded hi-fi Heaven.

**The Queen's Birthday Salute** (Band Concert, Royal Birthday Celebration and 21-Gun Salute). Herald Trumpeters and Band of the Royal Regiment of Artillery, Major S. V. Hays, narrator.

**Vanguard VSD 2011** (stereo)

When I first put this one on, I was instantly reminded of the first time I accidentally took a three-dimensional stereo photo in double-exposure. Strange shapes, superimposed on one another, faces leering out of trees, houses at the bottom of a pond, somebody's hand in the middle of somebody else's stomach!

Ostensibly, the Queen's Birthday celebration was recorded in stereo in London's Hyde Park. The photos show its wide open spaces all right. But since when, I ask, did Hyde Park develop a large, fat reverberation, something like that of an indoor swimming pool? Or just maybe an old fashioned armory—the Royal Artillery Regiment's?

Anyhow, a huge band plays across the rear of your room here, immersed in a vast indoor space, and every so often a British commentator—also in the echo—gives a bit of story to help things along and keeps you up on the local traditions.

However, and no doubt about it, the 21 very large and very loud guns on Side 1 were recorded out doors and not in a swimming pool! Same goes for a large mass of horses, dozens of them, which trot and gallop from right to left, then left to right, then right to left again, as the music plays on in its vast echo. Most confosin'.

The recording is surely a composite, the guns and the horses taken down on the spot, outdoors in Hyde Park, the band music and commentary recorded indoors in some large place or other, the whole run together. But the effect bothers my sense of stereo realism; for either I must imagine 21 guns and a hundred horses swooshing and booming away indoors or I must visualize fair Hyde Park with some sort of enormous enclosure built around it to bring out the echo. Neither vision is very convincing, though the music is sturdy, ultra-British and nicely played, the horses very horsey and the guns very artillery-like.

Incidentally, it strikes me anew, as I listen to this, how extraordinarily conservative British popular music is, as compared to our American equivalent. These British tunes are set up in pre-Gilbert-and-Sullivan style, strictly as of around 1850 or so for the most part; John Philip Sousa sounds modern beside them—and for my ear his stuff has fifty times the pep and the strength in sheer musical terms, British tradition or no. I think most Americans will find this music rather flat and tasteless, not unlike British food.

I honestly do think that our popular taste for band arrangements and settings of old familiar tunes is much advanced over the British, both more demanding and more sophisticated in every way.

**Famous French Fanfares and Marches.**  
Band of the French Navy, Semler-Collery.  
**Epic LC 4516** (mono)

It never rains but . . . here we go with a French band, to complement the British Artillery, and the difference is as great as any old difference between British and French ways.

The "famous" French tunes won't be familiar to you probably, but the style will, and it's easy enough to absorb. Jaunty, quick music, a sort of cross between "Gaité Parisienne" and "The Bear Goes Over the Mountain," it is much less pretentious in style than the British but also musically more complex, nearer to our own style of band music. (Ours is at a higher tension, more explosive, generally more dissonant.)

There's nice recording here, with a medium liveness (not as big as an armory) and plenty of fat bass drum sounds and clashing cymbals.

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# JAZZ and all that

CHARLES A. ROBERTSON\*

## STEREOPHONIC

**Gerry Mulligan:** The Jazz Combo from "I Want To Live"

United Artists UAS5006

**Rex Stewart:** Henderson Homecoming  
United Artists UAS5009

After several months spent marking time, the new label bearing the banner of United Artists has embarked on a series of jazz recordings that tap new sources for material and promise to uncover more in the near future. The two cited here represent a fresh departure in movie sound tracks and the first recorded visit to the Great South Bay Jazz Festival on Long Island. Both offer rewarding experiences, not the least of which is that one brings jazz to the medium of films without altering its spirit and the other recreates the spirit of the Fletcher Henderson band.

Johnny Mandel wrote the entire score of "I Want To Live," employing a big band of West Coast musicians for the bulk of the picture, and this section of the sound track is available on United Artists UAS-5005. Gerry Mulligan and the small group appear in the portions which require a more subtle underlining of the complex personality of Barbara Graham, whose dramatic story is played by Susan Hayward. The film must be seen to appreciate what is accomplished by the score, and no one who sees it will want to be without one or both of the recordings.

Mulligan very nearly played with the big band, as well as the group which includes Art Farmer, Bud Shank, Frank Rosolino, Pete Jolly, Red Mitchell, and Shelly Manne. That he was unable to do so permits a closer empathy between his baritone sax and the girl's inner character on *Life's a Funny Thing*, and *Barbara's Theme*, while the big band expresses her outward manifestations. The sound track is quite different from the usual studio recording, bright and almost too large for the number of musicians. It is superbly balanced and stereo gives it the necessary perspective.

Rex Stewart took charge of the Fletcher Henderson Alumni, a seventeen-piece band concealing one or two ringers, at last summer's homecoming concert. The results show that planning and purpose have their place at a jazz festival which wants to do more than present a series of club acts. *Wrapping It Up*, a riff tune which prepared the way for the swing era, is followed by *D Natural Blues*, a more valuable and personal example of Henderson's enormous talent as leader and composer. The Alumni star as Stewart unleashes his trumpet on *These Foolish Things*, and Hilton Jefferson lends his alto sax to *Willow Weep For Me*. Trombonist Dickie Wells plays *Over The Rainbow*, and Kansas City's Big Miller sings *Hello Little Girl*.

*Georgia Sketches*, a suite in three parts by Stewart and Dick Cary, fills one side and derives its title from Henderson's birthplace. The third section, with solos by Buddy Tate, Taft Jordan, Heywood Henry and Garvin Bushell, is brilliantly orchestrated by Cary

\* 732 The Parkway, Mamaroneck, N. Y.

and deserves a place in any jazz library. Dick Olmsted, the recording engineer whose company does its share of stereo mastering for the label, worked under the handiwork of a tent which channeled the unrestrained enthusiasm of the audience in the direction of the stage. As heard in stereo, it is likely to cause you to try and slush your neighbors in the adjoining seats. Both were supervised by Jack Lewis, now joined by Monte Kay, and their association is bound to lead to other interesting developments.

### This Is Pat Moran Audio Fidelity Stereodisc AFSD5875

Quartered at the Cloisters Inn on Chicago's northside, Pat Moran is a sophisticated pianist in the modern mode, and her trio adds mightily to the nightlife of the city. Their music is for midnight listening, not the cocktail hour, and Miss Moran seems most comfortable on *Come Rain or Come Shine*, styled along Bud Powell lines, or her own brightly charging *Blues*. The dictates of showmanship involve her in a few tricks of the trade. These consist of unaccompanied pianissimo introductions, played with a delicacy that commands attention, followed by bravura passages that concentrate over the keyboard in the crowd-pleasing manner of Brubeck and Garner. They are effective on Benny Goodman's theme and *Stella By Starlight*, but she is most engaging when meeting the challenges of drummer Johnny White and bassist John Doling on a number of showtunes. The stereo sound is nicely focused and includes broad dynamics.

### Frank Sinatra: For Only The Lonely Capitol SW-1053 The Ballad Style Of Stan Kenton Capitol ST-1068

Capitol's latest stereo release in the popular vein shows a continuing reliance on large units to create an impressive spread of sound. Surprisingly, this works in reverse where Frank Sinatra is concerned and his voice, when centered between two loudspeakers is conveyed with greater intimacy than in the monophonic version. One reason is that Nelson Riddle's orchestra moves out of the background and surrounds the singer with comforting sounds. There is no lessening of lament on *One For My Baby*, but the bar and its patient attendant take on a friendly glow. A master at developing a theme, Sinatra introduces the title song by Sammy Cahn and Jimmy Van Heusen, and finds an added touch of nostalgia in Benny Goodman's signature *Good-Bye*.

Stan Kenton usually reserves ballads for the band's female vocalists, who have ranged from Anita O'Day to the current Ann Richards. On one of the rare occasions where his piano is featured for an entire set, he assumes their place in lazy delineations of the melody against rich saxophone ensembles and broad brass chords. Among the dozen outlined by the pastel side of the Kenton sound is a new song, Dale Barnhart's *When Stars Looked Down*, which fits the languid tempos. Stereo serves the orchestra well and none of the tune is dropped in the transfer, but the Sinatra

volume loses Ben Bernie's *Lonesome Old Town*.

Meredith Wilson's "The Music Man" (Capitol SWAO-990), by the original Broadway cast, heads the remainder of the list and the big, brash musical is ideal in dimensions capacious enough for Seventy Six Trombones. Robert Preston, Barbara Cook, Eddie Hodges and the hard-working ensemble, under conductor Herbert Greene, command a broad stage.

Billy May's Big Fat Brass (Capitol ST-1043), scored for stereo by the rotund bandmaster, dispenses with reeds to balance two tiers of trumpets, three played open and three muted, on the right against four trombones and five french horns on the left. In the center are two tubas and a pair of tympanists, paced by drummer Alvin Stroller. *Ping Pong*, with interludes for piano and harp, is descriptive of May's intentions on his three originals. But he evolves new and tasteful sonorities for *Autumn Leaves*, *Love is the Thing*, and *Moonlight Becomes You*. And Ray Bryant's *Pawn Ticket* is a forthright swinger.

Ray Anthony: Dancing Over The Waves (Capitol ST-1028), by way of contrast, is a straight dance set built on *Liebestraume*, *Intermezzo*, and *Melody of Romance*.

Fred Waring And The Pennsylvanians In Hi-Fi (Capitol SW-845), also designed for stereo when the dam broke last spring, features the chorus in a crackling *Dry Bones*, *Hora Staccato*, and *The Whiffenpoof Song*.

### The Randolph Singers: The Catch Club Elektra 204-X

In the first year of demonstrating its capacity to enhance various types of music, the stereo disc chanced upon few forms more suitable for the normal living room than these convivial Catches, Rounds, and Gleees from The Randolph Singers. Proof abounds of the advantages afforded by greater detail in a symphony, wider spread for a large choral work, and the increase of drama in an opera, but these works will always suffer from the limitations of the listening area. Here the engaging complexity of the material and the intimacy of the four voices, raised to the full complement of six only for Arne's *Which is the Properest Day to Drink?*, make them a natural for stereo and the home.

There is considerable discussion about the worth of stereo in its application to a small number of performers. That it shows their deficiencies with crystal clarity might well be a contributing factor. How many popular quartets can stand comparison with this group? Suffice to say, in this case, stereo brings the singers into the home and makes them welcome. David Randolph describes the eighteen songs on the liner and the complete scores are reproduced in the accompanying booklet.

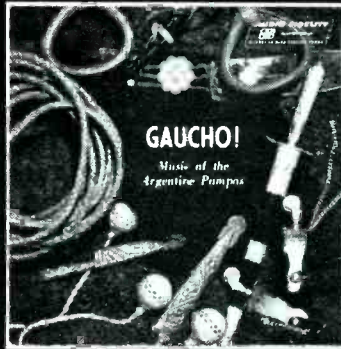
### Jazz West Coast, Vol. IV World Pacific Stereo 1009 Gerry Mulligan: Reunion With Chet Baker World Pacific Stereo 1007

The third stereo release from this label includes one of its helpful anthologies for the listener who desires a varied sampling of West Coast jazz rather than too much of any specific compartment. The territory covered indicates there is a valuable backlog of stereo sessions in company vaults and the quality, in the main, shows it has acquired a considerable know-how in the medium. The nine selections are extracted from sets prepared under the names of such leading lights as Art Pepper, Chet Baker, Bill Perkins, Bud Shank, Bob Brookmeyer, Charlie Mariano, and Jerry Dodgion.

Also included in the anthology is an inverted *Jersey Bounce*, from the album which unites Gerry Mulligan and Chet Baker in quartet context for the first time since 1953. Like most such reunions, it is more evocative of cherished memories than for concrete realities. But their affectionate recreations of *Stardust*, *My Heart Belongs to Daddy*, and *When Your Lover Has Gone* are uniformly agreeable. Mulligan writes a commemorative piece, *Reunion*, and enlists the aid of drummer Dave Bailey and bassist Henry Grimes, members of his current quartet.

Chico Hamilton: Introducing Freddie Gambrell (World Pacific Stereo 1008), gained





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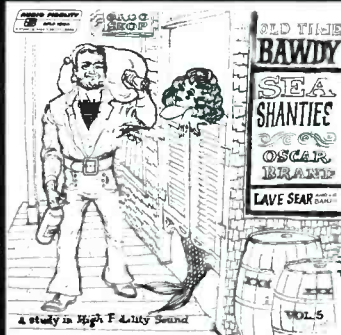
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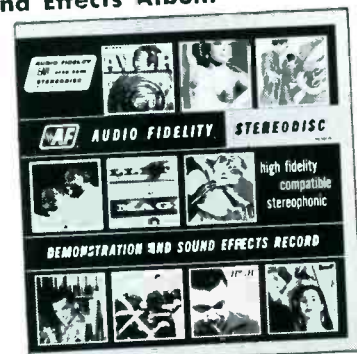
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favorable comment in this column when the monophonic version of this debut album was released last summer. In other quarters, the arrival of the young San Francisco pianist drew critical applause, although some opinions were reserved until his next appearance. Hamilton's action in discovering a new talent and launching a career does deserve a reward. One of these is the increased presence stereo gives to his drums, and one track is chosen for the anthology.

**Tony Scott: The Modern Art Of Jazz**  
Seeco CELP4250

Shortly after his return from a South African tour, Tony Scott resumed a casual acquaintance with the baritone sax and it seems to have developed into a lasting friendship. When he attended this session for the Dawn label, now absorbed by the parent company, he had owned the horn only two weeks. Trying it out on two numbers, he offers a pleasant contrast in style and tone to his usual polished clarinet, playing with rugged conviction and a touch of the swing era on *Lullaby of the Lears*. The best moments are Bill Evans' piano solo on his original *Five*, the interplay of Scott's clarinet and Shalib Shihab's baritone on *Blues for Three Hours*, and Clark Terry's succinct trumpet figures on *Tenderly*. Jimmy Knepper is vigorous and bustling on trombone, but has worked more closely with Scott in recent months.

Dave Hancock engineered the date and the balance of the rhythm section, sparked by drummer Paul Motian, is particularly good in stereo. Bell Sound cut the masters.

**Introducing Si Zentner**  
Bel Canto SR1007  
Si Zentner: High Noon Cha Cha Cha  
Bel Canto SR1011

Band sidemen, like people in other walks of life, harbor definite ideas of how things should be run. When raised to the position of leader, they usually do just the opposite of what they

had planned. An exception seems to be Si Zentner, who works in Hollywood studios and labored in trombone sections under Les Brown, Harry James, and Billie May. His sixteen-piece band, assembled from among other studio toilers for these recordings, operates with a carefree air and rare humor, indicating that all hands are contented. The crew includes Don Fagerquist, Jackie Mills, Don Lodice, Vern Friley, and vocalist Lynn Franklin. Planned for stereo, his arrangements give the engineers clean brass choirs and smooth saxophones to work with on a dozen tunes. Some are Latin-flavored and prepare the way for the *High Noon* set, where four drummers are added.

In the liner notes, Dimitri Tiomkin tells how the song affected scoring for films, and it may well have the same effect on the cha cha cha industry. Such unlikely popular hits as *Harbor Lights*, *Mr. Sandman*, and *Bye, Bye Blackbird* are converted to sultry rhythms. Billy May helped with the writing, but the resourceful lyricist for *Sonny Boy* is unidentified.

**Al Melgard: At The Chicago Stadium Organ**  
Audio Fidelity Stereodisc AFSD5886

Cited as the world's greatest unit pipe organ, the instrument in the Chicago Stadium lists a total of 40,000 pipes, 883 stops, and six manuals. Set 100 feet above the floor of the arena are four huge organ lofts, and the dynamics are manifold. No loudspeakers are required at the source to increase the volume of the tremendous pipes and they sound with natural resonance throughout the auditorium. With such physical properties, it deserves the spacious home of stereo and the care lavished on this recording.

Al Melgard, the man in charge of this mammoth beast, is well acclaimed to its peculiarities and allows for them by keeping his arrangements of popular melodies uncluttered. His showpiece is *I've Been Working on the Railroad*, complete with steaming locomotive, and he moves with elephantine good

humor through *Butcher Boy*, *Swedish Masquerade*, and *Asleep in the Deep*.

**Leon Berry: Giant Wurlitzer Pipe Organ**  
Audio Fidelity Stereodisc AFSD5845

Leon Berry's Wurlitzer is housed in the basement of his Chicago home, where he assembled it with painstaking care, and offers a sharp contrast to Al Melgard's giant instrument at the Chicago Stadium. The intimate surroundings call for a closer placement of microphones and the stereo effects are those of glockenspiel, cymbals, castanets, chinese blocks, and other special trappings. His treatment is less broad and abounds in lively detail on *Wedding of the Painted Doll*, *Cielito Lindo*, and *Cocktails For Two*. His partiality for airy tunes and light rhythms is exhibited on *Strolling in the Park*, *Harvest Moon*, and *Meet Me Tonight in Dreamland*.

**Men Of Brass, Vol. 2**  
London PS129  
Oklahoma City University Symphonic Band  
Sumco R003

Without the support of willing amateurs, exemplified here by British industrial groups and students from an American university, band music would soon revert to the military. The Brass Bands of Fodens, Fairey Aviation, and Morris Motors lead the way at annual concerts in London's Albert Hall. When massed under the baton of Harry Mortimer for purposes of stereo, they impart an impressive sound to Strauss' *Chit Chat Polka*, *Colonel Bogey*, and *Napoleon Galop*. The voices of the Sale and District Musical Society, another organization typical of a more relaxed way of life, are added for *Soldiers' Chorus*, and a sedate but powerful *Holy City*, under the direction of Alfred Higson.

James Neilson, leading his Oklahoma City University Band in the third album prepared by the Sunny-Birchard Publishing Co., Evanston, Ill., to introduce American com-

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posers, pays a tribute to the British bandsmen on William Latham's *Brighton Beach*, and Eric Leidzen's *English March*. More vivaciously American are Bill McRae's *Tangier*, and a festive Southwestern folksong rhapsody by William Rhoads. Included are Clifton Williams' *Symphonic Suite*, and Latham's *Court Festival*. Both recordings are excellent in stereo, but Universal Recording moved equipment from Chicago to the school's auditorium and aims at a sharper focus.

Didn't it Rain

Bel Canto SR1010

Members of the Wings Over Jordan Choir when it broadcast over a national network each Sunday, Tommy Reynolds and Evelyn Freeman are founders of a new group, also devoted to spirituals and based in Los Angeles. More closely aligned to gospel singing than the *a capella* radio choir, it enlists a rhythm section and an instrumental accompaniment from jazz musicians of various persuasions. Known as the Exciting Voices, they combine elements of both styles, preserving a calm dignity on *Steal Away* and *Deep River*. The jubilant shout of the camp meeting infuses *All God's Chillun*, and the handclapping beat of rock church propels the title song. When used to generate enthusiasm, the heavy beat becomes oppressive until the chorus takes over. Otherwise, the balance is good and stereo centers the interplay of mixed voices.

Francis Bay Big Band: Salutes Tommy Dorsey  
Omega OS1-16

A fixture of Brussels radio, the Francis Bay Big Band played at the World's Fair last summer and impressed visitors by its versatility. Steady employment enabled it to build up one of the most voluminous books in the business. That much of it stems from the swing era is of no import in Europe, where dancing to records of the time is still popular. Beginning with this salute to Tommy

Dorsey, the Belgians salute, on eight albums recorded in the fullness of stereo, the sources of their inspiration. A rekindling of the original creative spark is not always possible, but the modernized arrangements are uniformly suitable for dancing. Swing fans will find their society dance music on sets dedicated to Ted Heath, Glenn Miller, Benny Goodman, Perez Prado, Artie Shaw, Harry James, and Les Brown. Sides are kept under fifteen minutes and the sound is excellent.

Charleston Club Orchestra: My Fair Lady  
World Wide MGS20006

The Lerner and Loewe hit musical is in the record shops in so many different forms that it might be easily thought of as in public domain. When that time comes, it undoubtedly will be revived in an equally large number of settings, including one which will attempt to recapture the sounds of the 1950's. In all likelihood it will be possible then to feed a music synthesizer and come up with a reasonable electronic facsimile of the dance orchestras of the 1920's, plunking banjo and all. The Charleston Club Orchestra can call on the marvel of stereo right now, and engineer Rudy Van Gelder centers a live and kicking banjoist at the forefront of the rhythm section to turn the clock back to the days of Bernie, Whiteman, and Goldkette. This is the version for a dancing party or recalling fond memories. After receiving a full treatment, all the tunes are reprised in society dance medleys.

### MONOPHONIC

Tyree Glenn: At The Roundtable  
Roulette R25050

Jonah Jones: Swingin' At The Cinema  
Capitol T1083

Catering an intimate brand of jazz to supper club patrons is a lucrative pastime for the musician who can follow one of the prescribed systems and not fall into a routine. Here both leaders market relaxed swing, delivered with the strong melodic sense which

ensures back orders. To restore jaded appetites, they can always reach for a mute and mint a fresh chorus. Tyree Glenn also switches easily from trombone to vibes on *Limehouse Blues*, *Them There Eyes*, and a tasty exchange with pianist Hank Jones on *There Will Never Be Another You*. With Tommy Potter, bass, and Jo Jones on drums, guitarist Mary Osborne is as assuredly rhythmic as Freddy Green and interjects well-turned phrases. Perhaps the most flexible of trombonists, Glenn is deeply moving on *Just a Wearyin' For You*, and ranges from *Royal Garden Blues* to the latinized *Marcheta*. When some company decides to issue an LP of the history of jazz trombone styles, Glenn could play most of the parts.

Trumpering forth a dozen film songs, Jonah Jones salutes Hollywood in his usual jaunty manner, enlivening *Tammy*, *True Love*, and *Around the World in Eighty Days*. His buoyant personality at the helm means never a dull moment and he marches supreme through *Colonel Bogey*. The conviviality of his voice is infectious on *Three Coins in the Fountain*, and *Gal in Calico*.

Peter Ustinov: The Grand Prix of Gibraltar  
Riverside RLP12-283

The passion for sports cars knows no international boundaries, but never before has one person surmounted them all in one fell swoop, as does Peter Ustinov in this fanciful tale of a race on the Rock of Gibraltar. An automobile enthusiast who has owned an Aston Martin, Hispano Suiza, and Alfa Romeo, he takes inspiration from this label's recordings of the Sebring classic and is unhesitant about subjecting them to a satirical ear. All the characters found at a Grand Prix, and some mythical cars known only to the fans, are reconstructed solely by means of his vocal chords. The preliminaries are a little long, but once Ustinov establishes himself as a member of each team, both in the driver's seat and under the hood, there is no way he can lose the race or your admiration. He omits the racing widow, but she might be too close to the audio wife for comfort. **AE**

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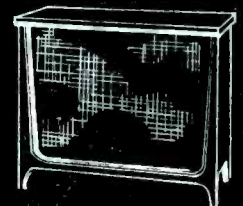
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**John Benson Brooks: Alabama Concerto  
Riverside RLP12-276**

The genesis of this work lies in an anthropological field trip Harold Courlander made to Alabama, where he studied the music of an entire Negro community several years ago. While engaged in transcribing the records brought back, John Benson Brooks became attracted to the insight they give into jazz origins and subsequently united the elements of blues, hollers, spirituals, and children's game rhythms in a concerto of four movements. The challenge of this material, to both composer and musicians, is in keeping it simple and free of worldly deceptions, no small feat for persons of some sophistication. For this reason, Brooks employs a quartet, joining it on piano in the third movement on *More, Members, More*, and is closely guided by the vocal character of the original themes. He sets spare ensembles, loosely woven together by written solos and extended improvisations, that follow the cries of children at play or capture a spirit of religious intensity.

Art Farmer, on trumpet, and alto saxist Julian Adderley reduce their styles to the bare essentials of traditional call-and-response exchanges and the undeviating flow of sincere emotions. Due to their sensitive collaboration, aided by Milt Hinton, on bass, and guitarist Barry Galbraith, the composer is more successful than in his previous efforts at combining folk music and jazz. This time his sources are less urbanized and the transfer to another form is negotiated without loss of basic qualities. He delves deeper, in this respect, than other young modernists who are trying their hand in this field and the results hold great fascination for folklorists and admirers of both recent and early jazz styles.

It is unfortunate that the only place for a work of this importance seems to be the recording studio. Concert performances are likely to be limited to brief sections because of an over-all length of forty minutes. The ad lib solos lend themselves to interpretation by a variety of players and it deserves a recording with a different personnel more than many pieces constantly turning up at

a number of sessions. Perhaps Riverside will find the way clear, until musical and financial prospects are exhausted, to make its repetition an annual event.

**John Coltrane: Soultrane**

**Prestige 7142**

**Lee Morgan: Candy**

**Blue Note 1590**

Two of the younger men of jazz appear as the only horns on LP's which offer much satisfaction to those devotees who take delight in watching the development of talent into a personal entity. Both have worked toward creating an individual, easily recognizable in any context, and molding it into plastic line with a lyric quality that is distinctly their own. John Coltrane's achievement of this goal is displayed on *Russian Lullaby, I Want To Talk About You*, and *You Say You Care*. The lament of his tenor sax on a blues, *Lament For Ernie*, is explanation enough for the album title. His companions are pianist Red Garland, bassist Paul Chambers, and drummer Art Taylor.

Lee Morgan, a protege of Dizzy Gillespie, would scarcely deny his influence, nor does he try to disengage himself from it on the rapid *C.T.A.* However, his conception of the melodic *Candy, All The Way*, and *Personality* would not be mistaken for that of Gillespie. Differences of feeling and the humor of his approach are conveyed by his trumpet phrasing. His assistants are pianist Sonny Clark, bassist Doug Watkins, and Art Taylor again.

**Sonny Rollins And The Big Brass**

**Metrojazz E1002**

A reminder of the diminished status of big bands during the last decade is explicit in this first encounter, on a new subsidiary of M-G-M, of Sonny Rollins and the big brass. Few players attain his stature, even in these trying times, without recording as a sideman in one large studio orchestra or another. Where soloists once served an apprenticeship in section work, his style was formed in an atmosphere free of such restrictions and is completely representative of a generation trained in small groups. It is not readily adaptable to conventional band arrangements and Gil Evans offered a partial solution to the problem, in writing for Miles Davis and Julian Adderley, by scoring frameworks for individual soloists.

Arranging four numbers for a dozen men and the featured tenor saxophonist, Ernie Wilkins takes this process a step further, giving the brass accents fully characteristic of Rollins and allotting his trait of using pedal points to punctuate a phrase to Dou Butterfield's tuba. The performances are finely integrated, but their strength is also their weakness. It is hard to imagine them played, as constituted here, without their main protagonist. To complete the circle, Wilkins might rework Rollins' *Grand Street*, a melodic number containing a warm cornet solo from Nat Adderley, and forward it to Harry James for trial by his new band. *Far Out East*, the one original from Wilkins, introduces the Belgian-born guitarist Rene Thomas.

One side finds Rollins in his now accustomed trio context reviving *What's My Name*, and a robust *Manhattan*. He also brings his attention to bear on an old Rudy Vallee favorite, *If You Were the Only Girl in the World*, effectively played in 4/4 time and as a waltz. An unaccompanied *Body and Soul*, quite naturally, invites comparison with the classic 1939 version of Coleman Hawkins.

**The Arrival Of Victor Feldman**

**Contemporary C3549**

Since journeying to these shores from Britain in 1955, Victor Feldman appeared as sideman on several dates, but this album is the first to signify his arrival as a leader in this country. A triple-threat man on vibes, piano, and drums while with the English band of Ronnie Scott, he now delegates the percussive effects to Stan Levey. Along with Scott La Faro, who also makes somewhat of an arrival as a powerful and inventive bassist, they form a trio capable of handling such

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\*Patent applied for by E. M. Villchur, assignor to Acoustic Research, Inc.

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Harry Arnold: Big Band + Quincy Jones  
**MerArcy MG39139**  
 Harry James: Harry's Choice!  
**Capitol T1093**

Brightened considerably when Harry James displayed his revitalized unit last summer, the big band picture is even clearer with the arrival of an import from Sweden. Harry Arnold was last heard introducing Ernestine Anderson, an American singer who first found fame abroad, and now enjoys an association with composer-arranger Quincy Jones, a native of this country quartered in Paris. Several of the soloists are known here for their work with small groups and include pianist Bengt Hallberg, alto saxist Arne Domnerus and trombonist Ake Persson, our personal favorite. Jones is in the Basie spirit in his contributions to the date, offering a warm contrast to Arnold's coolish *Brief Encounter*. Trumpeter Benny Bailey, a section mate from the Hampton band, is featured on *Meet Benny Bailey*, and Horace Silver's *Doodlin'*. This last arrangement, along with one of *Room 608*, belongs in every jazz library and indicates that Jones will make himself heard from abroad.

Harry James also continues under the Basie spell and his trumpeter, both muted and open, thrives on new settings from Ernie Wilkins for *Moten Swing*, *I Want a Little Girl*, and *Willow Weep For Me*. Together they work up a handsome *Blues For Sale*, and Wilkins writes a gaily striding *Just For Fun*. The sax team of Willie Smith and Sam Firmature carves neat phrases above the breezy rhythm section.

Arthur Lyman: Hawaiian Sunset  
**HIFirecord R807**

By virtue of the reverse logic peculiar to record companies, the program most suitable as a preface to the work of Arthur Lyman arrives as the third of a series. The primitive instruments which he employed to achieve a unique blend in his previous efforts are returned to their natural setting. Instead of mixing exotic South Sea sounds with classic, popular, and modern jazz idioms, he plays the ballads of Hawaii in typical native style. Fewer aural surprises are furnished, but there is the novelty of hearing this music handled with skill and an authentic touch. Seldom has it been performed so well, and many listeners will find themselves revising their estimate of the languorous melodies.

The familiar *Sweet Leilani* no longer seems trite, and *Hawaiian War Chant* is revealed as a love song. A conch shell heralds *King's Serenade*, and included among the other traditional numbers is the *Wedding Song*. As before, the Kaiser Aluminum Dome contributes to the superb sound and a stereo version is available. If Lyman's talents have somehow escaped your notice, this album provides an introduction upon which to base a lasting acquaintance.

Felix Slatkin: The Military Band  
**Capitol W1056**

At the head of a seventy-piece group composed of Hollywood musicians and delegations from service outfits, Felix Slatkin displays another facet of his conducting experience, gained leading an Air Corps Band while stationed at Santa Ana, California, during the war. A *Salute to the Services* medley awakens to *Reveille* and presents official versions of the anthems of each branch, tied together by a variety of drum corps rhythms from the eleven-man percussion section, before *Taps* and a mighty *Star Spangled Banner* at the close. There are six Sousa marches, with a section of seven for the piccolo passage in *Stars and Stripes Forever*, and a task force of six tubas adds depth to *Under the Double Eagle*, and *American Patrol*.

In dealing with an organization of such quantity, Slatkin never lets the quality deteriorate or the marching beat bog down. The first-rate sound has plenty of space, but you may easily prefer the stereo disc which is due in the stores by the time this note appears.

**Atilio Stampone: Tango Argentino**  
**Audio Fidelity AFLP1880**  
**Piano By Mores**      **Capitol TI0159**

For some years the tango has suffered neglect because of the concentration on other Latin American rhythms and these albums, both recorded in Buenos Aires, will go a very long way toward righting the balance in the eyes of the public and recording companies. The two leaders are excellent pianists, popular in Europe where love of the tango never lapsed, and their music is ideal for listening or dancing. Tangos grow as rapidly in their native clime as popular songs do here and none of the dozen tunes played by Atilio Stampone is a holdover from Valentino days. His orchestra is broadcast over Argentina's two top radio networks and Audio Fidelity's Sidney Frey and Johnny Bubbers flew down to ensure the quality of the recording.

Mariano Mores varies his collection with milongas, a waltz and his two-part concert piece, *Tango Rhapsody*. He turns back the pages for *La Comparsita*, but six numbers are from his own pen. Focal point of the arrangements and the recording is his sparkling piano, in contrast to Stampone's tendency to display the orchestra. If the tango ever displaces the cha cha and mambo in these parts, both men should be on the first northbound plane. **Æ**

## NEW LITERATURE

• **General Electric Company, Dept. SEC,** West Genesee St., Auburn, N. Y., announces specification sheets on six new GE "Stereo Classic" high fidelity components. They are:

Sheet No.	Product
EP-598A	—Models FA-11 and FA-12 FM-AM tuner.
EP-594	—Models GC-5, GC-7, and CL-7 stereo cartridges.
EP-651	—Models MS-4000 and MS-2000 stereo amplifiers.
EP-654	—Model LH-12 speaker system, Model LC-12 coaxial speaker, model LK-12 two-way speaker system kit.
EP-671	—Model MF-1 stereo preamplifier.
EP-674	—Model RG-1000 stereo remote control.

All are available from authorized GE hi-fi component dealers. Name of your nearest dealer may be obtained by writing to the address shown above. **B-12**

• **Belden Manufacturing Company, 4647 W. Van Buren St., Chicago 80, Ill.,** offers 382 new stock items in its 1959 Electronic Wire Catalog No. 859. This new catalog has been completely re-designed with all wires grouped by type and application, for easier use. All essential electrical characteristics and construction details are shown for each item, with each type of wire clearly illustrated. Typical listings include shielded microphone and power supply cables, TV camera cables, hi-fi, stereo and phonograph cables, and cables for installation of intercom equipment. **B-13**

• **Microtran Company, Inc., 145 E. Mineola Ave., Valley Stream, N. Y.,** has available a new short form catalog listing complete specifications of Microtran transformers. These include miniature, subminiature, transistor, MIL-T-27A, and industrial transformers which are available from distributor stock. The short form catalog serves as a ready reference for a quick run-down on Microtran transformers, showing the wide range of models at a glance. **B-14**

• **Leonard Radio, Inc., 60 Cortlandt St., New York 7, N. Y.,** announces publication of the "Hi-Fi Guide," a 128-page catalog of high-fidelity parts and equipment. Contained in the book are complete listings of monophonic and stereophonic components of the catalog are available on request, as well as related audio accessories. **B-15**

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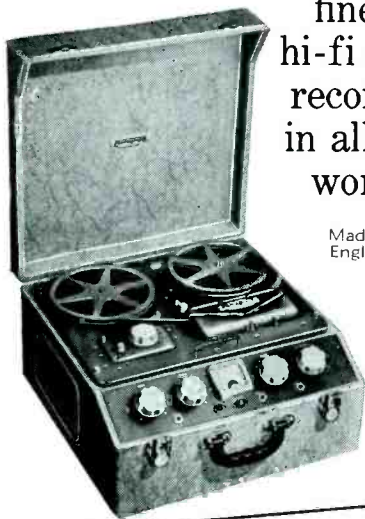
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## CONVERTING TO STEREO

(from page 25)

The price of the complete conversion kit, which includes detailed instructions and patch cords is \$38.20. Heads made by other manufacturers can be substituted provided they have similar dimensions and electrical characteristics.

### Conversion Steps for Monophonic Machines

1. First of all, remove the old combination head from the mounting plate and unsolder the leads to the head. These leads are then connected to the pins of the upper tracks of the new quarter-track erase and recording heads.

2. The scale template of Fig. 4 is then glued or taped to the under side of the mounting plate. The two head mounting holes are center-punched and drilled, and the heads are bolted to the plate as shown in Fig. 2.

3. The head assembly is put back in the nest as shown in Fig. 5. The miniature phone jack is shown mounted on the head cover, which is lying upside down just above the head nest in the photograph. The bottom channel of the record/playback head is connected to the miniature jack. To the left of the head nest is the spring hold-down clip which has a piece of sponge rubber cemented to it to help apply pressure downward on the head assembly.

4. The screw to the left of the erase head on the base plate is used to azimuth the pickup head for maximum high-frequency response on playback of pre-recorded tapes. The tape location across the faces of the heads should also be checked against that shown in Fig. 2. Spacers or shims should be used if neces-

sary to obtain the correct head height.

5. The foregoing is all the modification required on the recorder to convert it to stereo playback. The recorder amplifier and sound system is used for one channel. Any tape playback amplifier (the Nortronics PL-100 is an example) may be connected to the second head channel thru the miniature jack. Together with a speaker, this gives the second sound channel for stereo reproduction.

6. If another amplifier is available that does not have a tape head input with NARTB equalization, then a pre-amplifier can be added. Figure 6 is the circuit diagram of such a preamplifier which may be mounted on the chassis of the power amplifier, using the same B+ and filament supply. It has from 0.1 to 0.5 volts output, and so will drive most crystal phono cartridge or tuner input circuits. The preamplifier may, of course, be built up on its own chassis with its own power supply.

7. The recorder may still be used for monophonic recording and playback, in addition to stereo playback. For monophonic application, the top channel is used in the same manner as with the half-track system.

### Conversion of Half-Track Stereo Machines

8. These machines come equipped with a half-track in-line stereo head, and a single-channel erase head. If we replace the two heads with the quarter-track erase and record heads, then we shall be able to play back quarter-track stereo, and also record and play

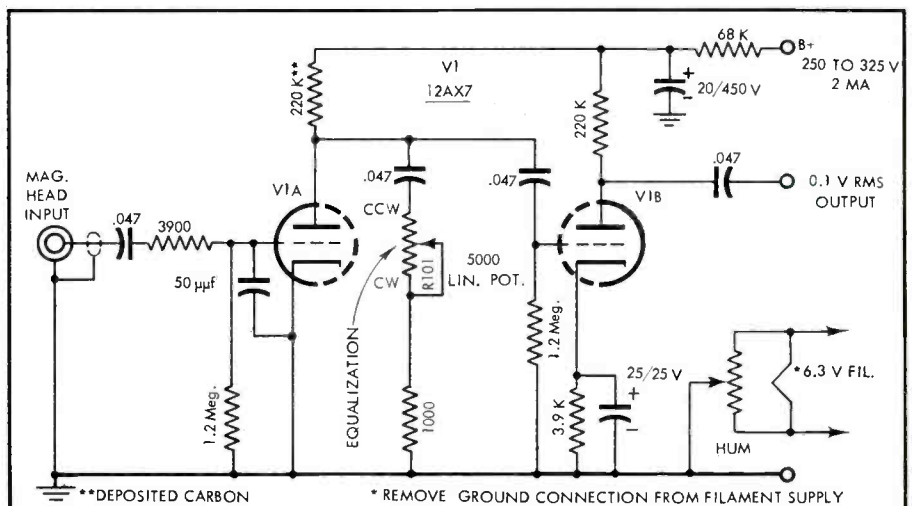


Fig. 6. One-tube preamplifier and equalizer for converting most audio amplifiers to NARTB-equalized tape-head input.



back quarter-track monophonic tapes.

9. Remove the present heads, using a hand drill to drill out the eyelets holding the erase head in place. The old half-track monophonic erase head may be left in, if desired, to simplify the playback conversion. This erase head will be adequate for monophonic recording. It may be replaced at a latter time when the step to stereo recording is made.

10. Mount the new heads and make the adjustments exactly as described previously, for the conversion of the monophonic machines.

#### Adding Stereo Recording

11. An additional recording amplifier is required to permit stereo recording. Either the Nortronics RA-100, or the Viking RP-61A will be satisfactory. The RA-100 is used for recording only, while the RP-61A has a preamplifier for use during playback. A minor internal modification is required on the RP-61 for correct bias, since it does not have a bias control.

12. It is also necessary to synchronize the bias oscillator of the tape recorder with that of the recording amplifier. This is normally accomplished by connecting the plates of the respective oscillator tubes together through a coupling capacitor. The RA-100 and RP-61 already have a synchronizing jack on the rear of the units which connects to the oscillator plate.

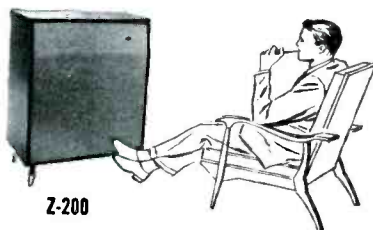
13. On the tape recorder, a .0047  $\mu$ f 400-volt paper capacitor should be soldered to the plate terminal of the oscillator tube. The other end of the capacitor is connected to a patch cord which may then be plugged into the synchronizing jack on the recording amplifier.

14. For dual channel erasing a set of jumpers is connected between the upper and lower pins of the erase head. The erase head is then operated by the recorder oscillator. It is not necessary to remove these jumpers for monophonic recording since the second track is not used.

With the two recording amplifiers synchronized together stereo recording is now possible. Two microphones may be used for recording live material, or stereo programs from the radio may be put on tape. Using a turntable and stereo cartridge, we can copy stereo discs on to quarter-track tape. In addition we can also copy stereo tapes by using two machines, one for playback and one for recording.

Either 7.5- or 3.75-ips tape speed may be used for recording, depending upon the requirements. Difficulty may be experienced with excessive high-frequency response at the higher tape speeds due to the improved performance. This can be corrected with the equalization control on playback. **Æ**

# SO UN D WITHOUT FURY



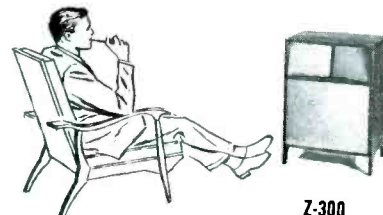
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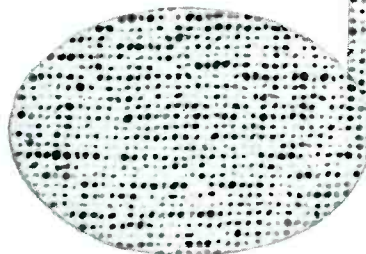
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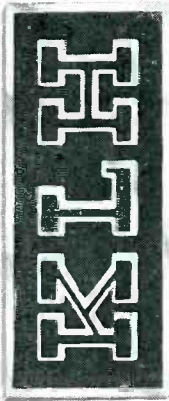
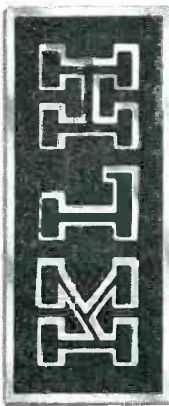
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# ABOUT MUSIC

## The Piano vs. the Harpsichord

HAROLD LAWRENCE\*

EVER SINCE the end of the 18th century, when it lost its pre-eminent position in the keyboard world, the harpsichord has been maligned, maltreated, and misunderstood. To the Romantic Age, its musical value had been totally demolished by the advent of the new pianoforte, next to which it appeared as primitive as the electric friction machine is to the storage battery. It seemed as if the harpsichord, along with the shawm, cornett, and serpent, was to be relegated to museum exhibits and music encyclopedias.

References to the sound the harpsichord made were contemptuous—a custom that has continued to the present time. Vaughan Williams, for example, compared the harpsichord to the “ticking of a sewing machine”; another critic described its tone as “a scratch with a sound at the end of it”; and even Virgil Thomson, who is pro-harpsichord, wrote of a harpsichord recital as “a shower of needles.”

Throughout the 19th century, the harpsichord was absent from the musical scene. Its reappearance was brought about by the turn-of-the-century reaction against German romanticism, bringing with it a fresh evaluation of early music. Little by little, the 19th-century attitude towards music written before Beethoven's *Eroica* gave way to a more enlightened approach. Discerning musicians chose to bypass transcriptions of early music and went directly to the source, investigating original scores, studying performance standards of the Baroque and Renaissance periods. Instruments such as the recorder, *viola d'amore*, and harpsichord were utilized in order to recreate the sound as well as the style of the early works.

While it must be frankly admitted that, to the general public, Bach's sonatas for violin (unaccompanied) performed with “Bach” bow, or Purcell's Fantasias played by a “chest of viols” is of little more than academic interest, harpsichord recitals have become popular features of today's concert life, thanks to the pioneering work of Wanda Landowska, who has regularly performed for sold-out houses and whose recordings often outsell other instrumental releases in the RCA Victor catalog. Landowska's recording of Bach's *Goldberg Variations*, for instance, sold more than 35,000 copies during the first six years of its release.

The nature of the harpsichord's return to the 20th century after more than a century's retirement, indicates that its life cycle is far from completed. Unlike the *viola da gamba*, whose growth long ago reached its final stage, the harpsichord is very much alive. Contemporary composers have written works especially for it, manufacturers have made various changes in its design and construction over the past fifty years, and the demand for new harpsichords has reached an all-time high in our time.

There is hardly any danger of the harpsichord displacing the piano, as was the

case in reverse in the last years of the 18th century. The piano is and will remain the leading keyboard instrument. More to the point is the fact that the harpsichord possesses qualities which render it uniquely suited to certain musical styles and periods.

A “band of guitars” is one of many descriptions applied to the harpsichord, whose strings are plucked by quills or leather-point plectra. Basically, the mechanism operates in the following manner: A key is depressed, raising an upright wooden rod (“jack”) to which is attached a quill (or leather tag). The quill plucks the string, then falls back to its original position, neatly bypassing the string in its descent. At the topmost end of the jack is a damper which stops the string's vibration when the key is released.

The first obvious difference between the piano and the harpsichord lies in tone production. Touch plays an all-important role in piano technique where hammers strike strings. On the harpsichord, finger pressure has no significant effect on tone quality; the string is plucked only when a certain minimum force is applied, and pressure beyond this point does not appreciably alter the tone, though a really determined pounding will be heard slightly differently.

This dynamic inflexibility was recognized by early harpsichord builders who added a second keyboard (manual) for loud-soft contrasts. (Later instruments were built with as many as four manuals.) Different timbres were obtained from the same keyboard through the use of multi-jack mechanisms. That is, several jacks were mounted along the same string, tonal variety being achieved by means of (1), differing plectra material and (2), position of the jacks on the string (just as in violin playing, variety in dynamics and tone color can be accomplished at different points between the bridge and the finger board). Stops of 4', 8' and 16' were also incorporated, giving the harpsichord a wider range. (Bach's instrument, for example, had a 5-octave compass.) Thus, the development of the double keyboard and compass/timbre stops provided the player with an enlarged dynamic, tonal and expressive palette.

By itself, however, each dynamic level and tonal setting is still inflexibly produced. Once the player has selected a particular registration for a phrase or section, gradations within that framework are impossible without stop changes. The pianist, on the other hand, is faced with no such restrictions. He may proceed from a *piano* to a *forte* without shifting gears, hence the name *pianoforte*.

It was the *piano-forte* capability that put the harpsichord out of business in the last part of the 18th century. In an attempt to compete with the first pianos, manufacturers of harpsichords adapted the “Venetian swell” to their new models. This mechanism operated on the Venetian-blind principle, letting out or shutting in sound. It was a crude device that merely served to

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# Now! The Most Important Product Announcement in the History of H. H. Scott!

underscore the natural superiority of the piano in this respect.

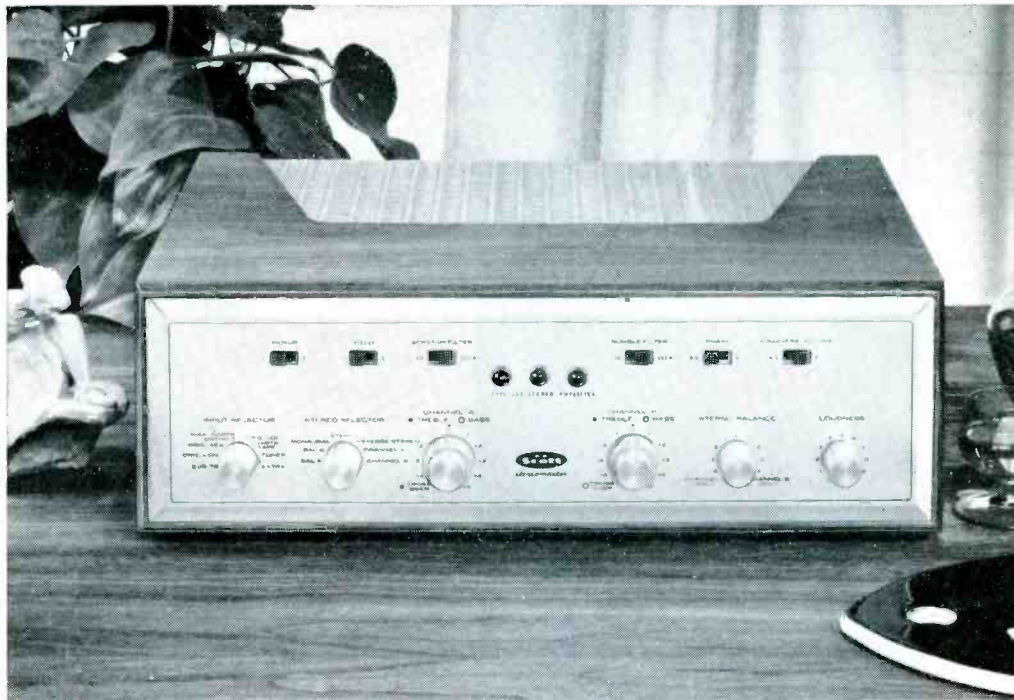
All the evidence would seem to indicate that the harpsichord is guilty of the charges of inflexibility, twanginess, and gross inferiority to the piano. Logically, it should have never returned to active life. But the very mechanical limitations that brought about its retirement 150 years ago now are responsible for the harpsichord's renaissance.

As performed on the harpsichord, the contrapuntal texture of Baroque music emerges with marvellous clarity, especially in the mid-low range. The even dynamic levels of the harpsichord have an almost detached serenity that well befits the well-ordered fugues of Bach and the variations of Frescobaldi. Because of the instrument's dynamic rigidity, slow movements of 17th and 18th century composers' works are sprinkled with mordents, turns, slides, and other embellishments, most of which sound out of place on the piano.

The special sound "outour" of the harpsichord was employed to full advantage by Falla in his *Harpsichord Concerto* and *El Retablo de Maese Pedro*, as well as in works by Poulenc and other moderns. Ever since Alec Wilder applied the harpsichord to popular music, it has figured prominently in Tin Pan Alley, thanks mainly to such A & R men as Mitch Miller.

The musical world is by no means undivided over the respective merits of the piano and harpsichord in works by pre-19th century composers. The instrument's majestic clang fails to palpitate the hearts of thousands of music lovers who maintain that the piano is superior in all clavier music.

There are, of course, musical areas in which the piano and harpsichord overlap. These are the areas where most disagreements take place. But the harpsichord reigns supreme in such works as Purcell's Suites, Byrd's Pavanes, Couperin's delightful tone paintings, and Pachelbel's Fugues. Æ

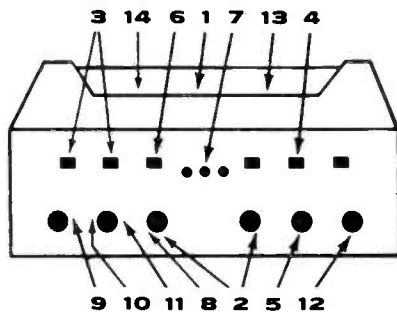


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Feb. 7-10—San Francisco, Cal.; Cow Palace. (*IHF*, Northern Cal. Audio Shows, Inc.)

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## DISC-HOP CONSOLETTA

(from page 36)

cross-talk is believed to come from close spacing between the channel switches rather than from the mixer busses (see Fig. 4).

The negative plate-supply buss connects to a chassis ground at only one point. A mounting screw on the first microphone input transformer was selected for this. All component grounds are made directly to this buss and not to the chassis ground.

To prevent “ground loops” and transient noises, only insulated shielded cable was used where shielded cable runs were necessary.

Lever type, three-position, positive action, switches were used after all channel mixers. Because of the make-before-break contact arrangement of these switches, we experience absolutely no switch “clicks” when one is used. When the switch is in the center position, it shorts that mixer stage to ground. This helps eliminate cross-talk and “leak-through” from the channel when it is not being used.

Only on the two microphone channels were the second half of these switches used. The bottom contacts were used to activate the speaker muting relays when the consolette is used at the studio. The contact action is brought out to the back of the chassis through a four-contact female Jones plug.

While we tried to economize in other parts of the unit, this was not the case when transformers were selected. In most part, our selection of audio transformers accounts for the fine frequency response and low hum level obtained in this amplifier.

A quantity of carbon-deposited resistors were used in the amplifier circuit. They aided materially in giving us a low noise content from the preamplifier stages. They cost a little more, but they are well worth the additional expense.

### Operation and Handling

In case the mixer-amplifier fails while we are doing a non-broadcast program, it is possible to continue programming by plugging one of the transcription arms into a phono input on the public-address amplifier. An “in-the-line” microphone transformer is used to convert our 50-ohm broadcast microphone from low impedance to high impedance, matching the microphone input on the public-address amplifier. This feature allows the operator to continue with the public-address program until our repairman arrives.

To keep our outfit from being defaced while it is being moved, a heavy canvas

cover was made so it could be protected. The unit is moved from place to place in a pickup truck and this cover serves to protect it from the elements in bad weather.

Instruments used to make the performance measurements are the same ones we use to take “proof-of-performance” measurements on our broadcast equipment. No external ground was made to the equipment being tested. We wanted to simulate, as nearly as possible, conditions which exist when the unit is used on remotes.

### Performance

Earlier the frequency-response measurements were given for the microphone preamplifiers and the phono preamplifiers. Frequency-response measurements taken by feeding tones into the auxiliary input channel gave us  $\pm 1$ -db variation in level from 30 to 20,000 cps. Hum and noise combined, were 62 db below 0-db output at the amplifier line-output terminals. Distortion proved to be no greater than 0.75 per cent at any frequency from 30 to 20,000 cps. Above 100 cps, the distortion was no greater than 0.5 per cent.

The average unloading and setup times are from 15 to 30 minutes, usually the lower figure if we don't have to check out a remote line.

A local trucker has been contracted to move the unit for us. An engineer goes with him to help move the unit into place and connect it. The announcer or operator helps the trucker disconnect it after the job and load it on the truck.

Our Double-Duty Disc-Hop Consolette has been to County fairs, school dances,



Fig. 6. Double-Duty Disc-Hop Consolette broadcasting from a location at local county fair.

zoos, museums, sponsors' showrooms, and many other places. Its appearance fits in well everywhere and it never has failed to draw a crowd.

The equipment described, including the public-address amplifier and its speaker and stand, cost us about \$550.00 to build. If we had been able to purchase a unit like it, the cost might have been something like \$1000.00.

Although we had no deadline to meet, and it was necessary to spread the expenditures over a period of time, our complete unit was "proofed-out" a little over three months after receiving the go ahead.

This station now has two Double-Duty Disc-Hop Consolettes. The black one shown in some photos has fewer mixing channels, one microphone and two phono channels. Other than this, it is essentially the same as the one described.

In conclusion, our station is more than happy with the results our unit has given us. We can directly credit it with making money for us and bringing in more listeners.

I wish to express my appreciation to the management of WILS and to the engineering department. Without their confidence and helpful assistance, the Double-Duty Disc-Hop Consolette might never have been built.

#### PARTS LIST

##### Resistors, carbon or metallized

- 2 180 ohms, 1 watt
- 1 560 ohms, 1 watt
- 2 680 ohms, 1/2 watt
- 2 820 ohms, 1 watt
- 3 1200 ohms, 1 watt
- 2 1500 ohms, 1 watt
- 4 2200 ohms, 1 watt
- 2 2700 ohms, 1 watt
- 2 3900 ohms, 1 watt
- 2 4700 ohms, 1 watt
- 2 5100 ohms, 1/2 watt
- 1 5600 ohms, 1 watt
- 4 10,000 ohms, 1/2 watt
- 3 10,000 ohms, 1 watt
- 2 18,000 ohms, 1/2 watt
- 2 22,000 ohms, 1/2 watt

- 1 24,000 ohms, 2 watts
- 2 27,000 ohms, 1/2 watt
- 2 47,000 ohms, 1 watt
- 2 56,000 ohms, 1/2 watt
- 2 56,000 ohms, 1 watt
- 2 82,000 ohms, 1/2 watt
- 14 100 k ohms, 1/2 watt
- 3 100 k ohms, 1 watt
- 1 120 k ohms, 1/2 watt
- 2 470 k ohms, 1/2 watt
- 2 680 k ohms, 1/2 watt
- 4 1 megohm, 1/2 watt

##### Resistors, miscellaneous

- 1 20-ohm Globar
- 1 5000 ohms, 10 watts, wirewound
- 2 47,000 ohms, deposited carbon
- 8 100 k ohms, deposited carbon
- 6 Ohmite carbon-deposited potentiometers, CU-5041, 500 k ohms (R<sub>1</sub>, R<sub>2</sub>, R<sub>3</sub>, R<sub>4</sub>, R<sub>5</sub>, R<sub>7</sub>)
- 1 Ohmite carbon-deposited potentiometer, CA 5041, 500 k ohms (R<sub>6</sub>)

##### Capacitors

- 1 200 µf, 600 v., mica
- 2 .0035 µf, 200 v., paper
- 5 .01 µf, 400 v., paper
- 5 .05 µf, 400 v., paper
- 6 0.1 µf, 400 v., paper
- 2 0.22 µf, 400 v., paper
- 2 0.5 µf, 400 v., paper
- 2 25 µf, 25 v., electrolytic
- 5 50 µf, 25 v., electrolytic
- C<sub>1a, b, c, d</sub> 20/20/20/20 µf 450-volt electrolytic
- C<sub>2a, b, c</sub> 20/20/20 µf 450-volt electrolytic
- C<sub>3a, b</sub> 75/75 µf 300-volt electrolytic
- C<sub>4a, b</sub> 75/75 µf 300-volt electrolytic
- T<sub>1</sub>, T<sub>2</sub> UTC A-11 input transformer
- T<sub>3</sub> UTC HA-106 interstage transformer
- T<sub>4</sub> UTC HA-114 output transformer
- T<sub>5</sub> Stancor P-6013 power transformer
- T<sub>6</sub> Ampex B-17331-1 input transformer
- L<sub>1</sub> Thordarson 7-1ly power choke
- Sw<sub>1</sub>, Sw<sub>2</sub> SPST slide switch
- Sw<sub>3, 4, 5, 6, 7</sub> Centralab 1452 switch
- Sw<sub>8</sub> Centralab 1454 switch
- Sw<sub>9</sub> Centralab 1455 switch
- Sw<sub>10</sub>, Sw<sub>11</sub> ISM1 Microswitch with JS-2 actuator
- P<sub>1</sub>, P<sub>2</sub> Cannon P3-13 jacks
- P<sub>3</sub> Jones S-304-AB socket
- J<sub>1, 2, 3, 4, 5, 6</sub> standard Phone jacks
- F<sub>1</sub> fuse holder with 1 amp. fuse
- V<sub>1</sub>, V<sub>2</sub> 12AX7 tubes
- V<sub>3, 4, 5, 6, 7</sub> 12AY7 tubes
- V<sub>8</sub> 12AU7 tube
- V<sub>9</sub> 5Y3 tube



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## TRANSFORMER DISTORTION

(from page 42)

cause the steel may not have been typical, cheap 26-gauge laminations were tested. At 14,000 gauss they had a permeability of 1850, or twice that of Audio A, and about 3/4 as much distortion. The high permeability at 14,000 gauss could lead to the assumption that the core loss was low. This was not the case. The measured power factor of these laminations was about twice that of Audio A at this flux density.

At low flux densities the cheap core material was most inferior. The low flux density peak in the distortion curve reached 18.6 per cent third harmonic compared to 10.4 per cent for Audio A.

The permeability at 3.4 gauss was 237 compared to 650 for Audio A. The impedance of a transformer using the cheap core material would be correspondingly low, and the distortion correspondingly high.

### Air Gaps

Ideally, the maximum electrical impedance results when the magnetic path has no air gaps. This is impossible with laminations. The result of the unavoidable air gaps is the lowering of the apparent permeability of the core material. All other factors being equal, the im-

# Sound Talk



by A. Fiore, Director of  
Engineering and Manufacturing

## QUALITY CONTROL—KEY TO PERFORMANCE

The performance and durability of hi fi equipment is closely related to quality control standards adopted by the manufacturer. In fact, next to its basic design, the product's performance is most strongly affected by the degree and nature of quality control used in its manufacture.

Quality control begins early in the design stages when the engineer selects and specifies the most reliable materials for the job. Next, several hand-built prototypes, representing many hours of laboratory development, are subjected to stringent tests and measurements. When the units are judged acceptable for production, strict laboratory performance standards are established. Each production-line unit must meet or exceed this standard before it is shipped.

Rigid quality control conditions are instituted at key production points. One-hundred percent inspection of parts and sub-assemblies, high grade tooling, precision instrumentation and test equipment, and a constant emphasis on quality are just a few of these conditions. When dealing with machined tolerances of 1/10,000 of an inch or parts so small they must be assembled under a microscope, quality control of workmanship becomes critically important. Qualitative procedures are developed to promote reliability of workmanship and to lessen the possibility of human error.

The final objective of quality control is a built-in resistance to failure under specified environmental and operational conditions. ALTEC designs and builds sound equipment for a wide variety of applications. The ALTEC High Fidelity line is famous for faithful reproduction. Stereo in its early stages was pioneered by ALTEC for theatre and recording use.

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pedance of the transformer coil varies inversely with the length of the magnetic flux path, so that lengthening of the path lowers the impedance. A small air gap has a large effect on the magnetic circuit because the permeability of space is unity while the permeability of the ferromagnetic core is commonly in the thousands. The numerical effect on the length of the magnetic circuit is determined by multiplying the length of the air gap by the permeability of the core material and adding this equivalent length to the length of the path in the ferromagnetic material. The apparent permeability is inversely proportional to this total length.

It follows that the higher the permeability of the material, the more severe the loss due to the air gap.

Small transformers suffer from the fact that the unavoidable air gap is a larger part of the total magnetic path, causing a greater reduction in effective permeability.

The manufacturers of lamination materials state that the usual minimum air gap with fully interleaved laminations is at least one thousandth of an inch, and that the minimum gap with great assembly care, and only with very large laminations, is one half thousandth of an inch. Fortunately these figures are very pessimistic.

Figure 3 for 50% nickel alloy shows a maximum permeability of 25,000. If the magnetic material were perfect and had infinite permeability so that all of the reluctance were in the air gap, a .0005" gap in the 4.5" total path of the EI-75 lamination<sup>7</sup> would limit the apparent permeability to 4.5/.0005 or 9000. Obviously then, the air gap is very much less than .0005".

To calculate the air gap from the electrical measurements, it is necessary to make an assumption about the core material. Of the various magnetic properties of these core materials the one that seems most predictable is neither the initial nor maximum permeability, but the ratio of maximum to initial permeabilities. Production variations in maxi-

mum and initial permeabilities are very large but the ratio of maximum to initial permeability is less variable. The measured ratio with an air gap is always less than the actual ratio for the material alone. In the extreme case where the air gap constitutes the entire magnetic circuit the permeability is invariant.

Initial permeability is commercially measured at 20 gauss. These curves show 20 gauss to be too high. One gauss measurement would be more suitable. Using actual initial permeability figures, the ratio of maximum to initial permeability for non-oriented silicon, and the nickel alloys seems to be about 10 to 1. Using this ratio, the maximum permeability of the core material in Fig. 3 is calculated to be 36,600, the initial permeability 3,660 and the air gap .000058", about one seventeenth of one thousandth inch. Even this very small air gap reduces the permeability of the assembled core from a maximum 36,600 to 25,000, indicating that the reluctance of the .00058" air gap is about half as great as the reluctance of the core material at maximum permeability. Because the adverse effect of an air gap is proportional to the ferromagnetic permeability, it has slight effect on the initial permeability, causing a reduction only from 3,660 to 3,500.

Figure 4 for a very small Mumetal<sup>8</sup> core shows a maximum permeability of 16,000 and an initial permeability of 6,000. The small ratio of these permeabilities indicates a relatively large air gap. This is logical for several reasons, the small magnetic length of 2.5" for the L-14 lamination, the small overlapping area of small laminations, and the high permeability of Mumetal. The values for this core material, based on the 10 to 1 permeability assumption, are found to be 86,300 maximum permeability, 8,630 initial permeability, and .000128" gap. This gap is about twice the length of the gap of the larger EI-75 laminations. It has reduced the maximum permeability to less than one fifth, and the initial permeability to about two

<sup>7</sup> "Allegheny Ludlum Transformer Laminations." Allegheny Ludlum Steel Corp., Pittsburgh 22, Pa.

<sup>8</sup> Bulletin EM-16, "Allegheny Mumetal." Allegheny Ludlum Steel Corp., Braekennridge, Pa.

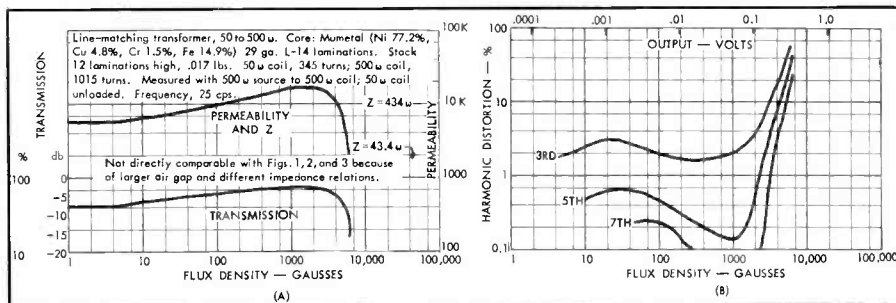


Fig. 4. Curves of transmission, permeability, distortion, and impedance vs. flux density for Mumetal core material.

thirds in the assembled core. If this particular Mumetal had been tested in the E7I-75 lamination used for Fig. 3, the curve would have shown maximum and initial permeabilities of about 40,000 and 8,000, due to the shorter air gap and longer magnetic path.

These very small calculated air gaps might be questioned. A designer who uses large quantities of L-14 laminations in geophysical transformers checks every completed unit for permeability. He reports an initial permeability of 6,000 to 8,000 for assembled cores. This may be directly compared to the 6,000 of Fig. 4.

The one indefinite factor in these calculations is the assumed permeability ratio of 10. If the actual ratio were less than 10 the air gap would be even shorter. If the actual ratio were 20 instead of 10 the calculated gap of Fig. 4 would be .000143" instead of .000128", only about one ninth longer. Manifestly a large error in assumed permeability ratio results in a small gap error. It seems unlikely that the calculated gaps are seriously inaccurate.

An air gap inserted into a closed core increases the energizing current. It might be expected that the distortion would also increase. This does not result. The additional exciting current energizes the air gap which is linear. The extra exciting current is accordingly distortionless. The actual result, which has been well verified experimentally, is that distortion *decreases* slowly with increase in air gap. Considering the magnitude of other core variables, this effect is insignificant with small air gaps. Because an air gap decreases the impedance of a transformer, it impairs the transmission and is generally avoided.

(to be continued)

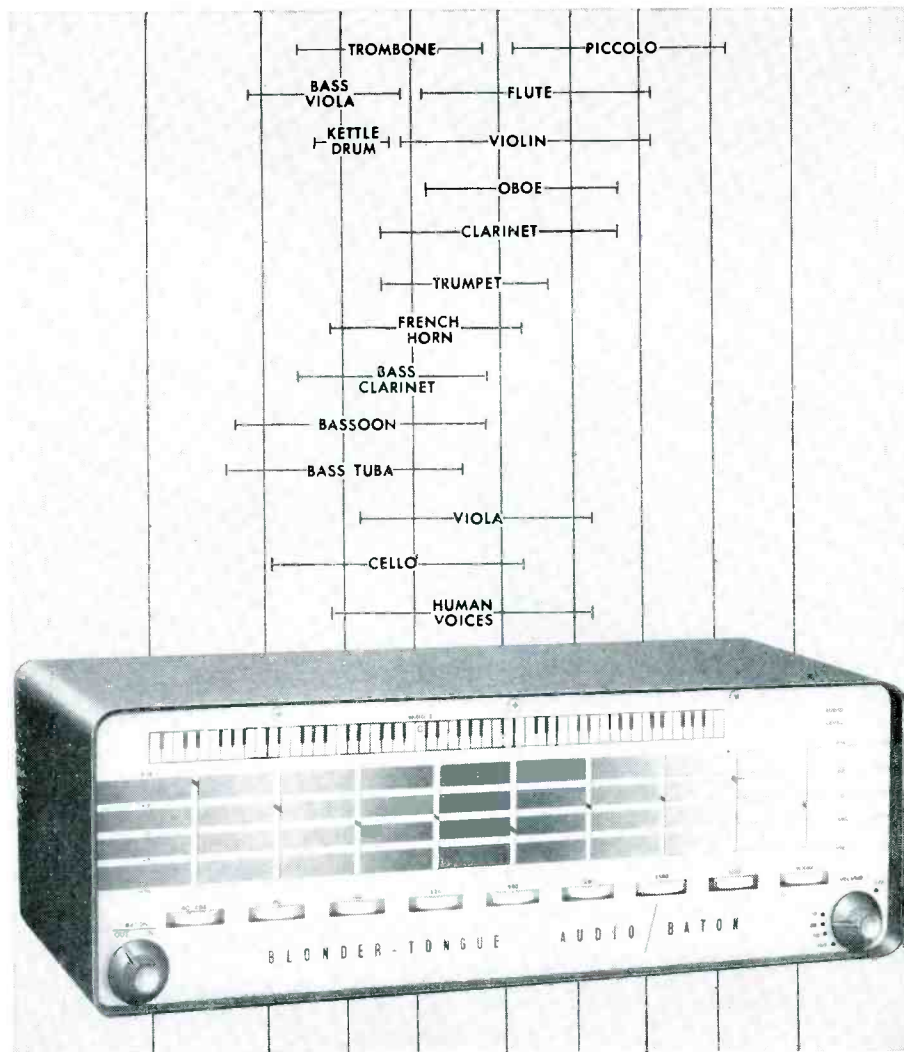
## RECORD REVUE

**De Banfield: Lord Byron's Love Letter.** Libretto by Tennessee Williams. Varnay, Ribla, Carlin, Carruba, Academy Symphony Orch. of Rome, Rescigno.

RCA Victor LM 2258

Ugh. This is one of those dreadful (so I hear them) folksy American operas sung in low-brow English by vast, bosomy, Italian-style sopranos and bellowing Caruso tenors, where one keeps feeling, rather violently, that if only they'd all stop yelling we might be able to figure out what they're trying to say. The music is utterly conventional, without style, grotesquely unsuited to any sort of effort by the terse and stageworthy Tennessee Williams, who ought to have kept himself out of this dismal affair.

Sorry, but if RCA is going to send out records of this worth, it's up to us to review them as we hear 'em! (The story is something about a couple of old N'Yorleans gals who have a love letter from Lord Byron (that the tourists come in to see. Faded Sutherland aristocracy and all that.)



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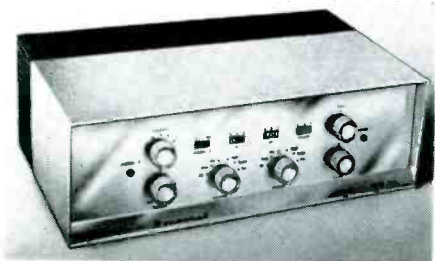
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# NEW PRODUCTS

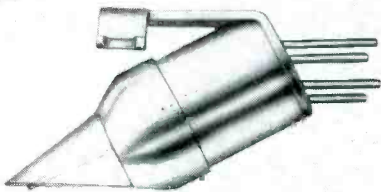
• **Arkay Stereo Amplifier.** Available factory-wired or as an easy-to-build kit, the Arkay CS-28 is a versatile stereo control center with dual 14-watt power amplifiers which may be switched to provide 28-watts for monophonic use. Intermodulation and harmonic distortion are both under 1 per cent at rated output. Frequency response is 20 to 20,000 cps. Con-



trols include a stereo reverse switch for interchanging channels, a balance control, and a gain control which governs volume in both channels simultaneously. Cabinet design is in the modern styling which recently won for Arkay the Fashion Foundation's coveted Gold Medal Award. Step-by-step instructions for assembly are supplied with each kit. For complete details, write Arkay, Inc., 88-06 Van Wyck Expressway, Richmond Hills 18, N. Y.

**B-1**

• **Dynaco "Stereodyne" Pickup.** Manufactured in Denmark by Bang and Olufsen and distributed in this country by Dynaco, the Stereodyne pickup cartridge utilizes a unique symmetrical design which provides equal compliance and output for each stereo channel. Output voltage is generated by a moving iron element which operates with two pairs of coils in a balanced push-pull arrangement. Output from each channel is 7.0 mv at 5 cm/sec

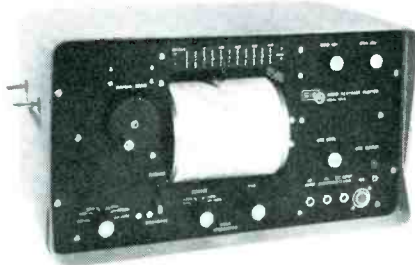


stylus velocity. Flat frequency response is obtained in either stereo or monophonic connection from 30 to over 15,000 cps. Channel separation exceeds 22 db. The high compliance figure of  $5 \times 10^{-6}$  cm/dyne is identical in all directions of stylus excursion. The cartridge can track at 2 grams; the suspension system will also permit use at up to 6 grams for record changers. The Stereodyne is equipped with a 0.7-mil diamond stylus, replacement of which may be readily accomplished by the user. Complete data on the Stereodyne pickup is available from Dynaco Inc., 617 N. 41st St., Philadelphia 4, Penna.

**B-2**

• **Audio Response Plotter.** Quick, easy and permanent pen-written response curves of any audio-range equipment are supplied economically by the Model ARP-2 Audio Response Plotter. Defining smoothness of output as the production of an equal amount of acoustical energy per octave in the audio range, the ARP-2 gives immediate visual proof of the smoothness of performance of any audio system or component. Input to the system to be tested is supplied by a 20-20,000-cps oscillator in the ARP-2. As the oscillator sweeps its range, driven either manually or by a self-contained motor, output signals from the

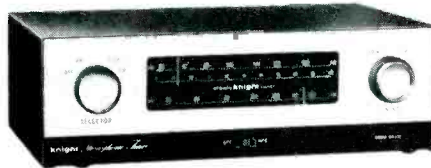
system or component under test are either fed directly to the plotter or detected by an accessory condenser microphone. Records are plotted automatically on a 40-db-range logarithmic chart by a high-torque servo-controlled pen. An input attenuator



network enables the instrument to accept voltages up to a maximum of 10 volts, while inputs as low as 40 db down from 10 mv yield quality records. Requests for further information should be addressed to John Joss, Southwestern Industrial Electronics Company, 2831 S. Post Oak Road, Houston 19, Texas.

**B-3**

• **Knight "Bantam" Stereo FM-AM Tuner.** The FM and AM sections of the Knight Model KN-130 are completely independent to permit separate FM and AM tuning for stereophonic reception. Dual outputs permit stereo or monophonic tape recording



of program material. Only  $3\frac{3}{8} \times 11\frac{1}{8} \times 9$ ", the compactly designed Bantam can be conveniently placed on a table, bookshelf, or mantel. Frequency response is 20 to 20,000 cps within  $\pm 0.5$  db on FM. FM sensitivity is 4.0 microvolts for 20 db of quieting; AM requires 10 microvolts for 20-db signal/noise ratio. Controls include: Selector (ON-OFF, FM, STEREO, AM); dual concentric knobs for AM and FM tuning, and AFC off-on. Attractively finished in leather-tone brown, the KN-130 has a contrasting brushed-brass panel with ebony trim. Further information may be obtained from Allied Radio Corporation, 100 N. Western Ave., Dept. PR-811, Chicago 80, Ill.

**B-4**

• **Thorens Turntable Kit.** This new  $3\frac{3}{8}$ -rpm transcription turntable in kit form can be assembled in half an hour without the use of special tools. Embodying the

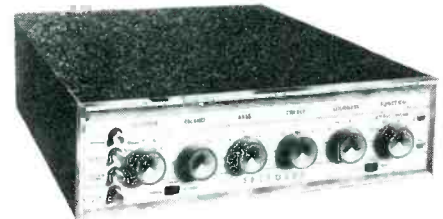


same precision craftsmanship that characterizes the well-known Thorens Model TD-124 turntable, the Model TDK-101 kit features mirror-finish machining on all critical working parts, and the same compliant belt-plus-idler drive found on the

more expensive Thorens units. Other features include automatic disengagement of the idler when the turntable is switched off, and speed adjustment of  $\pm 3$  per cent. A built-in strobe disc allows setting of the turntable to exact speed. Thorens Company, New Hyde Park, N. Y.

**B-5**

• **Sherwood 20/20 Stereo Amplifier.** Embodying a complete preamplifier and two 20-watt output channels on a single chassis, the Sherwood S-5000 offers every important control feature essential to both stereo and monophonic operation. Also included is provision for balancing out the vertical component when a stereo cartridge is used for playing a monophonic recording. Principal control features of the S-5000 include: All dual controls; stereo normal/reverse switch; phase-reversing switch; dual-amplifier monophonic operation with either set of input sources; stereo, stereo-reversed, monophonic 1, monophonic 2, monophonic 1+2 are selected by the function switch, which also operates a corresponding group of indicator lights to identify the selected operation mode; all controls operate both



channels simultaneously; loudness, bass, and treble controls may also be pulled forward to adjust each channel separately when desired. Each output channel delivers 20 watts from 20 to 20,000 cps  $\pm 0.5$  db with intermodulation under 1.5 per cent. Input sensitivity is 0.25 volt for tuner and 2.5 mv for phono. Complete information is available from Sherwood Electronic Laboratories, Inc., 4300 N. California Ave., Chicago, Ill.

**B-6**

• **Fisher Multiplex Adaptor.** This device makes possible the reception of fully compatible stereo broadcasts transmitted through the Crosby multiplex system. It is designed for use in a stereophonic sound system and is connected to FM or FM-AM tuners equipped with a multiplex jack. The MPX-10 adaptor contains a number of exclusive features, including a highly balanced matrix stage which provides



excellent separation of the two stereo channels. Special feed-through connections permit standard FM and AM signals to pass through the adaptor when multiplex stereo is not being received. This permits permanent connections for reception of both standard and multiplex broadcasts. Provision is made on the MPX-10 for both low- and high-level input signals. The sensitivity for full limiting at the low-level input is 30 mv; 120 mv at the high-level input. Manufactured by Fisher Radio Corporation, 21-21 44th Drive, Long Island City 1, N. Y.

**B-7**

• **Pilot Stereo Preamplifier.** Hardly any desirable audio control function is incorporated in the Pilot Model 216 stereo-

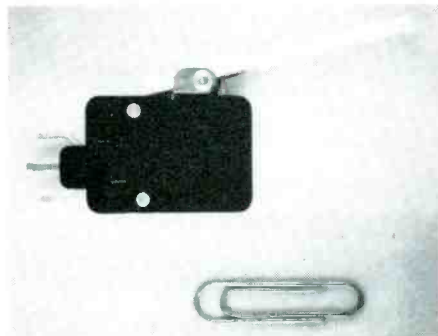


phonic preamplifier. Equally suitable for recording and reproduction, the 216 features two illuminated VU meters and recording-level controls. A front-panel level switch permits measurement of tape output level as adjusted by the recording level controls in one position, while in the other position it switches the VU meters to measure the main audio output level as adjusted by the balance, tone, contour, and volume controls. Twelve inputs are



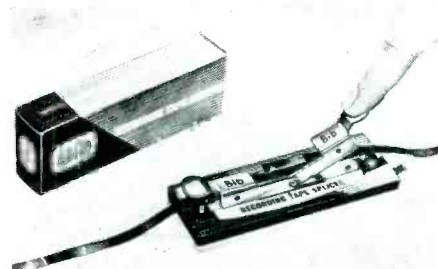
afforded for stereo or monophonic signal sources, three of them being high-gain inputs, and including inputs for an FM-FM multiplex adaptor. Frequency response of the 216 is 20 to 20,000 cps  $\pm$  1.0 db. Harmonic distortion for 1-volt output is 0.2 per cent. Record equalization for RIAA, LP, NARTB and AES curves is provided at calibrated positions on the bass and treble controls. Sensitivity for 1-volt output is 3 mv for phono, 2.5 mv for tape head, 3 mv for microphone, and 110 mv for tuner, multiplex, and tape recorder. Pilot Radio Corporation, 37-04 36th St., Long Island City 1, N. Y. **B-8**

• **Tape Shut-Off Switch.** This new switch is designed for installation on tape recorders which are not equipped with automatic shut-off. Not much bigger than a paper clip, it shuts off the recorder if the tape should break or run off the supply reel. The device incorporates a non-magnetic nylon leaf with rounded surfaces, over which the tape passes. In the event of tape



breakage, pressure on the leaf is released, shutting off the recorder. The main body of the switch is less than 1 1/2 ins. long. Movement differential is .223 in. maximum, and operating force is as low as 6 grams. Further information is available from Acro Division, Robertshaw-Fulton Controls Company, P.O. Box 449, Columbus 16, Ohio. **B-9**

• **BIB Tape Splicer.** An indispensable accessory for any tape recorder user, this new British-made splicer is extremely simple to use and can be employed both



for mending broken tapes and for editing purposes. Made of nickel-plated brass, the BIB splicer comes mounted on a flock-

# a stereo tape deck

for as low as \$89<sup>95</sup>



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• **Records and Plays Back Stereo**  
4-track head handles both 2-channel and 4-channel stereo tapes, as well as dual-track monaural tapes.

• **Pushbutton Controls**  
Unique, easy to operate... the complete facilities of a recorder... at your fingertips.

• **3-Speed Versatility**  
1 1/2 ips, 3 3/4 ips, and 7 1/2 ips to meet any speed requirement... including the new, low-speed 4-track stereo tapes.

• **Mounts Easily Anywhere**  
Vertically or horizontally the Telectro Series 900 is as easy to install as a record changer. Handsomely styled it blends perfectly into any home decor.



Add a Telectro Series 900 Tape Deck and make your Hi-Fi system complete. Flexible enough to fit into any system, the 900 is the design answer for the audiophile who has wanted to add tape facilities without duplicating his electronic components. It is the best of what you want, yet sensibly priced.

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- Solenoid operated automatic shut-off
- Digital Tape Counter
- Rotary design speed selector for easy speed choice
- Unique Brake Design permits easy reel rotation
- Fast Wind—Fast Rewind without tape spill or breaking
- Pushbutton Interlocks fulfill professional requirements

There are five models to choose from including a three-head unit with provision for simultaneous monitoring while recording. (Matched Record/Play preamplifier with VU meter and a play preamplifier are available.)

MODEL	FUNCTION
900-1	Monaural Record, Stereo Play
900-2	Monaural Record, Stereo Play, Monitor
900-3	Stereo Record, Stereo Play
900-4	Stereo Play
900-5	Stereo Record, Stereo Play, Monitor

All prices and specifications subject to change without notice.

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The International Exposition that was held for a period of six months from April 17th, 1958, in Brussels, Belgium, came to an end after having attracted a total of 50,000,000 spectators. Out of the more than 5,000 different products exhibited by Japan, Pioneer's speaker systems and amplifiers won the coveted honor award. There could be no better evidence to attest to the overwhelming superiority of PIONEER products.

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**THE ANSWER:**

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Not a new publication, but one which for over ten years has served engineers, libraries, experimenters, researchers, hobbyists, radio amateurs, radio and TV repairmen, and anyone else connected with radio or electronics. Covers radio, television, electronics, and related subjects, and published bi-monthly as a cumulative index throughout the year, with the last issue of the year an Annual which may be kept as a permanent record of all electronic periodical literature.

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



Transcribing machines. A 33 1/3-rpm record is being transferred onto tape.

entire system. His main job is keeping an eye on the meters and changing the tapes.

The birdsongs recordings have been provided by the well known British ornithologist L. Koseh.

The tapes are recorded in a room equipped with two transcription tables and a mixer control panel, so that practically any original medium can be transcribed. A listening room, sound-proof, and the most elaborate hi-fi chain are used to check subjectively the overall quality of the recorded tapes.

#### Economics

For the most part, the Brussels Exhibition distributes sound in an unconventional fashion. The chosen method presents several worthwhile advantages. Each source needs only a main socket to be operative. If necessary, sound diffusion can be reinforced by adding other independent sources or, conversely, a silent zone can be created by tuning off its receivers. The total number of sound sources is unlimited and does not in any way react on the transmitting equipment. Maximum flexibility is thus achieved with a minimum of operating trouble. Every sound source is totally independent and its power can be adjusted to any value from 0 to 10 watts. Moreover, its response curve can be tailored to suit its particular environment.

All receivers being identical, printed circuitry has been used wherever practical, and although produced as a small series, the receivers are inexpensive for the performance they give.

It should be pointed out that the whole system is in readiness day and night and never tuned off. Emergencies can thus be handled at any time, and the strain on the tube heaters, caused by switching on and off, is eliminated.

All in all, the existing system is hardly more costly than a cable-link installation would have been. It offers moreover an appreciable advantage: practically the totality of the equipment can be recovered and re-used. This is a decisive factor when such an equipment is costly and not too common on the market. **Æ**

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TODAY'S GREATEST VALUE IN  
HI-FI KITS AND WIRED

Comparison proves Arkay is the best value on the market today for advanced hi-fi engineering, styling and performance. Arkay means STEREO at its best, within your budget.

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**ARKAY CS-28 STEREO AMPLIFIER  
STEREO PRE-AMPLIFIER  
COMPLETE CONTROL CENTER**

Presenting... the ultimate in total stereo! The versatile CS-28 is a superb product of Arkay's 20 years of advanced electronic engineering, with beauty of design that won the Fashion Foundation's coveted Gold Medal.

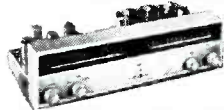
Identical dual 14 watt amplifiers convert to 28 watts for monaural operation. Full 28 watts, at flick of a switch, may be joined with an existing monaural amp for extended stereo, operated with the dual pre-amplifier.

"Reverse Stereo" switch interchanges channels. Balance Control compensates each channel for speaker system, room acoustics, etc. Gain Control operates both channels simultaneously.

Power Rating: 28 watts (two 14 watt channels); 60 watts peak. Frequency Response: 20-20,000 CPS. IM Distortion: 4 to 1. Harmonic Distortion, less than 1%. 30-20,000 CPS. Pre-amp Outputs 2V. Tape Recorder Outputs 10V. Speaker Outputs: 4, 8, 16 and 32 ohms.

Wired and tested \$99.95 Easy-to-build Kit **\$64.95**

PERFECT COMPANION FOR THE CS-28



**ARKAY ST-11  
AM-FM  
STEREO TUNER**

Unmatched by units costing twice the price, the Arkay ST-11 provides wide-range AM and FM tuning of remarkable clarity and drift-free stability. "Miracle Ear" sensitivity in FM channel, 4 uV. (2 uV. in AM) for 20 db quieting. Two distinctive receivers in one, for use singly in monaural reception or simultaneously for stereo broadcasts.

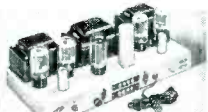
Wired and tested \$74.50 Easy-to-build Kit **\$49.95**



**ARKAY CS-12  
STEREO PRE-AMP  
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12 watts of clean power. Operates from ceramic or crystal cartridge, tape, tuners, auxiliary equipment.

Easy-to-build Kit **\$35.95**



**ARKAY SPA-55  
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CIRCLE 81A

## STEREO

(from page 44)

sound is coming from even when a good share of the sound energy we receive bounces off the wall. This is because we sense direction by means of the direct radiation which arrives just a few milliseconds before the echo comes from the wall.

Therefore if we put a little delay in the channel driving the woofer we will not suspect it of being a source for transient sounds and it doesn't make any difference where the low-frequency energy comes from. This is where my big Klipsch horn comes in handy because it has a built-in air column that is the equivalent of a five or six millisecond delay line.

The twisting five- or six-foot path from the speaker cone to the mouth of the horn does very well as an acoustical delay line. Since sound travels at a speed of approximately 1100 feet per second, it takes nearly 6 milliseconds for a sound wave to travel from the speaker cone to the mouth of the horn. This is ample delay to eliminate the directional effect of the Klipsch horn and leave creating of the spatial pattern to the two mid-range and high-frequency speakers.

Incidentally, the low-frequency horn must be of the type that includes a closed chamber around the back of the speaker so that no radiation comes directly from the speaker cone.

The phrase "mid-range and high-frequency" seems a clumsy expression to identify that portion of the audio spectrum above the low frequencies. I would like to suggest the word "alto" for this range. Alto is a short euphonious word that would designate the audio frequency range above the bass, which would probably be the range upward from about 250 to 350 cycles per second whether this range was covered by one, two, or more speakers. In this usage, alto would mean minus-bass, similar to the color designation of magenta to specify a color that is minus-green.

As shown in Fig. 2, my proposed system will consist of a stereo pickup, two preamplifiers, two 300-cps crossover networks, two small power amplifiers for the two alto speakers, and one power amplifier to drive the low-frequency speaker. Five watts should be ample to drive the small speakers and twenty watts should be enough for the woofer.

For me, the big advantage of this arrangement is that I can use my present low-frequency speaker to get those nice round bass notes and the two alto speakers with their two amplifiers will not be too expensive.

I suppose that I should finish the project and try it out before writing about it. But the project is moving along rather slowly so if anyone can point out

Circle 81B →

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this  
brilliant,  
new



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This tremendous demonstration record, produced by the foremost manufacturer of high-fidelity loudspeaker systems, explains briefly (and simply) the wonderful world of high-fidelity and the really easy-to-understand components required for the finest home music system. You'll be startled by the thrilling sounds on this record—many of them spectacular stereo "firsts."

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**5881** For service in amplifiers of up to 50 watts.



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

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

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

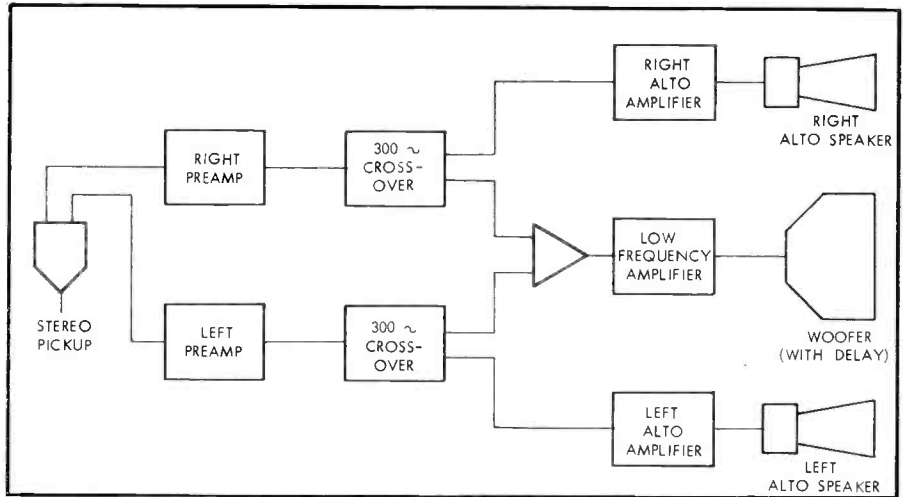


Fig. 2. Block diagram of reproduction system.

why this system will not be satisfactory, maybe I won't have to finish the job. Actually, I am still debating with myself whether the stereo project is worth while. When I go to a concert I usually sit so far back that all the sound seems

to come from one direction. In fact, the only way that I can tell that the string section is on the left is because I can see them there with my opera glasses. But in the interest of progress, I shall continue with the current project. **AE**

## AUDIO ETC

(from page 16)

anything like that. But I soon got the idea when I read the instructions, where there was more room to explain.

Natch, there are outputs for the two stereo amplifier systems, the simplest connection being one direct, from the AM source and the other FM. Natch, the TAPE outputs are for recording off the air—singly or in stereo form—at the same time as the out-loud playing. But we have other things to think about than FM-AM stereo, and Allied has them sewed up here.

Suppose you get sick of the AM half of your stereo, or the AM goes onto a different signal; you'll want your FM in *both* speakers. Simple; flip a lever switch out front and both amplifiers get the FM signal. In phase, of course; I checked it.

Suppose you want to see what gives on AM for a moment or so, without fussing with separate volume controls on your amplifier (you may not have them)—just flip the switch to the other end and you get AM only, in one speaker. The other is silent. (Who wants AM in both systems. Use FM, if you want two-speaker sound quality.)

Flip the same switch to the center position and you get AM in one speaker, FM in the other.

The principle of all this is good, and practical. The normally-AM outputs are used for anything that is to supplement the FM output—whether it is AM, or simply a duplication of the FM channel, two-speaker mono FM, which is the most useful sound on the air right now. (If, in the future, you want multiplex FM stereo, it will come out through its own separate rear output already built-in, to be mixed in the multiplex adapter with the regular FM signal.)

I found, oddly enough, that I can use both AM and FM at once quite often—for different signals. On Sundays, for example, I have to check on my own taped program via FM from New York. In the middle of it (I know it by heart, of course) there is a local weather broadcast I like to hear. So I turn myself down low, on the FM channel, listen to the weather on AM through the other speaker. When it's over, I flip that neat little lever switch and instantly hear

myself on FM through both amplifiers, the AM killed.

On further study, you'll find that all the potential one- or two-channel functions you can think of will work out in one way or via this simple switching arrangement. The only trouble at all with it is, as I say, in the terminology—the more versatile is your switching, the more difficult is the labelling. The middle switch position here is called "stereo" by default, since it allows for separate AM and FM reception to the two outputs; but its usefulness is much wider than that, as you can see.

This FM tuner is medium-sensitive and for the first time I can evaluate the hair-line difference between a sensitive FM tuner, in my country location, and a *very* sensitive one. For almost all ordinary purposes I find no useful difference between this tuner (rated 2.5  $\mu$ v for 20 db quieting) and my old Fisher (1.95  $\mu$ v), via the same FM/Q antenna.

But on the myriads of extremely weak and distant stations receivable in my exceptionally good location there is, or seems to be, a slight difference. I haven't tried to make an AB comparison; not important. I do suspect, though, that in a very few exceptional situations the ultra-high sensitivity factor is worthwhile. This is really an aside, since for 99 per cent of those interested in Allied's KN-120 the difference in practice will be nil between this tuner as rated 2.5  $\mu$ v and the presently highest-rated tuner (as rated by the maker, of course) the Sherwood at 0.95  $\mu$ v.

In other respects I find this tuner excellent, and not significantly unlike the earlier ones of high quality that I've tried out here. Nothing has gone wrong so far—after a month or so.

(Ha! It's Sunday at one, and I've just tuned in my program on FM, tuned the AM tuner to the weather station, set my egg timer for 1:10, set the switch to FM-on-both-channels. When the bell goes off, I flip to the middle position and listen both to the weather and self at once. Nice.)

One special FM feature and one quirk should be noted on the KN-120. Allied has a special circuit called Dynamic Sideband Regulation that can be switched into FM

(It includes AFC, which is also available on a separate switch by itself.) This DSR is a form of feedback correction, to reduce a common FM fault these days, over-modulation of the broadcast signal at the station. (Officially it doesn't exist. Unofficially . . . well, ask any expert.) The possibility of reducing a form of station distortion by, so to speak, remote control, remedying a distant fault right in your own home, is interesting, and I report that on a number of stations hereabouts, the DSR feature did result in increased sonic clarity and a better, more velvety background near-silence. The device works also to improve distant signals, though I'm not too clear just how at this point.

Thanks, I suppose, to its feed-back nature, this DSR circuit decreases the output volume of the tuned-in station by quite a bit. This makes it rather difficult to judge what happens, by ear alone. The background noise decreases, of course, due to lower volume level; the quality seems for an instant to be less brilliant, also due to the lower volume. But these are temporary effects. My considered judgment is, by now, that DSR is a good thing for many loud, close stations and for some distant ones, not too distant. In between, it doesn't make much difference.

A disadvantage of a sort (worth coping with) is that for tuning you must switch the DSR out. Its AFC action makes the stations "stick" and in addition, the usual off-tune hiss is replaced by a much harsher breaking-up noise, square-wave-type I'd guess by the sound of it. This is the same sound that one gets with a multiplex demodulator when something goes off-beam or out-of-tune in the main FM signal. Unpleasant, like scattered machine gun shot, but quite easy to keep under control in the case of DSR if you'll just remember to switch back to normal FM reception for all tuning. (I'd like to see better-quality switches, too.)

The FM quirk mentioned above is one I've never happened to notice before. I found for awhile that I was having trouble locating my favorite FM stations on Allied's new dial. I spotted the difficulty when I suddenly looked close and discovered that this FM dial is semigeometric. That is, the distance between numerical points spreads out as the megacycles go higher. The lower stations are thus fairly close together (though not abnormally so); but the whole upper end of the dial is more or less deserted, with most of the mid-upper stations situated down near the center of the dial strip. There must be a reason; but I prefer a straight ruler reading.

As to AM reception on this Allied KN-120, it is excellent, better in tonal quality and, in particular, lower in background noise than any I've heard in a long time. A quirk here, too: the sensitivity control, a SHARP, MED, BROAD lever switch, doesn't seem to affect the audio tonal bandwidth more than a trace, though most "sharp" tuning positions cut down the highs unmercifully. Odd, and I'm for the moment unable to explain it. To tell the truth, I notice only a slight difference in sensitivity for distant AM stations between SHARP and BROAD. The intermediate position seems quite unnecessary, but maybe I haven't had enough experience yet.

One odd trouble has cropped up on Allied's AM reception, which I gather they are already aware of and are eliminating—or have eliminated. On strong AM signals there is a persistent humming background noise; it disappears with the station itself. Weak stations don't show it, only strong ones. This apparently is related to the signal pickup of the ferrite antenna built



## THE NEW NEUMANN KM-56

with electronically  
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The answer for miniaturized microphones with unexcelled reliability and performance for TV, film, and broadcast. The KM-56 is a true self-contained condenser microphone incorporating electronic switching of the directional characteristic (U.S. Pat. No. 2,678,967) to all three patterns: omnidirectional, bi-directional and cardioid.

### specifications

- Frequency Response: 30-15,000 cps.
- Directional Characteristics: Omni-directional, Cardioid, Bi-directional
- Sensitivity: 0.8 mV/dyne/cm<sup>2</sup>
- Front to Back Rejection (Cardioid): > 20db.
- Output Impedances: 50 or 250 ohms
- Distortion: < 0.8% entire range
- Size: 7/8" dia. x 6" long
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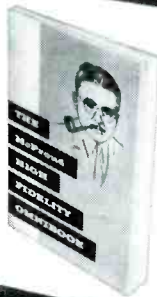
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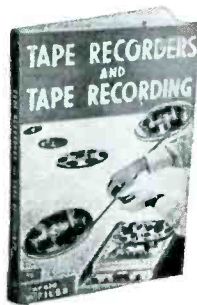
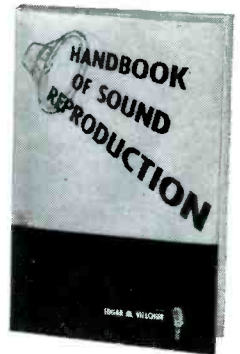
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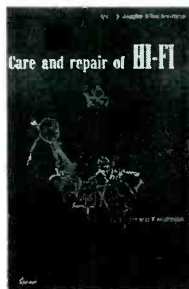
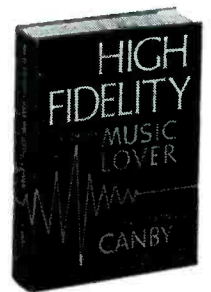
No. 112  
TAPE RECORDERS AND TAPE RECORDING

by Harold D. Weiler  
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No. 119  
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by Edward Tatnall Canby  
An up-to-the-minute guide that shows you how to get the best out of your hi-fi records and tape recorder. Mr. Canby discusses in detail the speaker, the amplifier, the radio tuner, the record player and the tape recorder. He shows you how to save time and money, and get the hi-fi equipment that suits your particular needs. Illustrated with line drawings. \$4.95



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by Leonard Feldman

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into the rear of the set. I note that noise seems to increase when I take hold of the ferrite "stick" at certain positions. This is a trouble that will surely be eliminated; if your receiver happens to suffer from it, I suspect that Allied will be glad to help you.

My impression is that the KN-120 (as with other Allied Radio tuners) is a well built, solidly conservative tuner in its principal aspects, decked out with good styling and intelligent switching, plus a bit of forward-looking radicalism in the DSR circuit, the whole available at rock-bottom cost in the usual mail order fashion. The original maker is the well known Rauland Borg Company.

#### No Instructions

Several intriguing gadgets have come my way recently and, by coincidence, none of them included that practical necessity (especially for the critic and with a public responsibility), an official instruction sheet. I haven't got around to asking for the same, thanks to other business—a couple of hundred stereo records, for example, all clamoring for a trial in a huge pile almost to my ceiling—and so I expect there'll be a slight delay (of a year or so). I'll mention some of this stuff for your curiosity, minus my own trial, just to be sure.

First, there's the Echoraser, a carefully calculated permanent magnet that, set up against your already-recorded tapes, is intended to erase a large proportion of the print-through on them without noticeably affecting the main signal itself. There are two magnets, one mild, the other drastic for serious cases. The mild version is claimed to do no damage at all to the basic recorded signal and may help remove moderate print-through. The drastic one will clip your signal down a bit, but may make a useless tape usable, for precious preserved material. This is a product of Audio Devices and I do hope, when time allows, to try it out on my own older tapes. I can use it. Meanwhile, you'll be interested to know about it and may want to try it out yourself.

Then, secondly, there is the Magna-See kit, which ingeniously makes the actual magnetic track on a tape visible to the eye, via a thin scum of magnetic particles deposited on the tape. I asked for a kit and was duly sent one, complete with can of liquid and assorted other pieces of equipment, the whole in a neat plastic box. Only trouble was, as I say, that the company forgot to include instructions and I am not the sort who uncorks a half-pint of anonymous magnetic suspension, to pour same over some unlucky tape, valuable or no. When and if I get some directions, I'll try out Magna-See with considerable interest. Meanwhile, if you want to see your own recordings with your two naked eyes, try Magna-See out for yourself. Your kit will probably have directions in it.

Finally—no directions needed—there is a semi-professional but extremely useful taping gadget called the TapeStrobe, that solves the tough problem of reading actual tape speed with accuracy, while the tape is moving and without confusing complications. (Sure, the capstan runs at the right speed, but *does the tape itself?* It might be slipping, for all you know.)

This gadget, from the Scott Instrument Labs of New York, is simply a flat wheel in a machined frame, with a strobe pattern on it (no 3 3/4 ips on mine). You slide the wheel against the tape itself, gently, and read the result. The wheel can be adjusted up or down to fit against tape at various heights from the base plate, but the device is made with the Ampex in mind and cen-

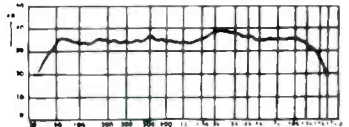


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ters at the proper height for Ampex machines of the professional sort.

If you're a home tape user you'll gulp at the price of the TapeStrobe, but professional users (and those who are well informed on accurate tolerances) will understand its necessity, given the profit motive. It's a really precise little gadget and I've found it very reassuring, so far. That is, my Ampex runs on schedule and right to time.

What you can do if the TapeStrobe says "naughty-naughty" is another matter. It can't help you a bit, but at least you'll Know the Worst.

\$\$\$\$\$\$\$\$

A big sensation from Capitol Records, this last Xmas season, was a semi-witty bit of satire, by a gent named Stan Freburg, about too much Christmas advertising. It's on a promotional 45-rpm record and makes conventional fun of a very serious matter—the all-out, hard-boiled exploitation of the Christmas spirit for commercial ends. Get one if you want a laugh; but if you feel as strongly as I do about this matter, you'll want something even more biting.

How right, how very right, Mr. Freburg is in his dismal little Xmas jingles—"Deck the Halls with Advertising, fa la la la la, la la—la—la; 'Tis the Time for Merchandizing, fa la la la la. . . Profit never needs a reason; get the money, it's the Season," etcete. The title of Mr. Freburg's itty bitty ditty is "Green Christmas\$."

I support him even more solidly, now that I have before me a fine, bright green and red Christmas, 1958, publicity release, no satire at all, which reads in part, "Let's go \$tereo with \$anta! \$tereo \$ales are the biggest boom to new set and record business since the 45's and the LP's came on the market. . . ."

"It is \$tereo! It is \$tereo Everywhere! (sings Santa Claus at the top of the page) In the City, in the Country, it is \$tereo Everywhere." "The important point," the release concludes, "is to mail the coupon NOW while . . . there is still time to team up with \$anta and \$tereo."

Well, thank God in Heaven, it's now too late for that and we can \$ettle down to a \$afer and \$aner pursuit of \$tereo happine\$\$—until our next Green Christmas\$ comes along. Æ

## REALISTIC BASS

(from page 23)

new system and to startle visitors like George Sellers does.

The original work was done on Sellers' record reproducer system using a home-built-and-styled version of the Jensen Imperial system. In a good sized room, the over-all balance is very good, but the living room of his house just didn't quite "have it" for a vital bass that was wanted. The auxiliary bass system has lived up to expectations completely. Organ pedal notes set the room throbbing and yet the other material is comfortable to hear. On *Duke Ellington Uptown*, the band is clean and crisp and yet when the man kicks that "whumpy" bass drum, it feels and sounds like they dropped a body on the floor. With the same settings of controls, Susan Reed and her Irish Harp have an absolute presence. It's wonderful! Æ

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## Industry Notes . . .

**IHF M ELECTS OFFICERS.** Joseph N. Benjamin, president of David Bogen Company, was re-elected president of the **Institute of High Fidelity Manufacturers**, at a membership meeting held January 9 in the New York Trade Show Building. Philip L. Gundy, president of Ampex Audio, was elected IHFM vice-president; Saul Marantz, president of Marantz Company, was elected secretary, and Milton Thalberg, president of Audiogersh Corporation, was re-elected treasurer. Board members elected for a two-year term were, in addition to the officers, William S. Grommes, president of the Grommes Division of Precision Electronics, Inc. and Walter O. Stanton, president of Pickering and Company.

**COLUMBIA, GE TRANSFER HI-FI OPERATIONS.** The phonograph division of **Columbia Records, Inc.**, has been transferred to **CBS-Hytron**, manufacturing branch of **The Columbia Broadcasting System, Inc.**, the parent company. James J. Shallow, who resigned recently from Philco Corporation, has been appointed vice-president of CBS-Hytron and general manager of the CBS phonograph operation. All marketing activities will be conducted from CBS's Madison avenue headquarters in New York.

The responsibility for high fidelity phonograph components now manufactured by the specialty electronics components department of **General Electric Company** in Auburn, N. Y., has been transferred to GE's radio receiver department. Operations will continue in Auburn, and no change in either distribution or marketing of GE hi-fi components is anticipated.

**ORR PREDICTS \$35 MILLION TAPE MARKET FOR 1959.** Quoting from a market survey, J. Herbert Orr, president of **ORRadio Industries, Inc.**, estimates magnetic recording tape sales of \$21 million in 1958 and a jump to the \$35 million mark in 1959. The growing market in recording tape is reflected in 1958 sales of ORRadio's Irish brand tape, which bested 1957 by 36 per cent. If the tape industry maintains its current pattern of growing at the rate of 30 per cent per year, tape sales in 1963 should run around \$115 million, Mr. Orr stated.

**DATES SET FOR I.R.E. CONVENTION.** March 23 through 26 have been selected as the dates for the 1959 national convention of the **Institute of Radio Engineers**, to be held again at the Waldorf-Astoria hotel and the New York Coliseum in New York City. More than 55,000 engineers and scientists from 40 countries are expected to attend. Of particular interest to audio engineers is a technical session scheduled for March 24 in the Sert room of the hotel. Titled "Contributions to Stereo Sound Reproduction," the meeting will comprise a number of papers delivered by engineers of worldwide repute in the science of stereo sound.

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**GUIDE TO AUDIO REPRODUCTION** by David Fidelman. Covers design, assembly and testing of sound reproduction systems and components, #148, \$3.50

**HOW TO SELECT & USE YOUR TAPE RECORDER** by David Mark. Saves money for tape recorder users and those about to purchase one, #179, \$2.95

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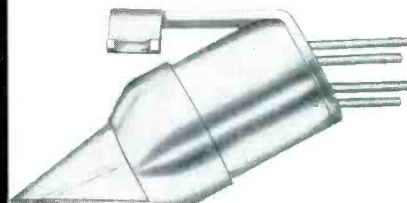
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