

AUDIO

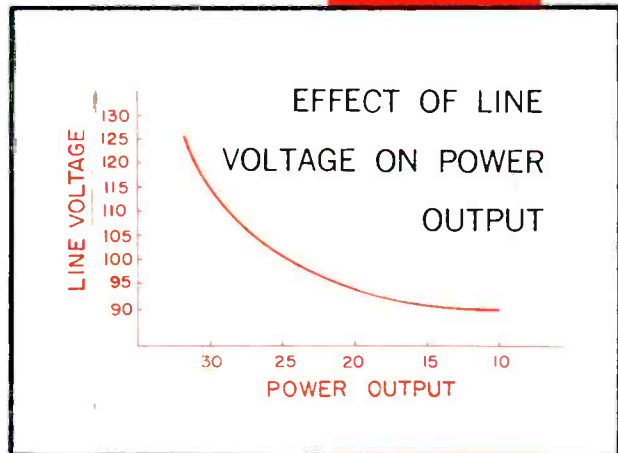
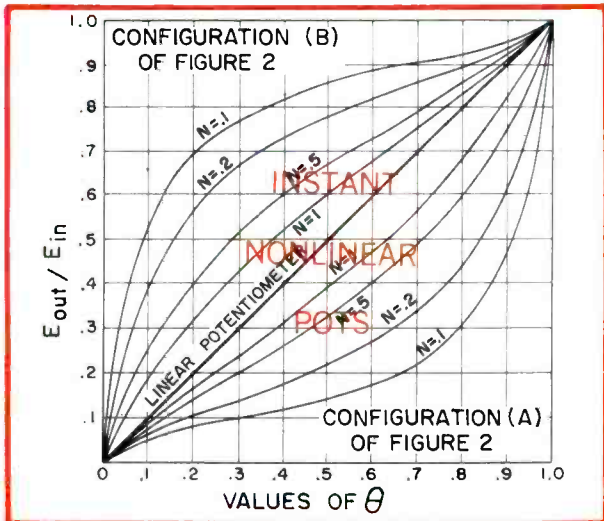
FEBRUARY/1965

60¢

...the original magazine about high fidelity!



Entertainment Center



The Scott 340 ... the tuner/amplifier Electronics World said

"...must certainly be classed as one of the finest integrated tuner/amplifiers we have tested..."*



In review after review the critics are unanimous in their praise of the Scott 340B Tuner/Amplifier. It offers technical performance unmatched by even the finest separate components.

The highly respected editors of **ELECTRONICS WORLD**, in their June, 1964 issue had this to say: "... from the first, it was evident that this was a superior product. It has the utterly smooth, clean sound which we normally associate with the finest component systems.

"The husky Audio section of the 340B, which is rated at 30 watts (r.m.s.) per channel delivers

about 36 watts per channel with both channels operating.

"The FM tuner is in the first rank in all respects. IHF usable sensitivity (rated at 2.2 μ v) measured 1.7 μ v ...

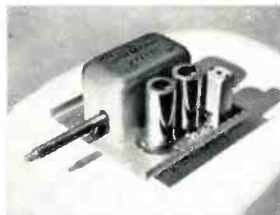
"... Suffice it to say that the unit met, and in many cases substantially exceeded, every one of the ratings for which we were able to test. It is not often that we can confirm EVERY published specification of a high fidelity component, particularly one as complex as (this), and it was a gratifying and pleasant experience ..." \$399.95



Scott 380 AM/FM Tuner/Amplifier has all of the features and fine performance characteristics of the 340B. It includes, in addition, superb Scott Wide-Range AM ... the AM circuit Hirsch-Houck Labs called "the finest AM tuner we know of on the current market." \$469.95



Scott 345 FM Stereo Tuner/Amplifier. The moderately-priced 64-watt 345 features Time-Switching multiplex circuitry, famous silver plated RF front end with 2.2 μ v IHF usable sensitivity, and most of the other high quality features of the 340B. Automatic indicator light tells you when to switch to stereo. Like all Scott components, the 345 carries a full two-year guarantee. \$364.95



Silver-plated front end. Only Scott, of all manufacturers, heavily silver-plates cascode front ends to attain maximum sensitivity and most reliable performance. In addition the 340B and 380 utilize Scott-perfected "Time-Switching" multiplex circuitry to provide maximum separation and perfect off-the-air recording.

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- Please send me your new 20-page full-color 1965 Stereo Guide and complete catalog.
- Send me complete information on new consoles by Scott ... component quality in beautiful, hand-finished cabinets. 35-02

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AUDIO

FEB., 1965 VOL. 49, No. 2

Successor to RADIO, Est. 1917

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Number 18 in a series of discussions
by Electro-Voice engineers



THE SEARCH FOR REACH

JOHN R. GILLIOM
Loudspeaker Project Engineer

Horn-and-driver loudspeakers are generally used in applications where extended reach and high efficiency are needed, such as at stadiums, athletic fields, etc. Where maximum reach is needed, large horns are often used to concentrate all of the available energy in a narrow beam. This technique is effective at low and mid frequencies.

At high frequencies, however, the large horn mouth is several wavelengths in diameter, so that the radiated power is concentrated into an increasingly narrow beam that does not fully cover the desired sound field. Secondly, the reentrant folds in the horn path have dimensions on the order of a wavelength at high frequencies. Acoustic losses are inevitable when the air path dimension at the bend is greater than about one quarter wavelength. Even with the use of wide-range drivers, severe losses in intelligibility are encountered with large reentrant horns.

A third problem is the production of harmonic and intermodulation distortion at high frequencies. The narrow throat section typical of most large reentrant horns gives rise to non-linear compression of air. For example, a large horn with 150 cycle cutoff and 7/8" diameter throat produces about 17% second harmonic distortion at 3kc with just one acoustic watt output from the driver.¹ This type of distortion rises with increasing frequency because it is proportional to the number of wavelengths through which sound passes at high pressure.

A unique solution to the problem of high-level propagation of high frequencies is the Electro-Voice Model AC100 Compound Concentrating Projector. The driver is horn-loaded on both sides of the diaphragm, with energy below 1kc being radiated from the rear into a large low-frequency horn. Output above 1kc radiates from the front of the diaphragm into a small, short horn with only two 90° bends, mounted coaxially with the low frequency horn. Both horns have similar dispersion patterns for uniform coverage.

Harmonic distortion is significantly reduced in the compound horn, due to the very short horn length at high frequencies. Intermodulation distortion is also lessened since lows and highs are separated. The resultant lower distortion and extended frequency response increases intelligibility in the listening area. A larger useful listening area also results from the uniform distribution of energy at all frequencies.

The AC100 horn and its matching drivers offer an economical and efficient answer to problems of extended reach. Its compact dimensions belie its ability to extend sound coverage where low distortion and high sound levels are required.

¹ L. Beranek. *Acoustics*, p. 276.

For technical data on any E-V product, write:
ELECTRO-VOICE, INC., Dept. 253A
Buchanan, Michigan 49107



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

Please read this message concerning the advertisement on the facing page...

If you are a regular reader of this magazine, you know that we have been running a consistent series of advertisements explaining the features of the Lab 80.

Furthermore, if you have had occasion to ask for a Lab 80 at your dealer, or perhaps have already ordered one, you know that this unit is in very short supply. There is a good possibility that your dealer has not yet been able to deliver, unless your order was placed many weeks ago.

We realize that this kind of situation makes for misunderstandings between consumers interested in Garrard equipment and ourselves; and between customers and their dealers. All of them ask "Why do you advertise the unit when you cannot fill my order?"

We are sincerely gratified that our products, and our advertising, are generally so well received. We want you to know that above all other considerations, we value your understanding and goodwill. These are, and must remain, the cornerstones of our reputation and continued success. Therefore, we feel constrained to detail the present situation concerning the Lab 80, and to explain why we not only continue to advertise it, but *must* and *should* increase this advertising.

Briefly, the matter is as follows:

1. The Lab 80 has been in production, and on the American market, since late September, when we began shipping demonstration units to dealers. However, Garrard products have been sold in the U.S. since 1937, and we have a very large number of dealers...so that you and they can appreciate that it has not been possible to ship all of them "first." It poses quite a problem in logistics to fill distribution channels with the large quantities required of this high quality product, which is not mass-produced in the ordinary sense...all in just a few months.

2. We announced the Lab 80 in the October issues of the high fidelity publications. Since then, the interest in this model has been staggering.

Furthermore, many of the original orders placed by dealers have already been doubled again and again, despite the shortness of time.

3. Since the Lab 80 is the very symbol of our reputation as the manufacturer of the world's finest record playing equipment, we are extremely rigid in its production and quality control. Nothing is being allowed to interfere with its quality, so that production moves at a steady, but not a frantic, pace. In plain English, we are insuring that every Lab 80 we ship is simply perfect...and this has been a matter for the entire Garrard quality control organization to guarantee.

4. Let there be no mistake about it—the Lab 80 is being produced, in *very* substantial quantities, and at an ever increasing rate. Nevertheless, despite our best efforts, we still cannot fill orders as promptly as we would wish, because we absolutely refuse to over-rush the numerous and essential processes involved merely in deference to the pressure for delivery.

5. We try to keep our distribution policies as fair as possible. Therefore, dealer orders are highly controlled and filled (perhaps we should say rationed) on a systematic and equitable basis. This explains why your dealer may have had to sound so vague in trying to tell you exactly when you would receive your Lab 80.

6. In view of this, we realize that our advertising policy probably requires some explanation. It is well-known that our advertisements generally are not written as much to catch the eye as they are to inform the reader.

We believe that in the high fidelity component field, particularly, the reader must have a good interpretation of a product, in order to select wisely...and that it is the function of our advertising to provide that information, up to the point where the dealer should logically take over and clarify the product through a demonstration.

Furthermore, we regard it as our *responsibility* to inform those who

read the high fidelity publications concerning the existence of our new models and their various features. This is one important way in which we can serve those who are interested in the finer high fidelity components and who therefore *need* to know what is on the market, in order to visit a dealer intelligently, being informed in advance concerning the products they wish to see.

Since the Lab 80 is on the market, and we believe you would want to consider it if you were interested in making a purchase, we are sure you would want us not only to advertise...but to explain it in the greatest possible detail. This we are doing in the present series of ads, and we must continue to do so increasingly as the season progresses. We want an informed public, for everyone's benefit.

Considering the above, and taking into account the difficult supply situation, we would appreciate your consideration of these alternatives, assuming that you may be in the market for a high fidelity system:

1. If you are interested in a Lab 80 (or have already ordered one) we assure you that it will be shipped as quickly as possible. However, there will definitely be a delay—and you will have to be unusually patient. If you are willing to wait, we say without reservation that you will have a superb record playing instrument.

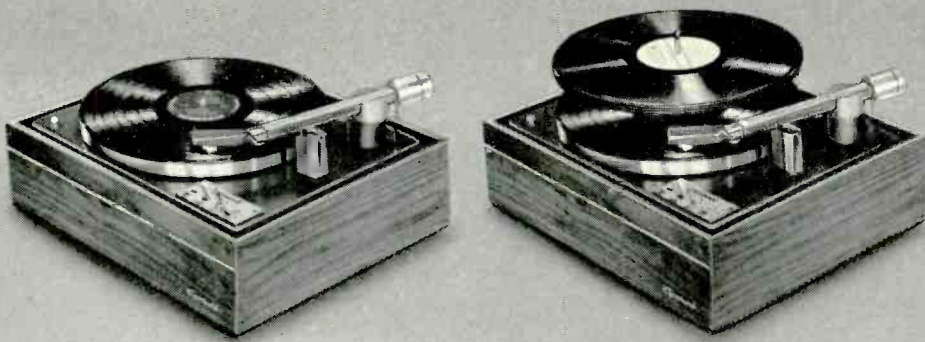
2. If you cannot wait, *do not order a Lab 80*, since this merely creates pressure on yourself, the dealer and ourselves. In this case, we would strongly urge that you give careful consideration to one of the other three new Garrard models—most particularly the Type A70, a top-flight unit which has many performance features equal to those of the Lab 80.

I cannot conclude without thanking you for your patience and understanding of this trying situation, which has come about only because the Garrard Laboratories are making the effort to provide a genuinely unprecedented, totally excellent record playing unit.

Sincerely,



Leonard Carduner
President
British Industries Corp.



**THE LAB 80,
a most advanced
transcription
turntable/tone arm
combination...**

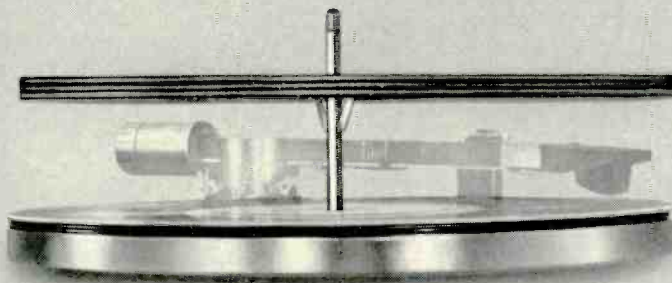
(for single records)

**is also
the most advanced
fully automatic
record changing
unit...**

(for up to eight records)

**The reason is
this revolutionary
automatic
spindle system**

(entirely new, yet based upon
proven Garrard principles)



In order to appreciate the sure, gentle operation of this automatic instrument, you must see it in action.

To begin play—press the automatic tab. At the end of the record, the arm activates an ultra-sensitive, magnetic trip—and the next record drops quietly, cushioned by air. To reject the record, touch the automatic tab again. To pause, press the *manual* tab. The arm will rise and remain suspended a safe 1/2 inch over the record. When you are ready to resume (exactly where you left off or at any other band), simply press the built-in cueing control, and the arm slowly descends. After the last record, the Lab 80 shuts itself off.

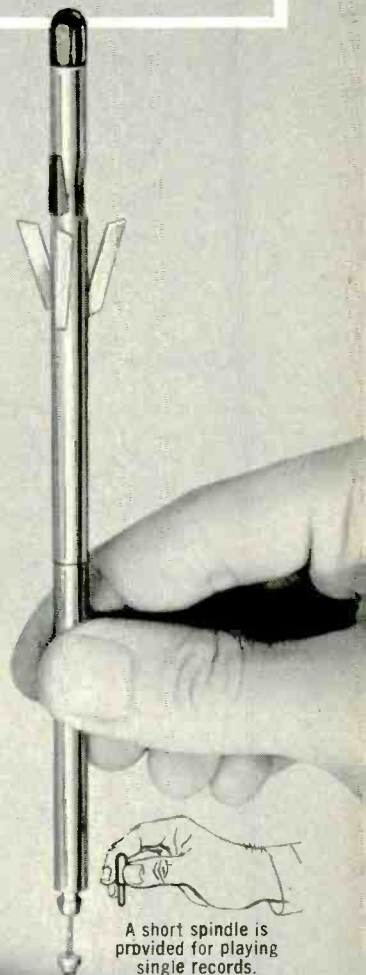
If an interest in music is the reason for your listening, the value of automatic play can hardly be overstated. The automatic shut-off feature alone can add an entire

area of pleasure to your enjoyment. But the problem has been to provide this convenience without impairing the distortion-free performance demanded by modern music systems. Today, with a fine tone arm (as exemplified by the dynamically-balanced, low geometry arm of the Lab 80), the maximum variation in stylus pressure between one record and a stack is a negligible 0.2 grams (two-tenths of a gram).

Therefore, the question of whether or not it is preferable to play only single records on a turntable, has been obviated. However, the search for perfection among record *handling* methods continues. This is the key to the acceptability of any automatic as a true peer of the finest single play units.

Now, the same principles which established Garrard as the pre-eminent name in automatics... proven through literally millions of playing hours... have been designed into the Lab 80 *spindle*, creating the safest, most positive device of its kind. The stack of records is securely supported on three widely extended arms. The arms retract and the next record is released, gently and positively. Then, during the entire performance of the record, the tone arm is absolutely free of the automatic mechanism.

The automatic spindle arrangement is only half of the story. The trip mechanism is the other half—and equally important—since it activates the entire automatic operation. At the end of the record, and not before, the tone arm must engage the trip... but with infinitesimal friction or drag. In the Lab 80, this problem is brilliantly solved. The trip assembly is molded of Delrin[®], the remarkable new Dupont "slippery" material. The tripping cycle works through *magnetic* repulsion, eliminating mechanical contact. These two principles, ingeniously combined for the first time in an automatic record playing device, are the answer of the Garrard engineers to the stringent requirements of ultra-sensitive cartridges, allowing you to use the cartridge of *your* choice, no matter how light the tracking specifications may be. All are compatible!



A short spindle is provided for playing single records.



LAB 80 \$99.50



TYPE A7D \$84.50



AT60 \$59.50



MODEL 50 \$44.50

Garrard[®]
WORLD'S FINEST



IMPORTANT READING: New 32 page Comparator Guide. For complimentary copy, write Garrard Div., British Industries Corp., Dept. GB-15, Port Washington, N.Y.
Canadian inquiries to Chas. W. Pointon, Ltd., 66 Racine Road, Rexdale, Ontario. Territories other than U.S.A. and Canada to Garrard Engineering Limited, Swindon, Wilts, England.

COMING

Construction

- A Calibrated Stereo Control. Raphael F. Ehat. A stereo control unit which incorporates the Bauer circuit for true stereo headphone listening, plus a separation ratio calibration circuit which enables measurement of actual separation ratio.

Loudspeakers

- Acoustic Resistance Damping for Loudspeakers. John L. Grauer. A method of achieving improved damping of dynamic loudspeakers, with resultant improved performance.

Circuit Theory

- A La Pic Mode. George Fletcher Cooper. Description and discussion of the π -mode class AB output stage for transistor amplifiers.

Profiles

- Garrard Lab 80 Automatic Turntable
- Fisher 600T Solid State Stereo Receiver
- Concord R-2000 Tape Recorder

In the February Issue

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



Send questions to:

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

Include stamped, self-addressed envelope.

Amplifier Feedback Adjustment

Q. Without a distortion meter, but with a CRO, VTVM, and source of sine and square waves, how does one determine the value of the resistor and capacitor required to give a desirable degree of feedback for any given amplifier? Typically, say, over 2 or 3 stages with push-pull output circuitry. A. G. Downersgrove, Illinois.

A. In order to find the proper resistor and capacitor values, start off with a resistor which gives the maximum feedback possible before the amplifier breaks into oscillation. Then feed in some square waves and try various capacitors until the best squarewave appearance is found. When this capacitor has been installed, it may be possible to increase the feedback still more. A further improvement in squarewave response may then be achieved by selecting another capacitor. In any case, provide a 3- to 6-db margin so that the amplifier will not oscillate.

Rotator Noise

Q. I recently added an automatic rotator to my directional FM antenna. My problem is that at the end of any degree of rotation of the antenna I get a terrific burst of noise through the speakers even when the volume control on the preamplifier is turned all the way down. There is no noise from the speakers while the antenna is rotating. The noise occurs only at the end of rotation when the power to the rotator is cut off. The burst of noise is so loud as to be uncomfortable. I have tried reversing the a.c. line plug of the rotator.

Can you suggest a method of eliminating or reducing these noise bursts? Robert E. Alleman, Monrovia, California.

A. If you will open up your rotator control box, you will find a commutator arrangement which switches the primary voltage off after the antenna has arrived at the proper compass heading. This is the portion of the circuit which must be

filtered. What you must do is to place a series combination of a resistor and capacitor across the switch contacts associated with the commutator. Use a 200-ohm resistor, two watt, and a 0.02 μ F capacitor, 600 vdc. This should eliminate the noise burst.

Stereo Channel Balance Meter

Q. I would like to build a stereo channel balance meter using a 50-0-50 microammeter, if such a project is practical, for use both at the amplifier outputs as well as at the outputs of my preamplifier, designed to work into a high impedance.

Will you please suggest a suitable circuit? John E. Kirkland, Jr., Knoxville, Tennessee.

A. I shall consider this question in two different ways. First, I will deal with the condition in which the balancing is to take place at the outputs of your power amplifier. There are three separate approaches by which balancing can be achieved at the amplifier output.

The first method is the simplest. It consists of using two separate VU meters, or two VU meters combined in a single case, especially manufactured for use as an aid to achieving stereo balance. In this scheme, one VU meter is connected to the output of each power amplifier channel.

If the signal provided by the power amplifier is insufficient to cause good meter pointer deflection, transformers must be used to increase the impedance in order to obtain a closer match between the amplifier's output circuit and the meter's input circuit. However, I do not recommend an exact impedance match because the rectifier action of the meter may be reflected into the system as distortion. Use a transformer which will provide impedance correction to about 100 ohms rather than the 600 ohms required for an accurate match to a standard VU meter.

The second approach will allow you to make use of your present meter but neglect the zero center. Connect this meter from the "hot" lead of one channel to the "hot" lead of the other channel. Next, feed a stereo signal into the system. A pointer deflection means that there is a difference of potential between the two

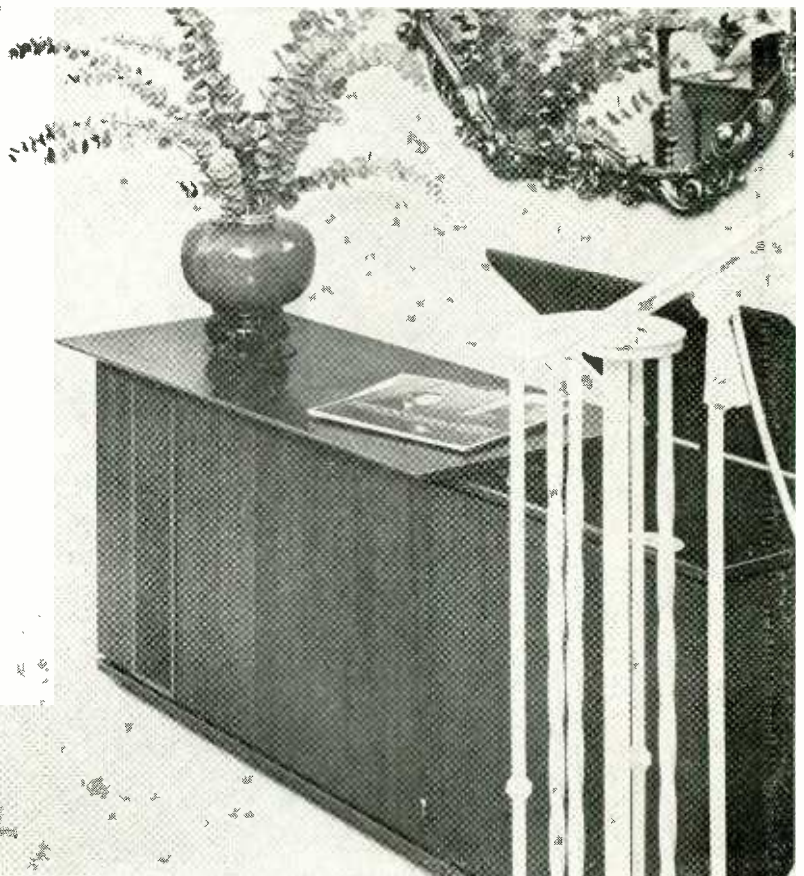
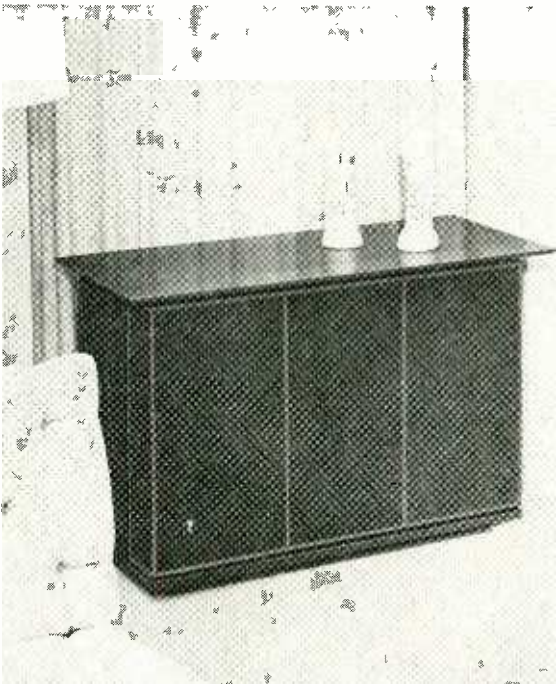
(Continued on page 58)

How will an Olympus Energizer/Transducer look in your home? Elegant, whatever your style. Accustomed as we are to viewing the Olympus in a contemporary setting, it is revealing to see here how comfortably it belongs among the rich and carefully selected traditional furnishings of an actual owner. This universal compatibility is the result of a manufacturing philosophy . . . a determination to handcraft components of such enduring excellence that they are destined to become heirlooms, passed on from one generation to another. The photograph shows only one Olympus of a matched pair powered by

JBL *Elegant*

a JBL solid state stereophonic Energizer that is precisely matched to the characteristics of the transducers.

At the foot of the stairs we see the new JBL Delphi, an equipment cabinet styled to complement the Olympus, and in which this owner has installed a Graphic Controller, JBL's latest solid state component. There is a completely new JBL catalog which we will be happy to send at your request.

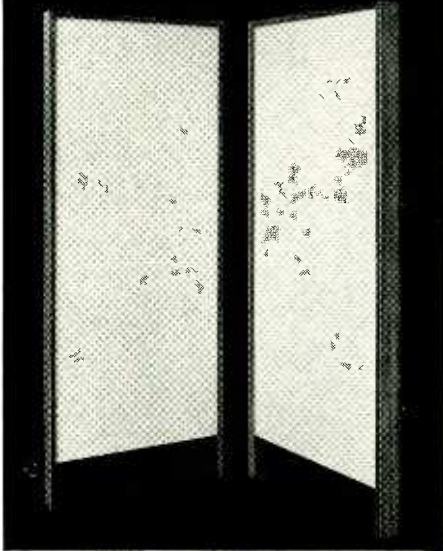


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World renowned for perfection in sound

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Introducing the ACOUSTECH X

Another exciting new
product from Acoustech



Full-range, stereo electrostatic loudspeaker/solid-state amplifier system

- Two electrostatic loudspeakers operating as true dipoles for enhanced stereo effect; designed, developed, and produced under the direction of Arthur A. Janszen.
- Frequency allocation for high and low frequency reproducing sections accomplished by four solid state power amplifiers (two per panel — one for woofer, one for tweeter).
- Fully stabilized system, complete — \$1690 (\$1699, West of Rockies)

For more information, mail coupon below



ACOUSTECH, INC. Dept. A-2,
139 Main St., Cambridge, Mass., 02142

FREE Please send booklet "Why Solid State Amplifiers Can Sound Better" and full information on the Acoustech X speaker/amplifier system to

Name _____

Address _____

City _____ State _____ ZIP _____

CIRCLE 106

LETTERS

Stereo Volume Compression

SIR:

A few hints to readers constructing a "Low-Cost High-Performance Volume Compressor" as described in your December 1964 issue. The circuit is fine for mono use, but will tend to reduce stereo separation if two such circuits are used for stereo, because the two circuits will independently try to equalize the levels in the two channels. For example, if a singer is heard mainly on the left channel, the left compressor will reduce his level and thereby shift the singer's apparent location toward the center.

The solution is to compress both channels together, rather than each channel separately. Thus the compression will reduce the total volume, but not the ratio of left-to-right output. This is easily done.

The circuit uses a Raysistor, which consists of a small bulb and a photo-sensitive resistor such as a cadmium sulfide cell, mounted together in a single, light-tight assembly. But the reader can make a much more versatile unit by putting such an assembly together himself.

Getting back to the problem of keeping a constant left-to-right ratio while controlling both stereo channels together, all this requires is that the controlling element, the cadmium sulfide cell, 'see' not only the bulb in its channel but also the bulb in the other channel. This is done by placing two bulbs and two cadmium sulfide cells together, carefully insulating their leads and then wrapping the entire assembly with reflective aluminum foil and sealing it.

There are many variations on this basic theme. One is to slightly modify this arrangement so that each cadmium sulfide cell sees the bulb in the *other* channel a little better than it sees its own. This has the rather unique arrangement of *increasing* the apparent stereo spread! A loud singer in the left channel thus causes the right channel to become slightly weaker, thereby making the singer seem even further left than he really is.

Carefully inserting two more bulbs and shielding each bulb, more or less, from the cadmium sulfide cell in the other channel, we get one more control element. These bulbs can then be controlled independently from a battery or d.c. source and a pair of potentiometers near the favorite easy chair. This provides noiseless and humless remote control of volume and balance at little additional cost.

Finally, slightly altering the control circuit and the position of the cadmium sulfide cell in its circuit, we can get expansion as well as compression. This,

however, has to be done carefully to prevent regeneration in the system.

PETER A. STARK
519 East 86th St.
New York, N. Y.

Listener Preference Versus Reproducing Fidelity

SIR:

Mr. Rubenstein's letter commenting on my article "live vs. recorded" concerts brings to the fore one of the most important distinctions in high fidelity terminology: the difference between listener preference and the evaluation of reproducing fidelity.

It is possible to make a very poor judgment of reproducing fidelity, either honestly or by design, as was done in connection with "live vs. recorded" concerts of the 1900's. Such errors of evaluation are quite different from the evaluation of reproduced sound on the basis of taste. An expression of "listener preference" at a live vs. recorded concert where the live and reproduced sound were not readily distinguishable would entail praising or condemning *both* the live and the reproduced sound.

The subject of psycho-acoustics is the perception of sound, and not, as some writers seem to think, listener preferences. Precisely because there are so many factors that influence the way we perceive sound, the evaluation of reproducing fidelity is aided tremendously by having the original live sound on the spot for comparison.

EDGAR VILLCHUR
Acoustic Research, Inc.
24 Thorndike Street
Cambridge, Mass.

Organ Oscillator Coil Source

SIR:

Several readers of my recent paper, "An Electronic Organ Design" have queried me concerning a source of electronic organ oscillator coils. Another reader, Mr. R. E. Pavelka, 1449 Rockway Ave., Lakewood, Ohio has recently written me offering to supply such coils. After examining and testing some samples, I can report that Mr. Pavelka's coils are of excellent quality and reasonable in price. Readers wishing to obtain such coils should contact Mr. Pavelka directly at the address above.

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

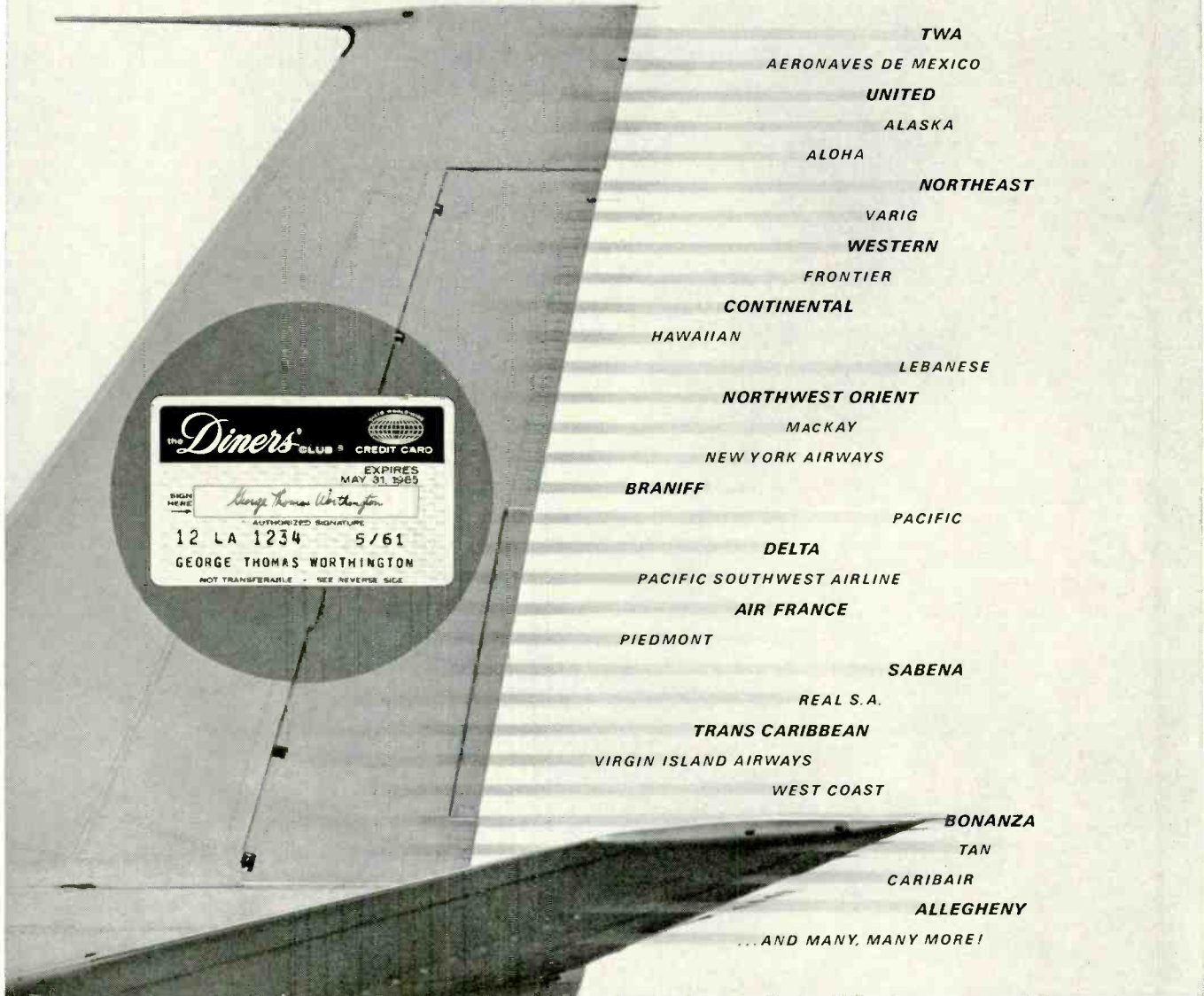
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SIR:

As I see it, the American Society of Composers, Authors and Publishers

(Continued on page 57)

Now fly the world's finest airlines and "charge it" with the world's Number One Credit Card



As a member of The Diners' Club
 ... You carry only one credit card for all your charges
 ... You receive one monthly bill for all your charges
 ... You write one monthly check for all your charges

Next time you fly anywhere, just present your Diners' Club card—and charge it! The world's most important credit credential is now honored by most major air carriers all over the world. You can charge on a regular credit basis or on the convenient Diners' Club time-payment plan.

There are many reasons why your Diners' Club card is "Number One" throughout the world, why nearly one million, three hundred thousand business and traveling people carry Diners' Club cards. You can charge your hotel, motel, restaurant, night club, car rental tabs... in fact, charge nearly everywhere for nearly everything. Your Diners' Club receipt is your complete record... the simplest, most convenient way of substantiating your business travel and entertainment expenses.

IF YOU ARE NOT ALREADY A MEMBER OF THE DINERS' CLUB, YOU SHOULD BE.

DINERS' CLUB, Coliseum Tower, 10 Columbus Circle, New York 19, N. Y.
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FULL NAME _____ FOR OFFICE USE _____

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 Phone _____ Rent home _____ Own home _____ Years at present address _____

COMPANY NAME _____ Nature of business _____
 Address _____ STREET _____ CITY _____ ZONE _____ STATE _____
 Phone _____ Years with above firm _____ Position _____

BANK & BRANCH ADDRESS _____
 IF COMPANY ACCOUNT DESIRED, INDICATE COMPANY BANK

CHARGE ACCOUNTS AT _____
 Reg. Checking
 Spec. Checking
 Savings
 Loan

CHECK ONE ONLY
 COMPANY ACCOUNT Bill sent to office address
 PERSONAL ACCOUNT Bill sent to home address
 PERSONAL ACCOUNT Bill sent to office address

Have you previously applied for, or held a Diners' Club Card? _____
 If addition to existing account, show number _____

\$11 FEE: ENCLOSED **BILL ME** covers 12 months' membership from date card is issued (includes one year's subscription to Diners' Club Magazine at \$1. Subscription optional.)
 Card holder assumes joint and several responsibility with company applicant.

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LIGHT LISTENING

Chester Santon

Golden Boy (Original Broadway Cast) Capitol SVAS 2124

Originality in musicals is not an everyday occurrence these days. I recall seasons when the spring months would come and go without the appearance of fresh ideas such as those found in "Golden Boy" at the start of the '64 season. If the originality shown in setting to music Clifford Odets' famous story of a prizefighter is an omen for '64-'65 on Broadway, we have a good year ahead of us. "Golden Boy" has been around for a long time, starting as a play back in 1937 when the Group Theatre ran it for 248 performances with a cast that later went on to wide fame in the theatre and motion pictures. The story reached a truly national audience in 1939 with William Holden getting his first big break in pictures in the title role. John Garfield furthered his career significantly in the New York revival of the play in 1952. The harshly realistic picture of the boxing world in the original has been given a pungent new twist in the 1964 musical. To make the struggle of the young prizefighter as up to date as possible, the plot has been changed so that a Negro now occupies the central role. The producers of the show make no bones of the fact that the part was tailored for the specific talents of Sammy Davis, the present lead. A large supporting cast headed by Paula Wayne and Billy Daniels lends total credibility to every scene dealing with the hero's rise and fall in his tragic ring career. The music of Charles Strouse and the lyrics of Lee Adams provide an insight into environment that would do credit to some of the past great shows with a New York locale. The early scenes that find Sammy Davis still up in Iarlem have the bite and penetration of the best moments in "West Side Story," "Gimme Some" and "Don't Forget One Hundred and Twenty-seventh Street" are outstanding examples of trenchant social commentary. Davis sets a hard pace and maintains it throughout the show with Billy Daniels keeping right up with him as his oily and sinister manager. You get an impression mighty early in this album that the key members of this aren't just play acting. All hands involved in this production rate a nod for a job well done.

Ben Franklin in Paris (Original Broadway Cast)

Capitol SVAS 2191

Who says old geezers aren't getting their share of attention in this year's Broadway musicals? In mounting for the stage this story of Ben Franklin's intrigues in Europe when he was pushing seventy, the producers are showing little concern for the tradition that a musical's main character should be no more than sixty-five in age. George W. George and Frank Granat, who recently made their producing debut with "Dylan" and "Any Wednesday," may have tackled this story for their first musical to demonstrate their daring—or simply to point up the absence of sufficient youthful male stars on the Main Stem. They have made one concession to the demands of show business. Although Robert Preston is decked out in the hairdo and spectacles of the older Franklin, his resonant voice needs no assistance to fill the theatre. Preston is pretty much the whole show on this recording just as he is on stage. He appears to have a fine time bringing out some of the lesser-known facets of Franklin's career as a diplomat at the time when the American colonies had just declared their independence from England. To the degree that the listener can work up an interest in Franklin's efforts to line up

French and Spanish support for the colonies, this is probably a great idea for a show. "Ben Franklin in Paris" has already whetted my curiosity to see what Broadway can do in setting to music the signing of the Magna Carta or Napoleon's decision to add another country to his empire. It must be noted immediately that such tantalizing morsels in Broadway's future probably won't be clever enough to secure the services of a leading lady as intriguing as this production's Ulla Sallert. To play the part of the Comtesse Diane de Vobrillac, Franklin's lady friend at the court of Louis of France, Miss Sallert has come all the way from Sweden, where in private life she happens to be the Baroness Von Lampe. In her public career, Ulla Sallert is Scandinavia's leading musical comedy star, having appeared in the Stockholm productions of most of our leading musicals. Her foreign accent, backed by a genuinely trained singing voice, is a perfect foil for the Fourth of July inflection of Robert Preston's Franklin.

In the packaging of this album Capitol Records appeared to be aware of the fact that the first side of this disc is somewhat less interesting than the second. To occupy the listener's thoughts until the score takes on some sparkle midway through the record, Capitol provides a seventeen-page souvenir program similar to those sold at exorbitant profit in the lobby of the theatre. By this time one has examined all the photographs and pored through the biographies of the players, designers, wigmakers etc., the show begins to come to life as a chorus of carefree monks at a vineyard bounces through "Hic Haec Hoc." In a further reduction of reserve, Franklin trades drinking toasts with the Spanish ambassador in "God Bless the Human Elbow." Ben's proposal of marriage to Diane is backed by two pleasant songs and the show closes with a patriotic soliloquy that has Franklin speculating on the importance of liberty to Americans 200 years later.

Harold Rome's Gallery

Columbia KS 6691

It's not easy to forecast what the mail will bring these days in the way of records for review. Here's a difficult-to-catalog album by the composer of Broadway shows such as "Call Me Mister," "Fanny" and "Wish You Were Here" that deals with the guy's paintings as much as it does with his music. In between his normal assignments, composer Harold Rome has been painting for his own pleasure and relaxation since 1948. Now, through the generosity of Columbia Records, he has lived to see the day when a collection of his modern paintings in full color adorns the two inner pages of a hinged record album. The paintings illustrate the collection of songs found in the grooves of the accompanying record. With a clear choice before me, I found a bit more interest in Rome's paintings than I did in the songs delivered by Betty Garrett, Jack Haskell, Rose Marie Jun and Rome himself. Some of the titles—*My Long Ago*, *The Wolf That Swallowed Red Riding Hood*, *Half-Forgotten Teddy Bear* and *Shake Hands, Dear Mrs. Cow*—would indicate Rome's reluctance to abandon thoughts of childhood. The songs, "The Critics," "Art in the Night" and "The Audience" take up matters that are part of a composer-painter's shop talk. Examined from any angle, most listeners will be inclined to put down this release as a curio that fills in a little extra background on the private life of one of our leading Broadway tunesmiths. Purists in reproduction will be pleased to learn that Columbia's registration of the paintings' colors covers with full fidelity a wide range of interesting hues.

Ken Griffin: Love Letters in the Sand Columbia CS 9043

In selecting material recorded solely in the mono medium for reissue as "processed" stereo, most of the disc companies have favored original cast albums and other vocal items that cannot be duplicated today or samplings of the orchestral work of conductors no longer available to practice their art. By now, most of us are familiar with rechanneled stereo in some form of vocal or orchestral music. This Columbia release happens to be my first opportunity to sample a mono Hammond organ recording that's been converted to stereo. It may be that this type of organ lends itself to reprocessing more readily than other musical material. Whatever the reason, Ken Griffin fans will be pleased to know that a fine job of behind-the-scenes workmanship has gone into this re-release of a best-selling artist. Griffin, far more than the average organist in the record catalogs today, did everything possible to make the melodic line of a tune clear and concise to the listener. He belonged to a period that didn't believe in cluttering a song with personal embellishment and the result is still refreshing today. The selections heard in this album fall into two groups: solo organ and organ with a very pronounced rhythm accompaniment. I prefer those tunes in this collection of favorite standbys where the organ alone holds the spotlight. The artificial separation is more convincing when the beat is heavy but the atmosphere of the skating rink may be too much for some tastes.

The Four Lads: Songs of World War I

United Artists 6399

What is there about the songs of World War I that makes them belie their age? Most of them seem about twenty or thirty years old yet the reason they're being revived these days is the fiftieth anniversary of the beginning of that conflict. Recalling the era in this album is the versatile quartet known as the Four Lads. This group has been fairly active in the past four years on the Kapp, Dot and Columbia labels. In this, their second release for United Artists, the quartet is assisted by an unidentified ensemble of girl's voices in arrangements that are either perky or sentimental in such standbys of another generation as *How 'Ya Gonna Keep 'Em Down on the Farm?*, *Madelon*, *My Buddy* and *Roses of Picardy*. Producer Jack Gold's closeup of the four featured voices will be considered an asset by any coder trying to follow half-remembered lyrics of the period.

Fiddler on the Roof (Original Broadway Cast)

RCA Victor LSO 1093

With the release of the Zero Mostel show, "Fiddler on the Roof," the new Broadway season can be considered underway in recording studios as well as on the Main Stem. It is difficult to forecast how vast an impression this musical based on tales of Sholem Aleichen is going to make in disc form. Much will depend on the amount of background knowledge of the story's locale the home listener will have at his command when he first puts on the record. Far more than the average RCA original cast recording, this musical calls out for the scenes-from-the-show deluxe packaging that other record companies feature in their top Broadway albums. The non-hep listener would then find it easier to follow the placid story of Tevye, a poor dairyman with five daughters to marry off in a tiny isolated Jewish village in Tsarist Russia. Lyricist Sheldon Harnick and composer Jerry Bock—whose past shows include "Fiorello," "Tenderloin" and "She Loves Me"—have obviously done their homework in researching pertinent folk music of the period in devising their sympathetic score. Of the entire cast, Zero Mostel appears the least handicapped by the absence of the visual element in putting over the songs and chants of a society that may seem a bit exotic and remote to the average showgoer. The sound on the disc is acceptable; the mixing is closer than average for a studio as large as Webster Hall and the stereo illusion is confined to across-the-stage movement on the part of the singers.

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AUDITIES

1. What a Waste!

I've hit upon a new and, to me, highly satisfactory way of rating the hi-fi speaker manufacturers without intruding upon the proper functions of our "Equipment Profile" pages. It has to do with my enormous need for waste baskets.

You see, I am the victim of much well-intended junk mail, both musical and hi-fi, and somehow or other it must be disposed of. No ordinary waste basket is of the slightest use. Big, industrial waste baskets are too heavy for my maid to carry and if you push'em around they scrape up the floor something terrible.

So I use cardboard cartons. Not ordinary cartons but those superbly engineered cartons in which our manufacturers ship ready-assembled speaker systems. As is well known, they come in all sorts of convenient sizes. Just take out a couple of cubic yards of inner packing those tricky side-pieces bent like angle irons, the bottom platforms of eight or ten layers of corrugated board stuck together, plus feet (I save these for future use, as space allows), the cardboard top plates, the side plates, the under plates; also vast masses of waxed paper and/or thin plastic sheeting, assorted instruction books, flyers, guarantee cards, little bags full of screws and bolts, envelopes containing rubber-felt feet to stick on the speaker, folders full of lay-out plans and wiring diagrams, sheetsful of dealers' addresses and service stations 'round the world, large warning posters saying DO NOT . . . in glaring red. Plus, probably, on top of it all, one of those unctuous greeting cards that wheezes out "Congratulations! on having bought the Finest Speaker Ever Made." Ugh.

Last but not least, remove the speaker itself, and dispose of same. It is beside the point.

Then tackle the remaining cardboard. The big problem is to get the top flaps off. No use trying scissors. Nor metal snips. Nor garden twig clippers. I've tried 'em all. Razors help but you're likely to slice a finger off and you'll find you can only cut through about half a layer in each side. Maybe a machete would be best; but I use my good arms. And fists. Just grab a flap manually

(having removed your coat, tie and perhaps shirt), brace yourself with both feet and PULL hard. The flap tears, about an inch. Rest a bit, and pull again. The flap tears sidewise in half, leaving most of itself still attached. . . .

When all is said (cursing and swearing), and all is done, you have yourself a really first rate waste basket, big enough to be in tune with our times' mail (and newspapers and record wrappings and what-not), and yet light enough to carry when full, or to slide o'er the newly-waxed floor, all the way from den to incinerator. You can even bump it safely down the stairs.

Well, the speaker makers don't all do the same sort of job for me in providing quality waste baskets. I dearly hate to have to say so, but that reputable firm, E-V, let me down a bit recently when I received a pair of E-V Two speakers. The cardboard cartons were a bit bigger than I'd expected and I jumped at them. But, alas, they turned out to be too flimsy. The sides quaked, the tops sagged in and when I lifted one of them, full of rubbish to dump in my incinerator, the bottom fell out. What a mess! E-V is now on my waste paper basket black list.

(N. B. The E-V Two's arrived in perfect condition. But that, as I say, is quite beside the point.)

For me, then, one of the happiest results of the recent trend towards a new size in "bookshelf" speakers is that I'm now collecting a whole new fleet of waste paper baskets of a wonderfully convenient size, just right for kitchen, front parlor or side room where space is a bit limited but waste paper abounds. Now, on my long-term list, the finest firm of all is Acoustic Research, Inc. Never mind the speakers they make. Unimportant. What counts is the quality of their cartonry, which is no less than superb! I just picked up two AR-4's and their twin cartons are absolutely perfect as waste containers. Just the right feel and give, the proper structural elasticity combined with rigidity (if you see what I mean); and the top flaps tore off so easily I figured they were pre-stressed and scored, for my special convenience.

Next to my desk in the city I have the oldest carton of them all, which has been pulled out and slid down the tiled hall

of our apartment house to the incinerator once every week for years and years. I've just looked at it, with new curiosity—I hadn't given a thought to its origin for I don't know how long. Well, it has a big AR on the side, I see. And on the back, against the wall, I discovered the legend "AR 2". That was one of the earliest AR 2's ever shipped out.

Anybody want an antique waste basket?

2. The Computer's Share

As an old fashioned humanist, i.e. a person who thinks people are more important than things, I am constantly amused (and made thoughtful) by the computer's attempts to take over just a bit more than its reasonable share of human ways. I guess it's natural for it to do so (or for us to tell it to), considering what astonishing things are now possible with such machinery. The picture admittedly changes almost day by day and there isn't an end in sight. Nevertheless, there's always somebody, there's always some computer or other, that goes too far, testing the future and coming off second best.

Sometimes the computer looks downright silly, though it isn't. It's just being narrowly reasonable, within the framework of its instructions from people.

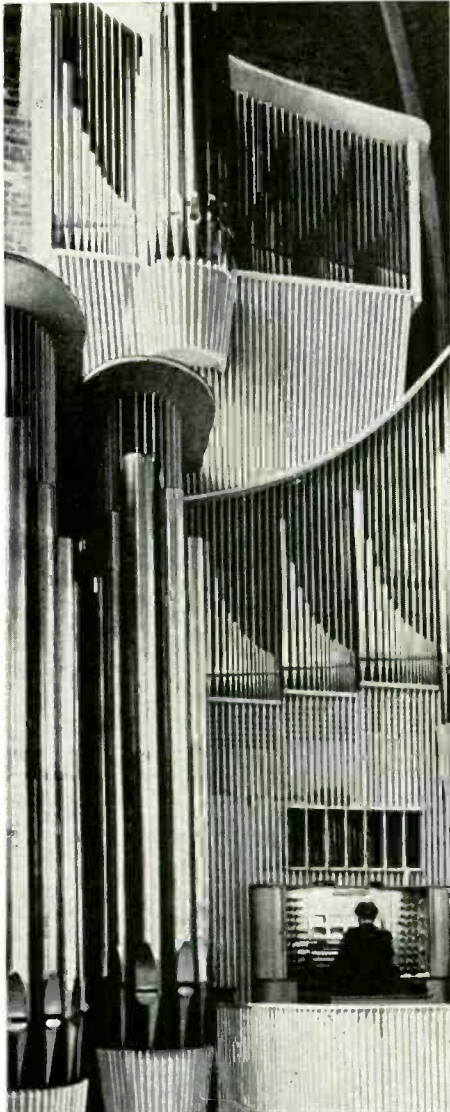
We may very well compare a human being to a computer, but not the other way around. Yes, we are computers and marvelous ones too—whether thought up by an ingenious Creator or, even more ingeniously, self-made out of living tissue that "just grew" that way in response to the peculiar laws that govern our cosmos. We do compute beyond compare. We can do many things faster and better, taking in more factors, than any man-constructed computer will ever be likely to. And so one of the things we ought to do more of is to discriminate between computing and thinking.

It isn't easy. Because thinking is, indeed, a form of computing and vice versa. You really can't draw any theoretical line between them. Yes, computers do "think." So did the first adding machine and before it the abacus. Within limits, of course. Also beyond some limits, of the sort that hold back or stymie the human computer. But nowadays we seem to feel that the limits are off, or ought to be. I doubt it. I'm a humanist, as I say.

Tools

The best thing is to look at the whole business pragmatically, that is from a practical (i.e. human) point of view. The proper use for all computers, as anybody can see, is as *tools*. A tool is a figurative lever, which doesn't work by itself but rather as an aid to human workings. Never forget that. So far, only human

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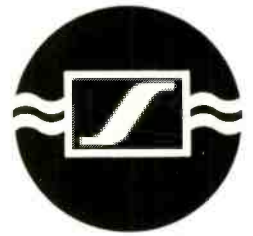
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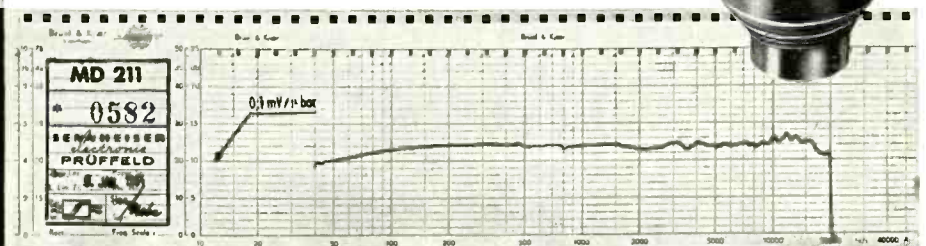
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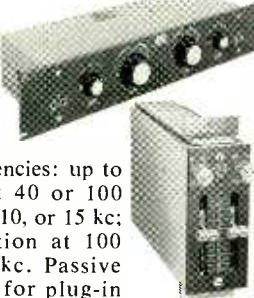
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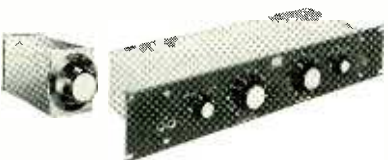


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beings have learnt to use them, and thus we define ourselves. Tool-users.

A tool has two qualities: 1. It derives its motivation, physical or mental, from a human being, whether directly, like the mechanical typewriter I'm using, or indirectly, as the horse pulls the plow; 2. a tool necessarily does its task better than a human being, unaided. Like, say, a screw driven by a screwdriver. Or my 200-year-old grandfather clock that computes the time continuously for eight days running.

(You might say that 3. some tools, under proper direction, can do things altogether beyond human ability. But if you'll stop a moment and think it out, you'll see that this is merely 2. carried to a greater degree. A tool is a tool.)

There's nothing very new about all these ideas. Computers, in this sense, aren't new; they're merely advanced. Unprecedentedly quick tools, because at last they are freed from the inertia of mass and the annoyance of gravity. And hugely capacious tools, because their memory devices are so small (though not half as small as our own). Unprecedented, but still—tools.

When is a tool not a tool? Only when it starts to act like a human being, which is undesirable and against our best interests. We are still at the top of the Creation heap, remember, and for us all things are tools. If not, they work for their own purposes, oblivious of us from the word go, then the Age of the Tool is over and, for that matter, so is the Age of Man. And thus we want to be rather careful as to how we rate our new tools in respect to our own computing abilities. We'd better, or else.

The trouble is that some of us, in spite of all this, expect our computers to think for themselves in ways that aren't practical and are unwise too, what with millions of perfectly good human brain-computers waiting around, looking for a proper education followed by a respectable job. Nobody in his right mind would suggest that the computer isn't enormously useful in all its ramifications. But too much computer thinking, still, can reduce the computer-human-being relationship to a shambles. Nobody in his best mind should degrade the human computer as some people do with the best of intentions. The two systems must learn to work together, meshed for greatest usefulness—to us. Not to the computer.

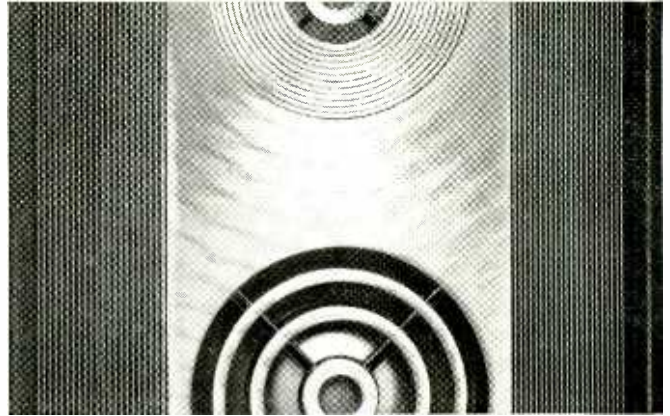
Luckily, most of the examples of current computeritis turn out humorously, because a computer trying to act like a man and not succeeding usually makes a dizzy fool of itself. Gives us a nicely secure sense of our own very reasonable human-ness!

Old Lady

For instance, I suppose you've heard
(Continued on page 65)



With the new Royal Grenadier



You can turn up the sound



You can turn down the sound

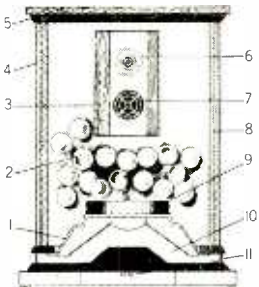
You can sit to the left of it



You can sit to the right of it



You can sit behind it



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ABOUT MUSIC

Harold Lawrence

The Music Goes 'Round and 'Round— A Look at the Background Music Business

In his December 15th column in *The New York Times*, Russell Baker decried the mounting number of electronic assaults on our privacy. His article was prompted by the fact that walkie-watchie television will be introduced this fall. As you might have guessed, walkie-watchie TV is a small battery-operated transistorized receiver which can be slung around the neck and carried everywhere. It is, Baker points out, "only one gun in the massive entertainment barrage" launched against the American people.

Many of these guns are manned by operators of background music. According to a recent survey, 60 million Americans are exposed to background music daily, twice the number as 10 years ago. Sales of this music were \$45 million in 1963, with the lion's share going to Muzak, a division of Wrather Corporation. Muzak and its imitators in the piped-in music business have made it possible to hear music virtually all our waking hours. Loudspeakers are everywhere: underwater in specially wired swimming pools, above the clouds in jet airliners, even in space capsules.

Nowadays we can expect to hear tunes like "You're the Cream in my Coffee" in hotel Breakfast Rooms, "It's Gonna Be a Great Day" in elevators, "Whistle While You Work" in factories, "Abide With Me" in mortuaries, or "Jingle Jangle Jingle" in savings banks. It would seem as if, as *Time* magazine put it, "the total musication of America is by now almost complete."

Not so, say the purveyors of background music. There are still many new worlds to conquer. Ripe for attack is the office where, until recently, telephones typewriters mimeograph machines and human voices have dominated the aural atmosphere. Efficiency experts have come around to the opinion that "background music boosts morale and picks up sagging spirits when the morning and afternoon doldrums set in and mental fatigue threatens to take over." (*Modern Office*

Procedures magazine). When boredom, and the noise of its newly installed computer system, began to endanger morale at the American Express Company, Muzak was called in. A Wall Street firm, Walston & Co., introduced Muzak into its offices to improve the surroundings. "A brokerage house is not known for being one of the quietest places in the world. The piped-in music primarily overrides background noises, particularly in the back room," commented the company's senior vice-president. To relieve the monotony of transcribing letters from a dictaphone, Edison Voicewriter brought out the *Serenader*. The new unit consists of a "headset with two earphones, one for transcribed dictation and the other for music transmitted through leased telephone wires."

Selecting music for offices, hospitals and other public places is a serious business, according to Donald M. O'Neill, Muzak's Program Director. From its 30 years of experience, Muzak has learned that jazz, solo instrumental music, vocals, everything in a minor key, and anything that lasts more than 3 minutes are undesirable. O'Neill's 35 arrangers and 10 musicologists work towards an unobtrusive sound that will stimulate, but not excite; soothe, but not put to sleep. Dynamic range is cut in half by Muzak's engineers: instead of the usual 50 db engraved on most discs, its recordings are held down to a maximum of 25. Instrumentation varies according to the locale: "In an office, where it is quieter," O'Neill explains, "you can be more subtle with your music, more restrained. But both (office and factory) are given programs that fit our 'mood stimulus chart.' Since workers usually start off the day with a smile [No comment. *Editor*], sag in mid-morning, pick up a little at the thought of knocking off for lunch, then undergo a similar mid-afternoon droop, the music must be keyed to combat these curves."

The chief objection to the typical

Muzak orchestra, writes Russell Baker, "is not that its repertory is lugubrious, its instruments cloyed with honey, and its musicians in deep melancholia. The point is that, good or bad, it abridges the priceless human right not to be entertained. There must be millions of shoppers (for instance) who do not want to contend with 'The Skater's Waltz' while pricing peanut butter."

Muzak Is Music Is Muzak

But do these millions really exist? Based on the evidence we can gather, there seems to be no groundswell of opinion against this invasion of sonic ooze. Piped-in music may be "pallid pap that will cause all our musical teeth to fall out," as Helmut Blume, the acting dean of music at Montreal's McGill University maintains, but most people don't seem to mind it a bit. To a Muzak man in Los Angeles, "the nut who complains about music is the same one who bitches about the office being too hot or too cold and a thousand other things."

The "nut" who attacks background music is probably the kind of man who would hail a cab, get in, announce his destination, and, hearing music blaring out of a transistor radio on the dashboard, tell the driver: "Would you mind turning that thing off, please?" It's a risky question. Some drivers respond quickly, twist the dial and say, "I don't know why I bother to have it on; I wasn't listening to it anyway." Others just reduce the volume a decibel or two. Some argue. A passenger recently received this dressing down from his driver: "Look, I'm a Hungarian refugee. This is a free country, isn't it? Are you trying to dictate to me? I fought the secret police in Budapest during the Revolution to get away from just such oppression." The embarrassed passenger could do little more than apologize, plead a splitting headache, and mutter something about having read a city ordinance forbidding hacks from playing radios when passengers are aboard.

When we are not being worked over by permanent background-music installations, chances are that mobile h.m. transmitters using small transistor radios will molest us on streets, beaches, country lanes, museums, subways and buses. The transistor-radio player, however, suffered a legal setback in Philadelphia last December 21st when a grand jury refused to indict a history professor at La Salle, accused of hitting a woman with a transistor radio that he thought she was playing too loud on a bus. "The professor said he became angry when the woman turned up the radio's volume, and even moved to a seat closer to him. As he sought to seize the radio, it struck the woman on the head." (*New York Times*).

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CULPRIT

Tubed components are doomed. It is now common knowledge among hi-fi engineers that tubes and output transformers play a major role in creating distortion.

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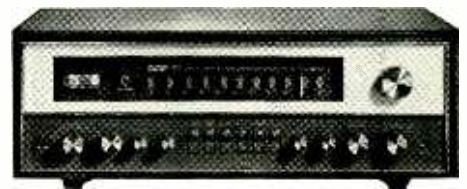
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EDITOR'S REVIEW

THE CASE OF THE CROAKING LOVEBIRD

PICTURE IF YOU WILL a suitor about to suit. A tender look on his face. A tender look on her face. James Garner and Julie Andrews. He opens his mouth to speak and out comes a series of sounds which would undoubtedly please and thrill almost any female—frog!

A short time ago we took ourselves *et al* to the local cinema to look at and hear what was billed as one of the ten best pictures of 1964, *The Americanization of Emily*. And it is a very fine movie. But the sound we heard, oh my that wouldn't have won a prize for the best of anything.

What should have been a soft, thrilling sound turned out to be a raspy croak. Frog-like. (Not that we dislike frogs or frog sounds. In fact we do like frogs. Especially their legs.) Hardly an appropriate sound for the visual presentation. Incongruous in fact. It destroyed the scene for us.

This experience started us thinking about the quality of sound in movie houses. Strangely enough we had not thought much about this facet of the "sound picture." After all movies are an intrinsic part of our childhood. One always went to the movies. And we discussed the movies. Not the sound quality. Hardly even the picture quality. Just what happened.

In previous Editorials we did mention sound quality in "live" theatres. Because the contrast between live performers and poor sound re-enforcement is immediately obvious. And most "live" theatres we have attended have pretty poor re-enforcement systems. We could never understand why a performer would permit his presentation to be limited by a poor sound system. Perhaps performers are so busy concentrating on their performance that they are unaware of what the final projection is like. You'd think their best friends would tell them.

Of course it is understandable that movie theatre sound systems would not be questioned. After all weren't they the daddies of all the sound re-enforcement systems used today? Before "hi fi" and all the mutations and combinations we listen to in our highly "soundized" world, we were listening to the sound of the movies. And who would question a daddy?

But now we had been forced to question. We had to find out whether this experience was the rare bird, or whether "daddy" hadn't kept up with the times. Our hearing tastes, collectively, have become much more sophisticated. We no longer tolerate the sound quality our "forefathers" found wondrous. Just as we no longer tolerate, collectively, the visual styles of the twenties.

The question, then, is whether movie sound, collectively, has remained relatively static.

The answer is no.

After much looking, listening, and thinking, we determined to our satisfaction that movie theatres generally have good sound re-enforcement systems. Not perfect. Not "hi-fi." But capable of producing voice quality fully believable as accompaniment to celluloid people. And music that sounds like music. We didn't uncover a frog in a carload.

Not that it can't be improved. And a lot. But the quality is definitely on the upper rungs, in comparison with the all the other sound re-enforcement systems we are subject to. For example take television. Ugh!

We can consider the case of the croaking lovebird as having been solved. It was a rare bird, croaked by a defective system.

PLUG-INS PLEASE

We note, in our review of a solid-state amplifier in this issue, the use of plug-in printed circuit boards. The value of plug ins relates to the ease with which the consumer might get them serviced. All a serviceman need do to determine the area of malfunction is plug in a known good board. And send the customer on his way if that does the job. Then, rather than get involved in the vagaries of troubleshooting these boards, he could just send it on to the manufacturer for repair. The manufacturer, with test jigs and a variety of expensive test instruments, plus the intimate knowledge of how they are made, would be able to service them easily and economically. After all, the manufacturer would be servicing relatively large numbers of the same board. Thus a flat, and somewhat small, fee could be charged to repair the board and service to the consumer would be very much quicker than under present procedures. Also, in many instances the quality of service would be vastly improved. The manufacturer would bring the boards up to manufacturing specifications, which is not too likely in the ordinary service shop.

It should also be advantageous for the serviceman. He would stock plug-in boards rather than a large amount of parts. And troubleshooting would be the simplest imaginable procedure.

This "black box" approach was, and is, used very successfully in the military services. For the very reasons we mentioned: servicing speeded, and economies effected. Of course this approach is very hard to apply when equipment is very complex. Fortunately audio equipment (including tuners) is not complex in that sense. Transistors are making it even less complex.

Now if only manufacturers would accept this black box concept. . . .

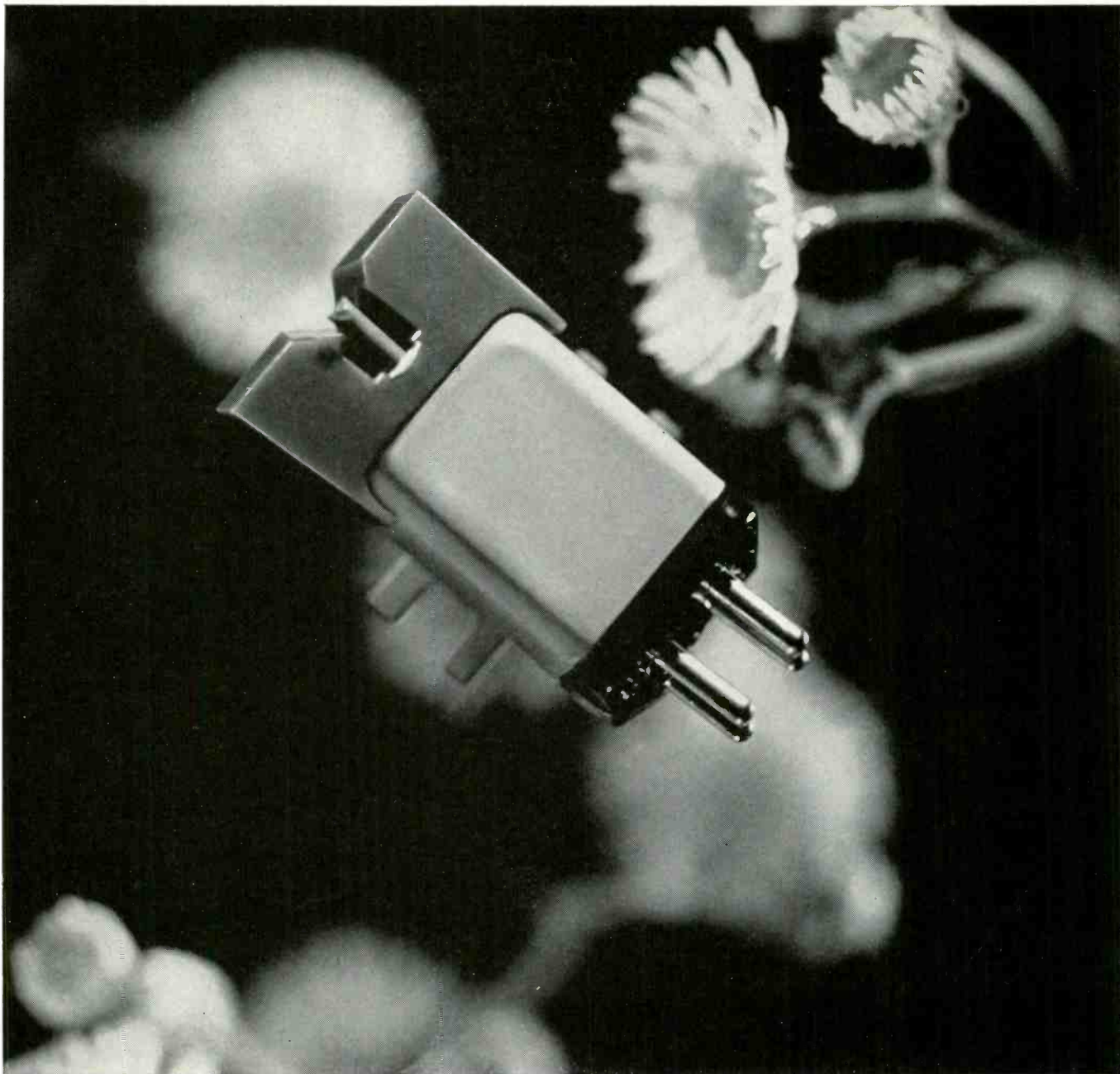
CORRECTIONS

The following minor corrections were noted by Wayne B. Denny, author of "Matrixing amplifier for 2-channel stereo signals" which appeared in our January 1965 issue:

In *Fig. 2* the legend should read

$$\frac{\text{gain of difference signal}}{\text{gain of sum signal}} = \frac{(1+k)}{(1-k)}$$

Also in *Fig. 2* the two phase inverters to the left in the diagram should be designated P and not R. And the output signal from the top left phase inverter should be $(1+k)(R-L)$ and not $(L-R)$. Finally, in Table II, the top value of $(R-kL)$ should read $B-C$ and not $B+C$.



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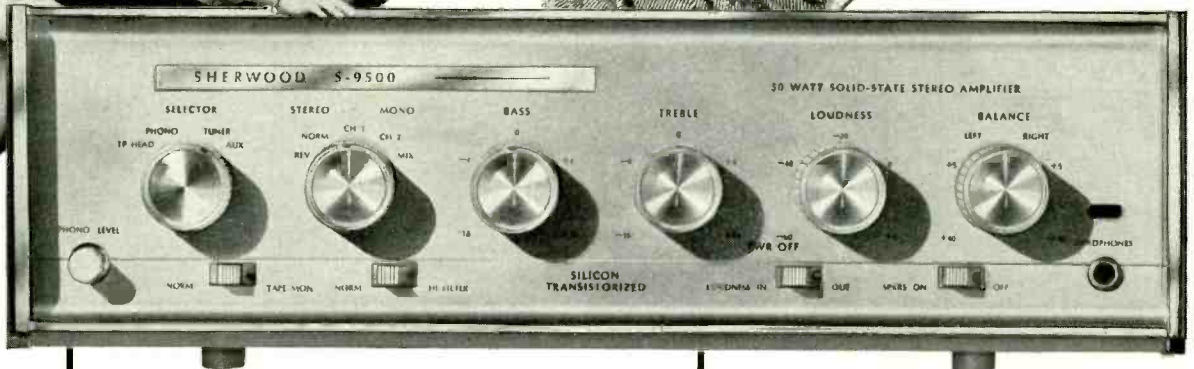
AUDIO • FEBRUARY, 1965

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Characteristics of Shunted Potentiometers

RONALD L. IVES

How to achieve special tapers quickly and easily

NONLINEAR POTENTIOMETERS are widely used in electronic control and instrumentation circuits, particularly in volume and tone control applications. To meet these needs, a few of the better manufacturers have brought out limited lines of nonlinear potentiometers. These, in general, perform as advertised, and are suitable for many applications.

In experimental and developmental work the need frequently arises for a nonlinear potentiometer with characteristics unlike any available manufactured nonlinear pot. Special pots, it is true, can be made to order, but their cost is usually inordinately high, and the delivery tends to be maddeningly slow. In most work, when a pot is needed, it is needed today, or at least this week, and a 120-day delivery delay is both intolerable and uneconomical.

For quite a few decades, it has been vaguely known in the electronics profession that connecting a shunt resistor from the moving arm of a potentiometer to one side will change its characteristics. A few specific applications of this principle have appeared from time to time, but no general cases seem to be available in the literature. Direct computation of the characteristics of a shunted pot is, of course, possible by use of Kirchoff's Laws. This procedure gives perfectly correct answers, but usually bogs down in overcomplex notations, and is extremely vulnerable to arithmetical errors, particularly when we are dealing with high values of resistance.

Simplified Notation

To eliminate the numerous R 's with subscripts that are employed in the classical use of Kirchoff's Laws, as well as the error-susceptible multiplications of resistance values, we can use a relativistic notation, in place of the classical absolute notation. This is shown, as applied to a simple linear potentiometer, in Fig. 1. Here, the value of the entire potentiometer is indicated by a ; and the degree of rotation of the potentiometer arm is designated by θ , which is a decimal as here used, with 0.0 representing "all the way out" and 1.0 representing "all the way in." This notation is sub-

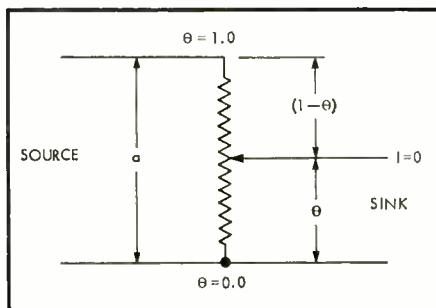


Fig. 1. Simple potentiometer circuit, showing notations.

stantially compatible with the "0 to 10" dials normally provided with potentiometers, many of which have an effective rotation of roughly 270 degrees.

With this arrangement, resistance across the source is constant and is indicated by a . Assuming that source resistance is infinite, resistance across the sink will be $a\theta$. With no current drawn by the sink, voltage out (to sink) will be voltage in multiplied by θ , and this will be true for all finite values of a . This is a simple alternate statement of the standard voltage-divider relationship.

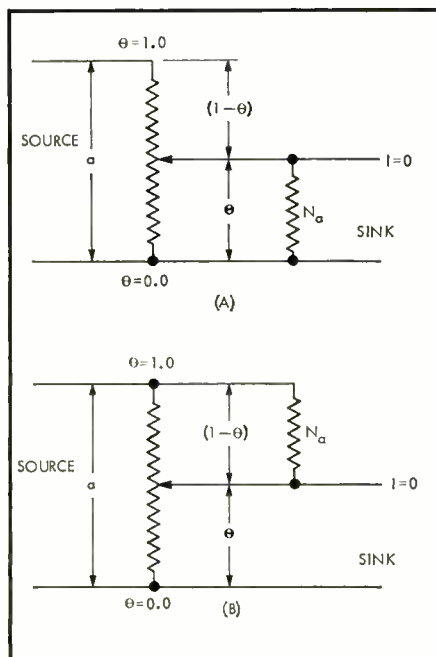


Fig. 2. Potentiometers shunted by fixed resistors.

Shunted Potentiometers

By connecting a fixed resistor from the moving arm of the pot to one side, its characteristic is altered. There are two cases of this connection, shown in Fig. 2 as (A) and (B). In both cases, the shunt resistor is designated relative to the resistance of the potentiometer as Na , N being any finite factor. Note that in both cases, the resistance across the load varies with the potentiometer adjustment.

In the first case, (A), resistance across the source is:—

$$a(1-\theta) + \frac{a\theta \cdot Na}{a\theta + Na} \quad \text{Eq. (1)}$$

eliminating the common a in numerator and denominator of the second term, this becomes:

$$a(1-\theta) + \frac{\theta Na}{\theta + N} \quad \text{Eq. (2)}$$

putting this all over the same denominator makes it:

$$\frac{a\theta - a\theta^2 + Na - \theta Na + \theta Na}{\theta + N} \quad \text{Eq. (3)}$$

and, simplifying:—

$$\frac{a(\theta - \theta^2 + N)}{\theta + N} \quad \text{Eq. (4)}$$

Resistance across the sink is:

$$\frac{a\theta \cdot Na}{a\theta + Na} \quad \text{Eq. (5)}$$

eliminating the common a in numerator and denominator, this becomes:

$$\frac{\theta Na}{\theta + N} \quad \text{Eq. (6)}$$

Now, dividing resistance across sink, Eq. (6), by resistance across source, Eq. (4), we get:

$$\frac{\frac{\theta Na}{\theta + N}}{\frac{a(\theta - \theta^2 + N)}{\theta + N}} \quad \text{Eq. (7)}$$

this readily simplifies to:

$$\frac{\theta N}{\theta - \theta^2 + N} \quad \text{Eq. (8)}$$

and, applying standard voltage-divider concepts, it being assumed that the sink draws no current:—

$$E_{out} = E_{in} \left(\frac{\theta N}{\theta - \theta^2 + N} \right) \quad \text{Eq. (9)}$$

which is the working formula for (A), Fig. 2. Note that this formula applies,

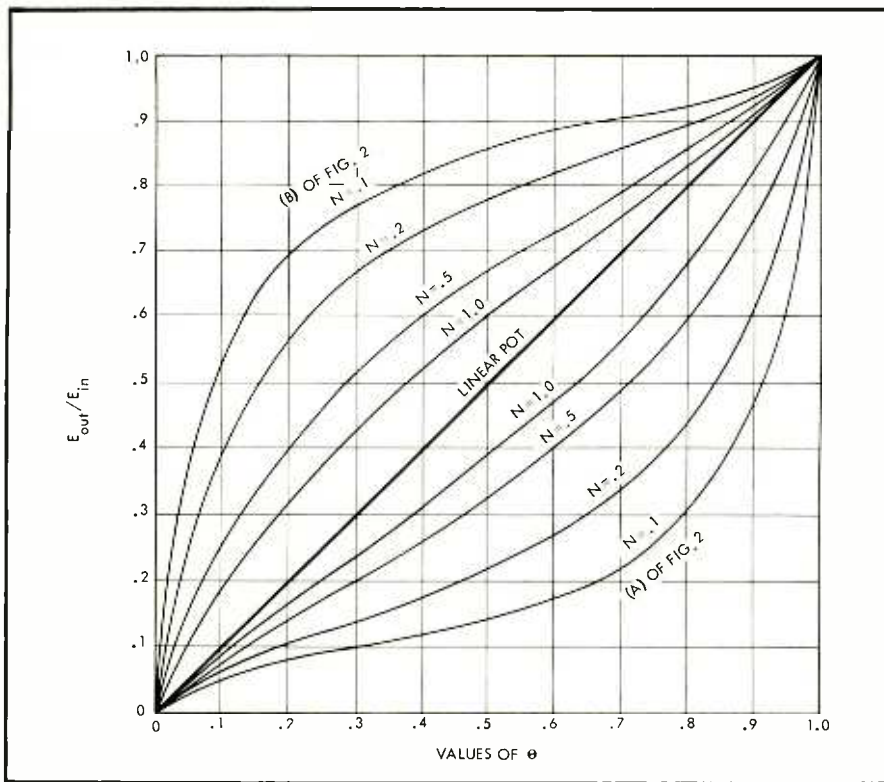


Fig. 3. Characteristics of shunted potentiometers for configurations (A) and (B) of Fig. 2.

within the stated limitations, for all finite values of a and N .

Derivation of the formula for (B) of Fig. 2 is similar. Resistance across the source is:

$$\frac{a(1-\theta) \cdot Na}{a(1-\theta) + Na} + a\theta \quad \text{Eq. (10)}$$

using the same simplifications as in the previous case, this becomes:

$$\frac{a(\theta - \theta^2 + N)}{1 - \theta + N} \quad \text{Eq. (11)}$$

Resistance across sink, by inspection, Fig. 2 (B), is:

$$a\theta \quad \text{Eq. (12)}$$

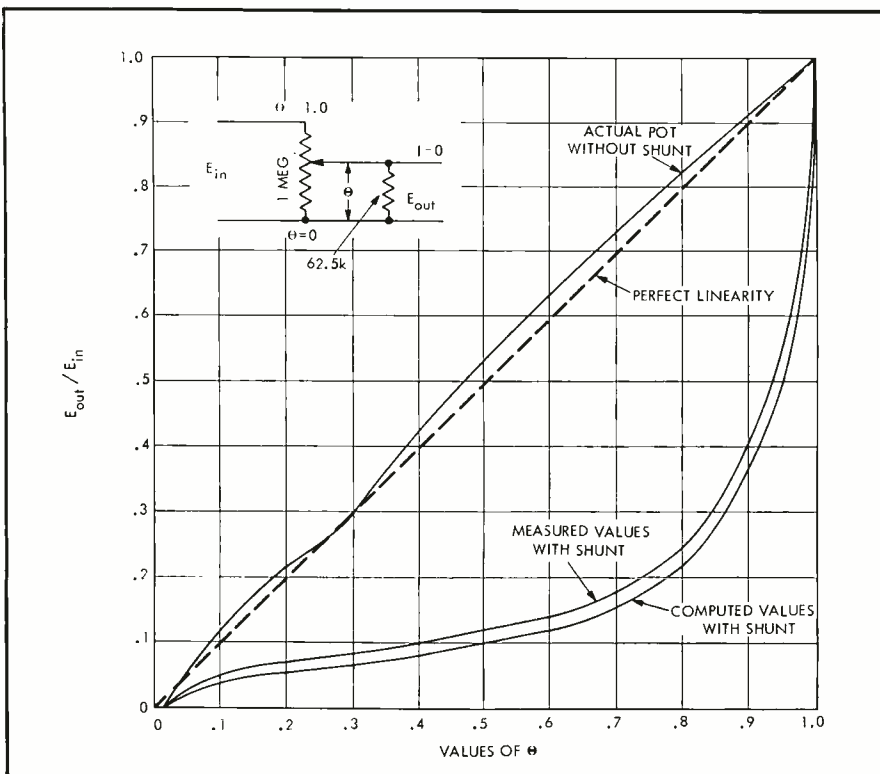


Fig. 4. Computed and measured values for 1 meg pot with shunt of 62,500 ohms.

Again, dividing resistance across sink Eq. (12) by resistance across source, Eq. (11), we get:

$$\frac{a\theta}{\frac{a(\theta - \theta^2 + N)}{1 - \theta + N}} \quad \text{Eq. (13)}$$

which simplifies to:

$$\frac{\theta(1 - \theta + N)}{\theta - \theta^2 + N} \quad \text{Eq. (14)}$$

and, again applying standard voltage-divider concepts, it being assumed that the sink draws no current:

$$E_{out} = E_{in} \left(\frac{\theta(1 - \theta + N)}{\theta - \theta^2 + N} \right) \quad \text{Eq. (15)}$$

which is the working formula for case (B) of Fig. 2. Note again that this formula applies, within the stated limitations, for all finite values of a and N .

Characteristics of shunted potentiometers, for various value of N , for both cases, are plotted in Fig. 3. These curves will give an immediate indication of the configuration required for a given circuit situation, and an approximate value of N for most instances. Exact value of N is determined by substitution in the applicable formula.

This is best shown by a practical example. In a given circuit, it is required that the ratio E_{out}/E_{in} be 10 percent at 50 percent rotation of the control. Reference to Fig. 3. shows immediately that configuration (A) of Fig. 2 is applicable, and that the value of N will be somewhat smaller than 0.1.

Here, Eq. (9) applies, and θ will be 0.5. Substituting:

$$0.1 = \frac{.5N}{.5 - .25 + N} \quad \text{Eq. (16)}$$

simplifying:

$$.25 = 4N \quad \text{Eq. (17)}$$

$$.0625 = N \quad \text{Eq. (18)}$$

Computed and measured values, using a 1-meg pot (Ohmite CU 1052) and a fixed shunt of 62,500 ohms, are shown in Fig. 4. Characteristics of the potentiometer alone, a stock item picked at random from the shelf, are shown in this figure also. As a general rule, with most stock potentiometers, the values below $\theta = .1$ and above $\theta = .9$, will be of little use, because of "end effects." If, by mischance, the wrong equation is picked, (say Eq. (15) in place of Eq. (9) here), the determined value of N will be negative, immediately pinpointing the error.

Special Cases

Although the two most common cases of shunted potentiometers have been detailed, with formulae and an illustrative example, a large number of additional cases will occur to almost any fertile mind. Most of these are not very useful, and many of them are so complex as to strain the analytical procedures outlined in Pender and Warren¹ or Guillemín.²

Some of these rather involved computations can be markedly simplified by use of the relativistic notation employed in this paper (it actually predates Euclid).

Tandem Potentiometers

If the fixed shunt in any previously-mentioned case is replaced by another potentiometer, and the movable arms are ganged (in phase), a whole new family of nonlinear potentiometers is made available. Circuit and characteristics of a typical example are shown in Fig. 5, the two potentiometers here being of equal value. For purposes of comparison, the curve of a linear potentiometer, and of a shunted potentiometer (with $N=1$) are shown on the same figure.

Formula for two potentiometers in tandem, connected as in Fig. 5, is:

$$E_{out}/E_{in} = \theta \frac{\theta N}{\theta - \theta^2 + N} \quad Eq. (19)$$

The similarity of this to Eq. (9) should be obvious, as also should be the derivation. By similar methods, a working formula for configuration (B) of Fig. 2 can be derived, provided the moving arms of the potentiometers are ganged in phase. Where more than two potentiometers are operated in tandem; when their moving arms are not exactly in phase; or when current is drawn at the output; then the computations become most involved, and are best handled with the techniques outlined for "ladder circuits" in any standard work on circuit theory.

Double-Shunted Potentiometers

What would happen if both the upper and lower sections of a potentiometer were shunted? When a potentiometer has a shunt from both the low side and the high side to the moving arm, a most interesting characteristic curve is obtained, vaguely resembling the curves of configurations (A) and (B) of Fig. 2, already discussed, placed end to end.

Formula for this connection, derived by direct application of Kirchoff's Laws, is:—

$$E_{out}/E_{in} = \frac{N\theta(1-\theta+M)}{M(1-\theta)(N+\theta) + (1-\theta+M)(N\theta)} \quad Eq. (20)$$

Characteristic of this potentiometer, for the values $M=N=1$, is shown, along with the circuit, in Fig. 6. By changing the relative values of the main potentiometer a , M , and N , the position of the point of inflection of the curve, and the deviation of the curve from linearity, can be changed through a wide range of values.

Applications

Nonlinear potentiometers are commonly used in volume and tone control circuits, as well as in the timer circuits

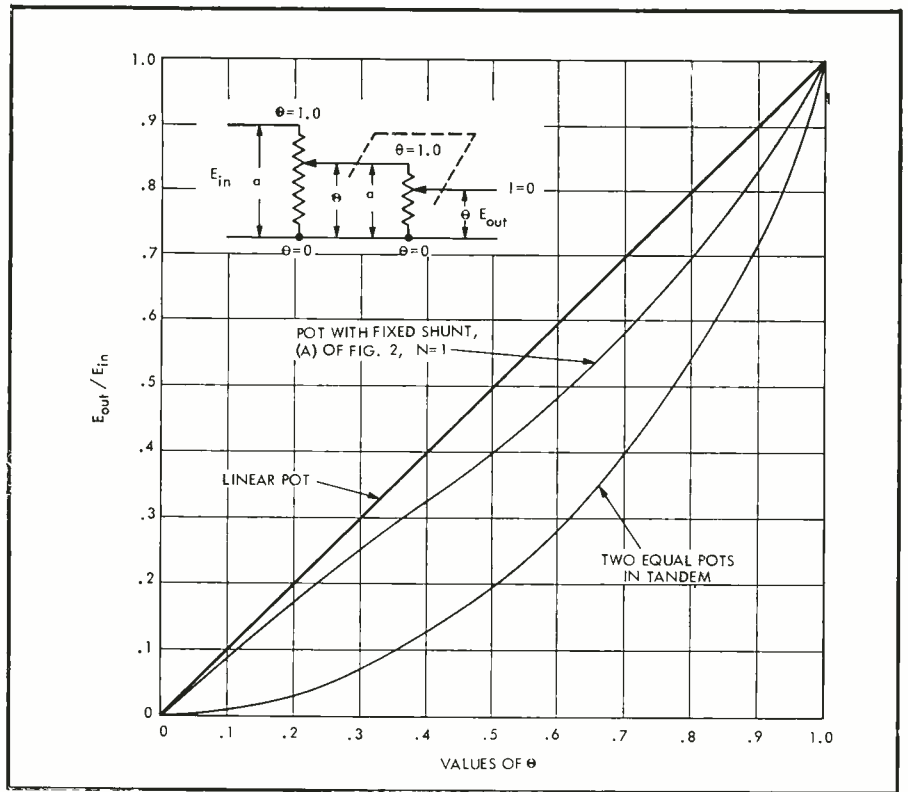


Fig. 5. Behavior of two potentiometers in tandem.

already mentioned. For most volume control work, configuration (A) of Fig. 2, with N evaluated at 0.1 or less, will provide the desired volume range, although a pair of equal ganged potentiometers also offers interesting possibilities.

Where a potentiometer with varying "sensitivity" is required, the double-shunted potentiometer is useful, as it

has a considerable range, yet is "sensitive" in the central portion of the range. This arrangement works well on the centering controls of oscilloscopes and pan-adaptors.

Other applications, as well as additional permutations and combinations, will suggest themselves to the reader, (Continued on page 56)

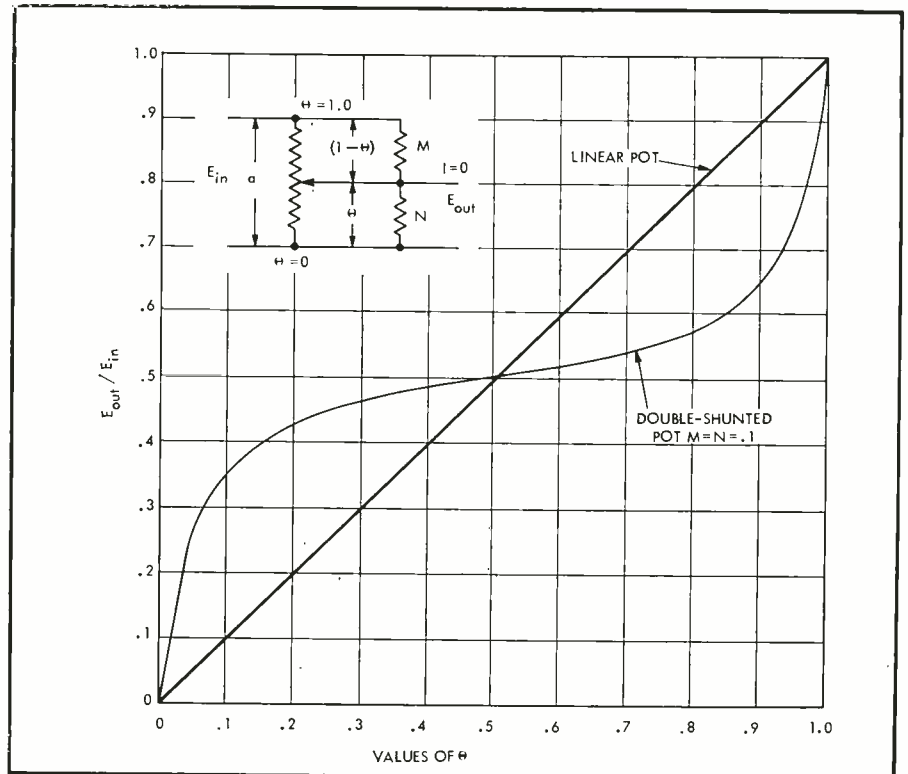


Fig. 6. Characteristic of a double-shunted potentiometer.

Effects of Power Line Variation on Low-Frequency Operation of Amplifiers

GEORGE LEHSTEN*

Normal voltage variation of the a.c. power line may cause loss of 25–50% of low-frequency power if the amplifier power supply is not properly regulated.

ACERTAIN AMOUNT OF INTEREST has been raised concerning the operation of audio amplifiers during supply voltage variations. Extensive evaluation of amplifier performance was undertaken to select amplifiers suitable for geophysical uses. The qualifications required in geophysical applications are perhaps more severe than normal audio operations since the effects are recorded on paper or film and an absolute comparison made for each operation.

General geophysical use of amplifying equipment such as preamplifiers, post or intermediate amplifiers, and power amplifiers require bandwidths and noise figures much the same as audio applications. It was decided that a better grade hi-fi amplifier should suffice for a large percentage of the needed amplifying gear. In actual use, however, hi-fi equipment was not satisfactory. Various tests and actual operating conditions provided proof that this type of equipment did not possess the needed stability and response.

Normal stratigraphic recording techniques require a general bandwidth of 40 to 5000 cps. Conventional sparker systems are in the higher end of the frequency range, usually 300 cps to 2000 cps. Gas gun, boomers, and so on require the lower end of the spectrum, 40 to 300 cps. Upon looking at these frequency ranges it would seem that conventional hi-fi gear should cover the needed range since most units advertise a range of 20 cps to 20,000 cps. While they do cover these ranges, other specifications needed, such as stability and linearity, deteriorate rapidly especially at the lower end of the response spectrum.

The most pronounced defect at the low end of the frequency range was susceptibility to the effects of line changes. In order to evaluate the nature of these effects the units were coupled directly to recording instruments that were capable of recording frequencies up to several hundred cycles. Thus it was possible to see the effects as they occurred and have a permanent record of the distorted signal for comparison. These records show that even if the amplifier were driven to only a part of its total rated output power level, serious wave-

form distortions prevail during the period of line voltage changes. In all the units tested, some of which were in the \$300 price range, *none* had sufficient power supply regulation to assume adequate operation during these periods. Thus in the frequency range from 100 cps down, even "good" amplifiers lost $\frac{1}{2}$ to $\frac{1}{4}$ of their power output capability; an amplifier rated at 50 watts rms could deliver only about 25 watts when the line dropped to 107 volts.

This was a rather startling fact when one figures that the a.c. line is not constant except possibly in the testing laboratory. Some people say that the variation occurs so quickly, say 50–100 milliseconds that one doesn't notice it. Our findings tend to disprove that contention. In the home, the a.c. line is subject to loads presented by high current consuming devices such as oil burners, refrigerators, electric irons, washers and dryers, and such. These on-off loads present a line-voltage condition where a range of variation of 15 volts or more is not uncommon, rather it is the rule. A spot check of the voltage ranges at the homes of several people revealed ranges of 105 to 128 volts. The duration of these variations was up to 3 seconds during the period we checked. We understand that during the air conditioning season the drop lasts much longer. It would seem rather obvious from this that a non-regulated supply would not have a chance to properly furnish power to electronic equipment that requires a specific supply level to maintain a preconceived degree of performance.

Trying to Solve the Problem

Keeping these results in mind, active work was started to develop amplifier equipment which would perform well with the type of line variation normally encountered. Two types were involved. The first type encompassed voltage insensitive circuits for applications where the available power supply and size were of paramount importance and the limiting factor, such as in portable gear. The second type included precision regulated supplies used in conjunction with insensitive circuits when their use did not deteriorate the over-all performance of the system or component. This philosophy was carried out to the extent of programming the supply to provide the

necessary regulation at the tube or transistor element, not only at the common supply point. This approach made the power supply rather complex, however performance was the important consideration.

The initial design used a regulated supply for the entire unit. The output amplifier, its driving amplifier, and the phase inversion stages were to be directly under the control of a regulated supply. The plates of the output tubes had a "negative impedance" characteristic to the degree that compensation for the voltage drop in the output transformer plate winding did not appear at the plates of the tube. The amount of correction was based on the d.c. resistance of the winding at the operating current.

The input amplifier was not under direct regulation but was allowed to remain in a normal resistive decoupled configuration. Since this amplifier was a modified cathode follower, it was insensitive to plate supply voltage variation. The remaining voltage gain stages and driver for the phase inverter were supplied from the output screen supply which was also closely regulated. The reasoning behind this being that the effect of the output screens is the inverse of the voltage amplifier section provided that the plates and bias are not allowed to change. Fixed bias from a precision supply completed the general design.

The power supply itself consisted of a series regulator pass tube for all potentials except the bias which used a shunt regulator system.

Having completed this aspect of the problem the next step was to correct, as far as practicable, the deficiencies of existing equipment. This problem was a bit more complex as the original design of this equipment made no provision for the effects of supply regulation. Several "dual" amplifiers were subject to these modifications with a vast improvement in performance. However, in certain aspects these units are not improved enough to justify the added cost of a regulated supply.

Several different conditions are apparent as a result of supply voltage variation. Each occurs during the voltage change, and some remain as a result of

(Continued on page 61)

* Chief Engineer, Electronics, Alpine Geophysical Assoc., Inc., Norwood, N.J.

Temporary Sound Amplification Systems

DAVID L. KLEPPER

Temporary systems can be well engineered, even though the time allowed for design and installation is limited. (For clarity Part One should follow Part Two—the author intended it that way)

IN TWO PARTS—PART TWO

The Billy Graham Greater Boston Crusade in September and October 1964 presented an opportunity to demonstrate that even temporary sound amplification systems can be engineered on the basis of known acoustic principles to provide high-quality results. Two systems were involved; an indoor system for the Boston Garden, intended for eight days of use and later employed for a "return engagement" of one week, and an outdoor system designed and installed on a last-minute basis for an afternoon gathering on the Boston Common. Important considerations in the design of both systems included: 1. Adequate coverage of the audience area with minimum feedback; 2. directional realism for the maximum number of listeners; and 3. avoidance of artificial echoes. All amplified sound energy was to arrive at the listener's ear at approximately the same time.

The Boston Garden System

The Boston Garden's permanent loudspeaker system, installed over thirty years ago, is useful for many regularly scheduled athletic events, but less than adequate for other special uses as cultural or religious activities. Previous experience indicated that fine sound could be obtained in the Garden, if a properly engineered sound system was installed.⁴

The functional requirements for the Garden temporary system were:

1. Reinforcement of speech from the podium, with coverage for the entire audience area.
2. Reinforcement of both piano and Hammond electronic organ from the platform with coverage for the entire audience area.

3. Reinforcement of speech from the choir director's lectern with coverage for the choir area only.

The advantages of "central" loudspeaker systems with loudspeakers clustered over the source of live sound, in spaces where they are applicable, have been discussed previously.^{5, 6, 7} When properly designed, such systems can provide high intelligibility and naturalness by assuring that live and amplified sound arrive at the listener's ears at approximately the same time, and from approximately the same direction.

All seats could not be covered from a central loudspeaker cluster; line-of-sight was blocked by balcony overhangs over the lower side and rear seating areas. Also, the area behind the platform was occupied by a large voice choir, and a separate system was necessary, enabling the choir director to speak to the choir without his voice being amplified in other seating areas. The complete system, therefore, was a compromise, using distributed loudspeakers to supplement the coverage of the central loudspeaker systems. The line diagram of the system is shown in *Fig. 6*. Location of speakers is shown in *Fig. 7*.

Central Cluster

The central loudspeaker cluster design is illustrated in *Fig. 8*. Phasing considerations for smooth frequency response required close spacing of the high-frequency drivers. This results in equal path-length for amplified sound energy received by listeners in overlap areas covered by two horns.

The low-frequency loudspeakers were designed to be in a vertical line above the high-frequency drivers for best

phasing at the crossover frequency for most seating areas covered. A last-minute installation compromise resulted in a different arrangement of low-frequency loudspeakers, with two single-loudspeaker low-frequency horns side-by-side. The phasing problems in the crossover frequency range and lack of directional control introduced by this compromise were evident when the central loudspeaker system was equalized, as will be discussed later.

The lowest horn of the cluster was used only when people came forward to an area immediately in front of the platform at the end of the service. At other times, this area was unoccupied, and the horn was switched off.

Different transformer taps were used for high-frequency horns, as illustrated in *Fig. 6*, to partially compensate for varying distances to areas covered by the central loudspeaker cluster.

The orientations for the high-frequency horns were obtained using the techniques described by Malmund and Wetherill⁸ (a three dimensional scale model of the seating area, a light machine with templates for horn coverage in the 2400-4800 cps range). This design technique proved to be especially useful for the very complex coverage problem posed by the Garden seating layout.

A 160-watt amplifier fed the central cluster and levels could easily meet the 95 db criteria for the system.

Distributed Systems

Eight-inch coaxial loudspeakers in small, 1.5 cu. ft., glass-fiber filled wood enclosures were used for the distributed loudspeaker systems.

The first distributed loudspeaker zone included the choir seating area and upper balcony behind the speaker's stand.

⁸ Wilfred Malmund and Ewart Wetherill, "Design of Complex Directional Loudspeaker Clusters," presented at Audio Engineering Society Convention, New York, October 1964. Preprints are available from Audio Engineering Society.

* Bolt Beranek and Newman Inc., Cambridge, Massachusetts

⁴ Beranek, Radford, Kessler and Wiesner, "Speech Reinforcement System Evaluation," *Proceedings of the IRE*, vol. 39, No. 11, November 1951, pp. 1401-1408.

⁵ *Ibid.*

⁶ H. F. Olson, *Acoustical Engineering*, D. Van Nostrand Co., Inc., Princeton, N. J., 1957, p. 518.

⁷ D. L. Klepper, "Central Vs. Distributed Systems," *AUDIO*, vol. 48, No. 6, June 1964, p. 19.

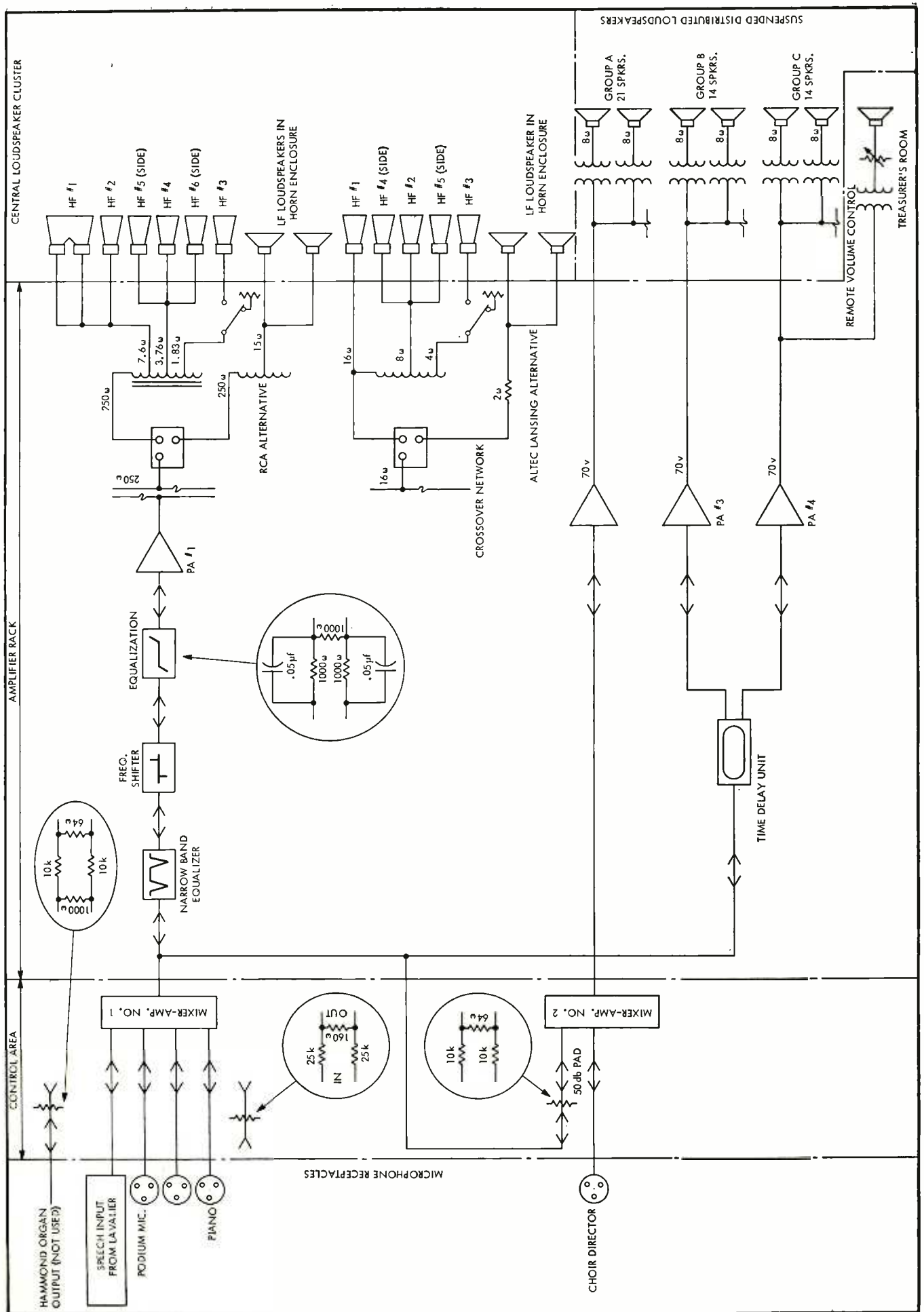


Fig. 6. Line diagram for the Boston Garden system.

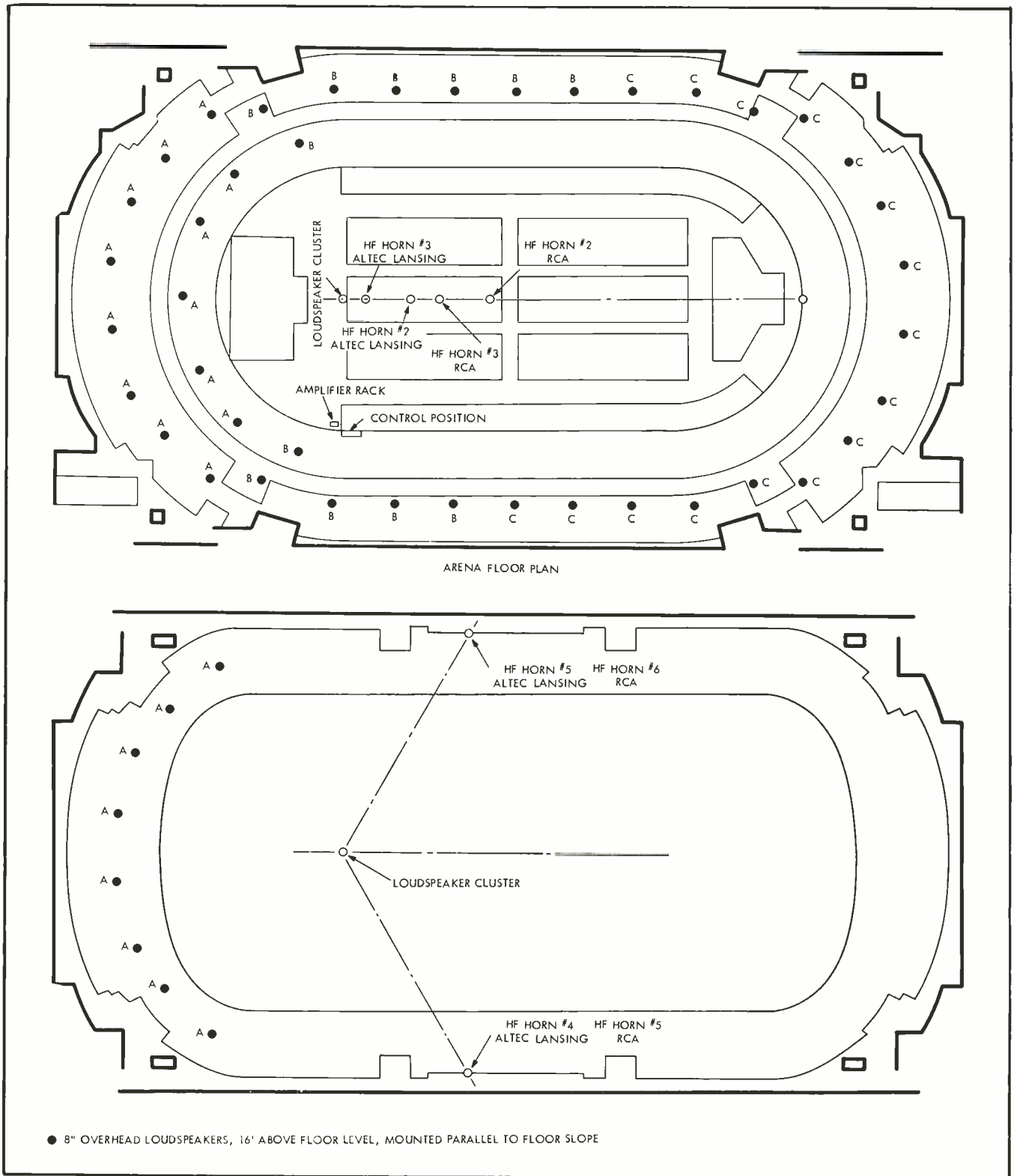


Fig. 7. Loudspeaker locations for Boston Garden system.

Here the loudspeakers were suspended by separate wire cable, and each enclosure angled so that the loudspeaker centerline was perpendicular to the seating slope. The enclosures were located roughly ten feet above seated head height. All loudspeakers were tapped for 8-watts from a 70-volt line, fed by one 160-watt power amplifier.⁹

This amplifier was, in turn, fed by an independent mixer, allowing the choir

director's microphone, and the microphone for the piano to be heard by the choir, without being directed to the audience. A third choir mixer input was fed from the main mixer output.

The choir loudspeakers were judged sufficiently close to the central cluster

⁹ For a discussion of the constant voltage basis for sound distribution, see N. Crowhurst, "A Basic Course in Commercial Sound—Chapter 4," *AUDIO*, vol. 48, No. 7, July 1964, p. 30-31.

not to require time delay. (Realism would certainly have been helped by time delay, but the added complication and cost did not appear justified for a temporary system.)

Time delay was considered essential for the signal to the other two distributed loudspeaker zones, however.

Two delays were used. One, approximately 70 milliseconds, was used for the side under-balcony loudspeakers and the

other, approximately 140 milliseconds, was employed for the rear under-balcony loudspeakers.

Two more 160-watt amplifiers were employed, one for the side loudspeakers and one for those at the rear; again these loudspeakers were connected to draw 8 watts from the 70-volt line.

The side and rear wood loudspeaker enclosures were all suspended from the balcony soffits above. The side under-balcony loudspeakers were centered over the sloped seating area requiring coverage, and their axes were perpendicular to the seating slope. However, the rear under-balcony loudspeakers were actually located over the overlap zone between the central and distributed loudspeaker system; consequently, they were directed toward the rear of the under-balcony coverage area.

Microphones

Billy Graham has worn an omnidirectional condenser microphone as a wired lavalier microphone for talks during the past fifteen years. This microphone has an interesting history; it was built in 1949 (from the early Altec M-11 microphone system) and uses the 21B microphone "button" but in a special brushed aluminum "lipstick" case. The microphone system was the development or pilot model of the now-familiar M-20 "lipstick" microphones, and was supplied to Billy Graham by John Hilliard, then chief engineer of Altec Lansing.

The signal from this microphone is fed directly to the ABC network input equipment and a padded output was fed from the ABC mixer to the main sound reinforcement system mixer.

A dynamic cardioid microphone was used at the podium for all speakers except for Billy Graham. The signal from this microphone was also fed to the main sound reinforcement mixer. A second cardioid microphone was used for the choir director, feeding only the choir system mixer. Omnidirectional microphones were used for organ and piano pickup; the organ microphone was fed directly to the main mixer and the piano microphone to both the main and choir mixers. Finally, a bridged padded output from the main mixer was connected to the number 1 input of the choir mixer, allowing the choir to hear all speeches.

Equalization and Feedback Suppression

Broadband equalization was applied to the amplification channel feeding the central loudspeaker cluster and consisted of an RLC network giving approximately 4-db loss to an octave centered at 1.8 kc and high-frequency boost raising the response by 8 db at 10,000 cps. This network was installed following measurements of the over-all fre-

quency response of the central cluster system with $\frac{1}{3}$ -octave band filtered noise tapes applied to the console input. Measurements were performed with a Bruel and Kjaer sound level meter to measure the response at four different typical seat locations. This broadband equalization, together with use of all 4 db of high-frequency padding available on the crossover network, yielded a slightly downward sloping smooth frequency response.

We had planned on using narrow-band equalization to provide great reserve gain before feedback for the complete sound system.¹⁰ Unfortunately time was too short to exploit this technique fully, and only three narrow-band LC sections were employed to control feedback modes around the crossover frequency.

¹⁰ C. P. Bonner, "A Procedure for Minimizing Acoustic Feedback and Room Modes in Sound Systems," presented at the Audio Engineering Convention, New York, October 1964. Preprints are available from Audio Engineering Society.

One may speculate that the first three feedback modes appeared at this frequency because of the compromise to the low-frequency portion of the loudspeaker cluster and the resulting lack of phase alignment of the low-frequency loudspeakers and high-frequency drivers. This compromise may have destroyed any directional control of the loudspeaker system in the crossover range and may have resulted in peaked response behind the loudspeaker. No measurements were performed to further check this hypothesis. Once the three modes in the crossover region were suppressed with narrow-band equalization, the central loudspeaker system had great reserve gain over feedback, over 15 db above the gain required for system operation.

Since the necessary time for carrying out many stages of narrow-band equalization was not available, a frequency shifter feedback stabilizer was specified to insure a satisfactory margin of gain

(Continued on page 57)

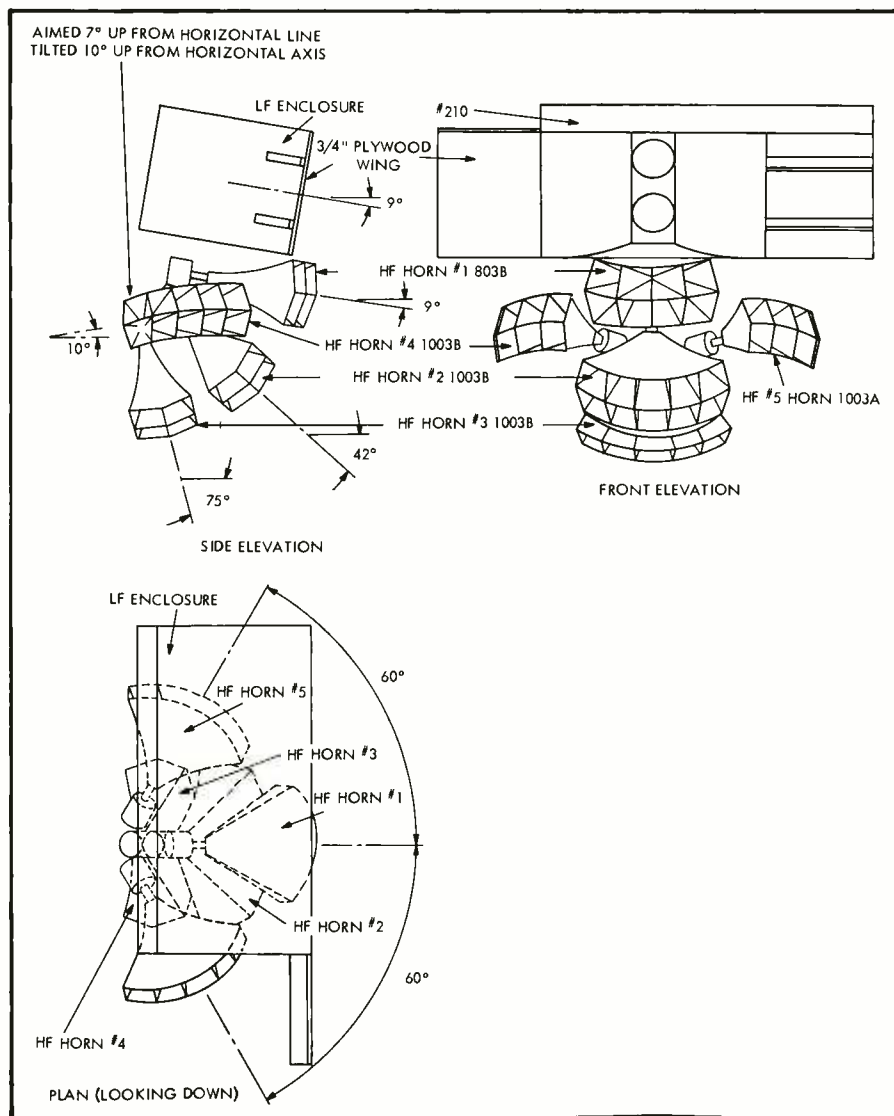


Fig. 8. Central loudspeaker cluster.

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GIVES you more features you want from an omnidirectional hand-held microphone

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SOLVES the most common problems of other omnidirectional microphones

• **FEEDBACK**—Proved much less susceptible to feedback because its unique ultra-flat response has no undesirable peaks at any specific frequencies (a major cause of omnidirectional feedback).

• **DISTORTED SOUND**—The most natural sounding omnidirectional microphone ever developed. No "off-axis" sound coloration. Smaller diameter means there's far less of a "blind spot" in the pick-up pattern. No troublesome "boominess", no fall-off at the high end.

• **EQUALIZATION**—By far the easiest omnidirectional to equalize to the characteristics of the speaker's voice and the room acoustics . . . because it's ultra-flat . . . adds no false peaks or roll-offs of its own.

• **HUM PICK-UP**—Steel case reduces hum of the 578 to half that of any of the leading competitive units.

PERFORMS PERFECTLY in scores of diverse applications

• **VERSATILE**—In just one year, the Shure $\frac{3}{4}$ " Omnidyne probes have proved their superiority in an impressive array of applications ranging from stage and night club performances, to seminars, "pass-around" microphones in audiences, interview situations . . . anywhere and everywhere an omnidirectional is called for.

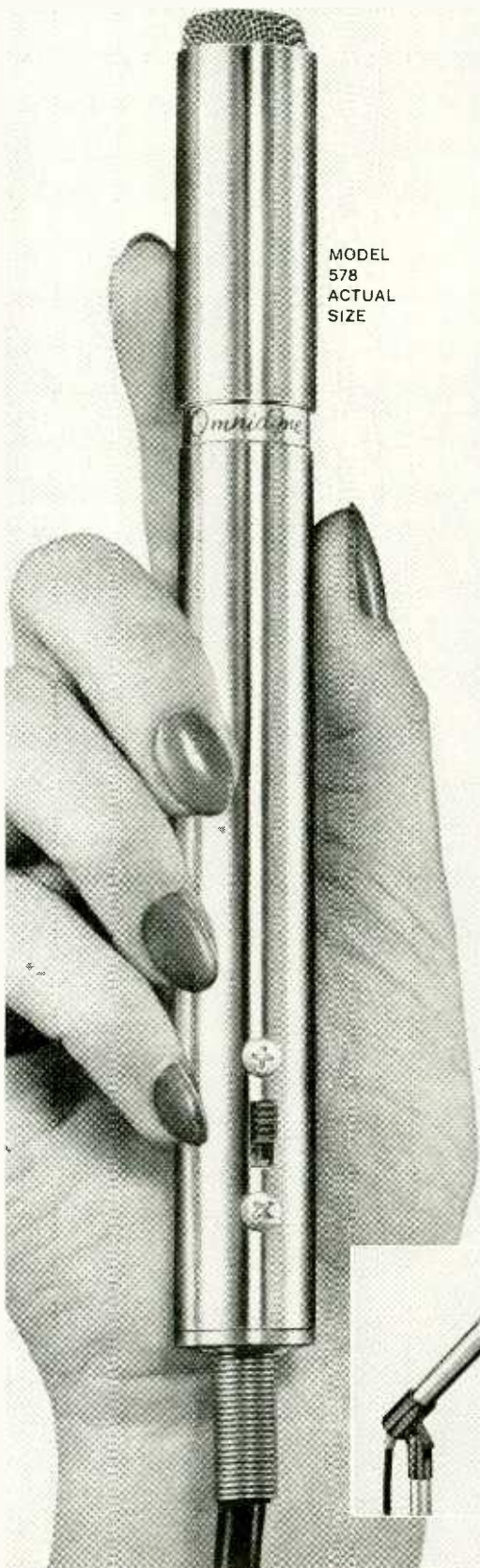
SPECIFICATIONS—Dynamic omnidirectional with ultra-flat frequency response and perfectly symmetrical pick-up pattern. 50 to 17,000 cps. Dual impedance: High impedance has -59 db output (0 db = 1 volt per microbar), 200 ohm (low) impedance has -60 db output (0 db = 1 milliwatt per 10 microbars). Trouble-free Duracoustic diaphragm. Steel, satin-chrome case. Built-in on-off switch with locking provisions. Supplied with swivel stand adaptor and 18 ft. 3-cond. shielded cable. Only 7 oz. (less cable), $\frac{3}{4}$ in. diam., $7\frac{1}{8}$ in. overall length.

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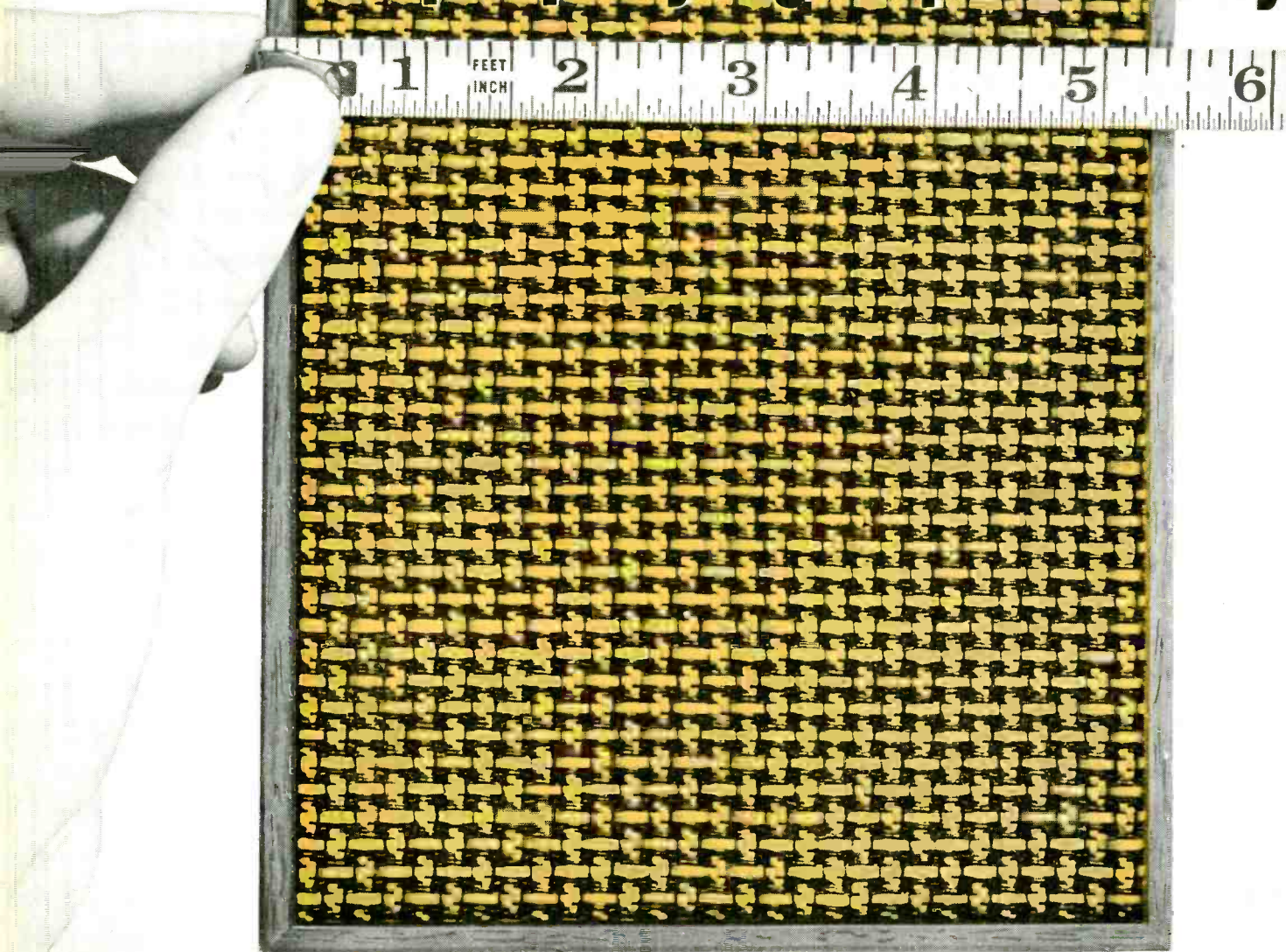


MODEL 578 ACTUAL SIZE



**This is
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Size:**

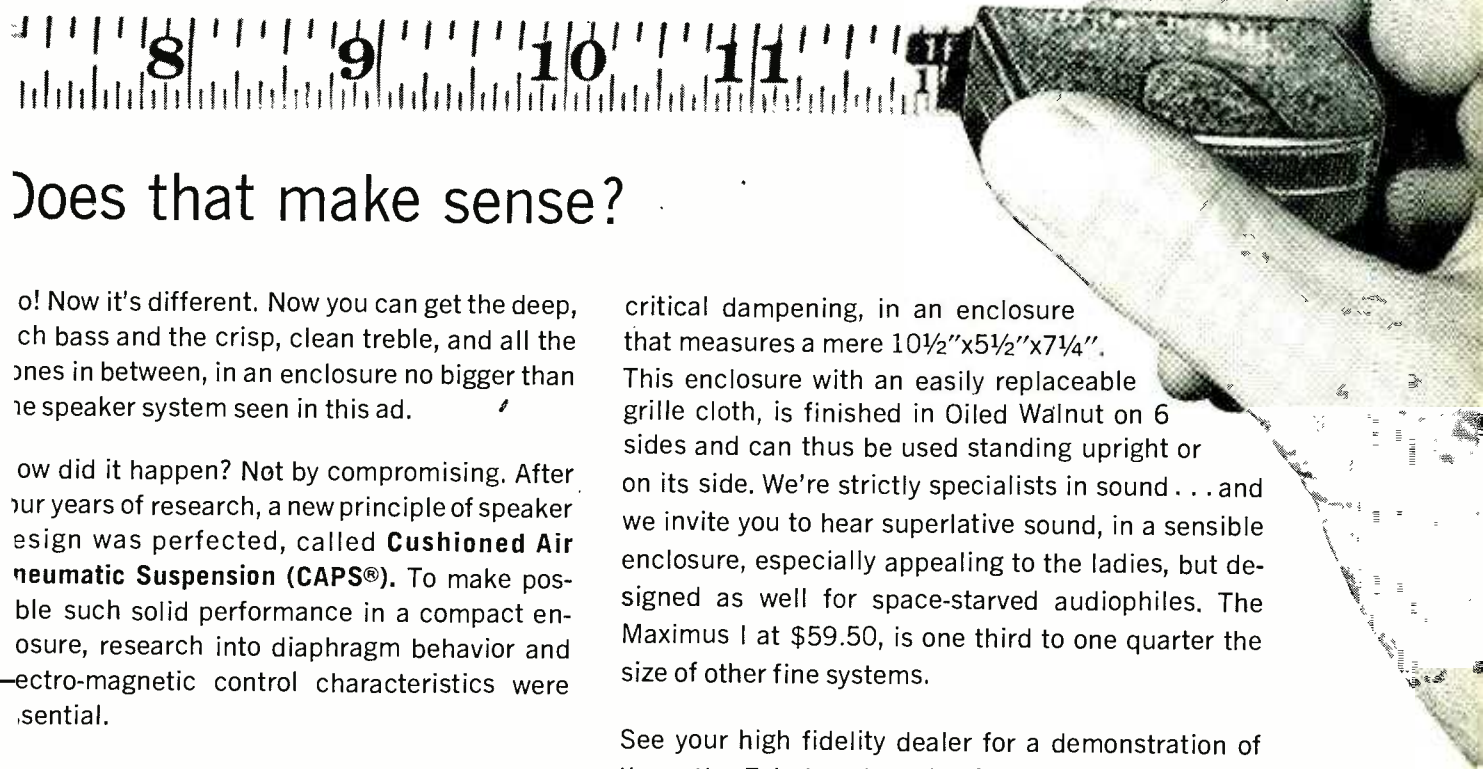
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This David Outclasses All the Goliaths

Now, you need not compromise on space or your listening pleasure.

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Does that make sense?

Now it's different. Now you can get the deep, rich bass and the crisp, clean treble, and all the tones in between, in an enclosure no bigger than the speaker system seen in this ad.

How did it happen? Not by compromising. After four years of research, a new principle of speaker design was perfected, called **Cushioned Air Pneumatic Suspension (CAPS®)**. To make possible such solid performance in a compact enclosure, research into diaphragm behavior and electro-magnetic control characteristics were essential.

Now, you can find the **CAPS®** principle in **only one line of speakers — the MAXIMUS Series by UTC Sound**. Maximus I, for example, is a multi-speaker system with a magnet structure of over 3½ lbs., capable of driving cones 3 to 4 times its size, but designed for maximum

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BE EXHIBITED at The Washington High Fidelity Music Show — in Suite C-240/241/242 — In the "C" wing of the Sheraton Park Hotel, February 12, 13, 14, 1965

Special Electronic Organ Tone Sources

D. WOLKOV

The Band-Box, Side-Man and ChimeAtron represent three different methods for the production of sounds complementary to the electronic organ

THE OLD THEATRICAL AIR ORGAN, and some of the classical air organs, employed as adjuncts such percussive instruments as drums, triangles, castenets, and so forth. These were operated through air controllers, with the musician operating the pilot valve (or electrical value actuator) at his keyboard.

The electronic organ industry has provided the home musician with sealed down versions of similar percussive sections. Of the units available, three are particularly interesting. All three of these "traps" operate on different principles: a. The Artisan Band-Box is a group of genuine percussive musical instruments that are solenoid actuated; b. The Wurlitzer Side-Man is a specialized electronic organ with a motor driven switchboard in place of the conventional keyboard. c. The Schulmerich Chime-Atron, an electronically amplified set of musical chime bars.

The Artisan Band-Box would on the first consideration seem to be useful only for the playing of hurdy-gurdy music. But consider the amount of traps that different conductors have used in recent recordings of Ottorino Respighi's works, or more obviously in the Strauss waltzes.

The Band-Box includes a large fraction of the number of percussive instruments that one would find in the percussion section of a modern symphony orchestra. The instruments in the Band-Box are genuine musical instruments operated through solenoid mechanisms. If remote sound is required then microphones and the usual amplification techniques must be used.

The Wurlitzer Side-Man, in contrast, does not contain a single musical instrument. All of the percussive sounds are generated and modified by vacuum tube oscillators and formant filters respec-

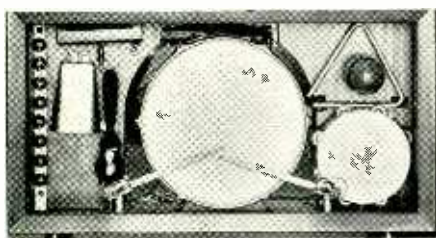


Fig. 1. Band-Box, external view.

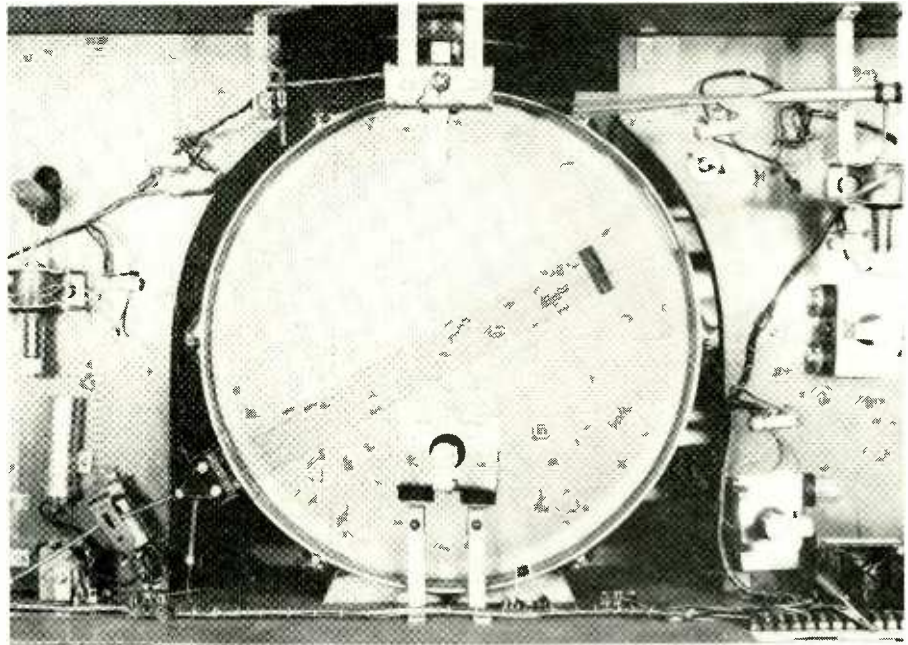


Fig. 2. Band-Box, rear view, showing actuators.



Fig. 3. Wurlitzer Side-Man.

tively. An adjustable-speed motor-driven switch provides the tempo settings and a manual switch is used for selecting the tonal combinations.

The Side-Man is obviously designed for dance music, it is almost as auto-

matic as the older and more familiar player piano.

The Schulmerich Chimes are musically tuned rods which are struck by electromagnets; an inductive pick-up changes the mechanical vibrations of the rods to electrical oscillations; the electronic signal is amplified and then heard as sound at the speaker. Chimes were originally associated with religious music. Today, however, many organists are using chimes in popular music with noticeable dramatic musical effects.

Artisan Band-Box

We begin our detailed discussion with the Artisan Band-Box. *Figure 1* shows the front view and *Fig. 2* the rear view, the latter shows the instrument actuators. A typical setup includes:

Pedal	Great	Swell
Cymbal Crash	Cymbal Tap	Snare Drum
Cowbells	Cymbal Brush	Roll
	Wood Block	Maracas
	Snare Drum	Castenets
	Beat	Tambourine
		Sleigh Bells
		Triangle.

There is nothing special about such an arrangement, and the user can rear-

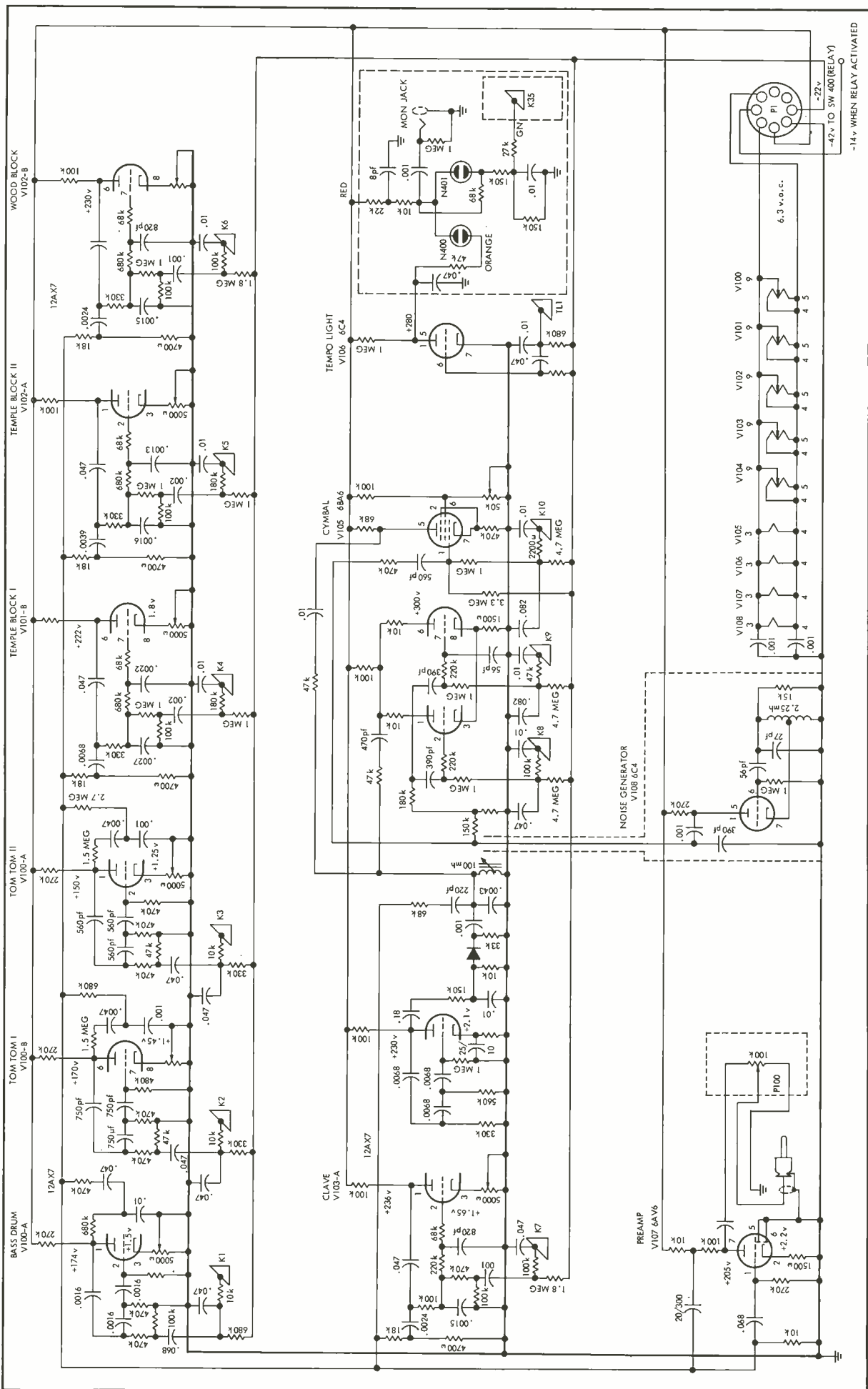


Fig. 7. Schematic of Wurlitzer Side-Man.

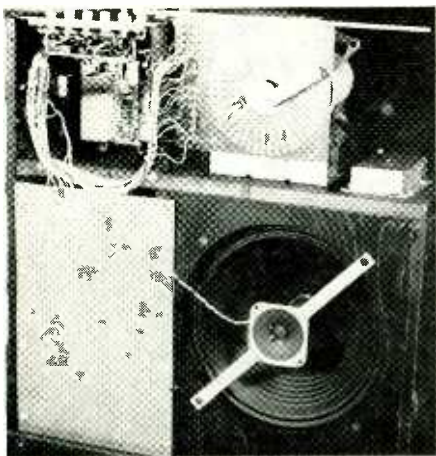


Fig. 4. Front interior view of Wurlitzer Side-Man.

range the cabling, or group the controls into one box at his discretion. Wiring is extremely simple.

Since all of the instruments in the Band-Box are true musical instruments, we will not, in these articles investigate their scientific aspects, but instead, we will pass on to the description of the techniques which make them compatible with electronic organ playing methods. Readers who are interested in the scientific aspects of these musical instruments will find "A Textbook of Sound" by A. B. Wood (Macmillan 1937) most useful. This book contains detailed mathematical analyses for all of the instruments in the Band-Box.

Instead of air hoses, valves and air actuators, which were used to operate the trap section of an air organ installation, the Band-Box uses electrical solenoids. The complete grouping of actuators is shown in Fig. 2. A make-break contact arrangement is used in the snare drum actuator. These contacts provide a very rapid drum roll of high rhythmic uniformity.

At one time Artisan supplied the Band-Box as a kit. In line with the growing trend to keep mechanical assembly out of kits (Schober for example in their new keyboards), Artisan now only furnishes the Band-Box completely assembled.

The Artisan percussion instruments are soft and melodious in their voicing. They form delightful contrasting and complementary sounds to the electronic organ.

There are several Artisan records available from Electronic Organ Arts, 4949 York Boulevard, Los Angeles 42, California. These records have the Artisan Band-Box sounds incorporated in the various musical arrangements.

Wurlitzer Side-Man

In contrast to the Band-Box, the Wurlitzer Side-Man does not contain a single musical instrument but depends, instead,

on the techniques of oscillators and filters. The percussion sounds vary in rhythm patterns which are suitable for all of the rhythms used in today's popular music. Maracas, temple blocks, tom toms, and other similar sounds are combined in the patterns of the rumba, bolero, waltz, fox trot, and so on.

Figure 3 shows the exterior view of the Wurlitzer Side-Man and Fig. 4 and 5 show the interior views. Figure 6 shows the control panel.

The circuit of the Side-Man is straightforward. There are ten continuously operating tone generators. The output of these generators are fed to the preamplifier and then to the audio system through a selector switch.

The oscillators can be grounded (i.e. stopped) by manual pushbutton switches, or they can be cyclically grounded by the variable speed motor (tempo wheel).

Figure 7 is the schematic for the tone generators, the audio oscillators, and the

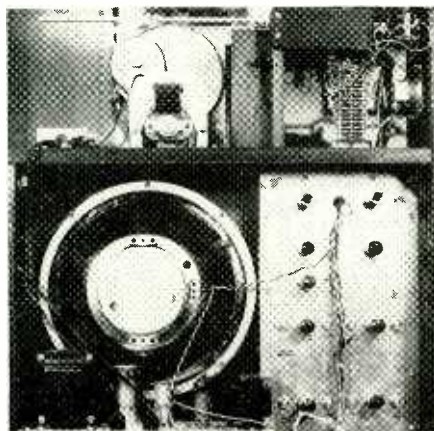


Fig. 5. Rear interior view of Side-Man.

formant filter networks. Note that each oscillator tube is also the power tube.

The real story of the Side-Man is the switching setup. The ten basic tone generators are tonal building blocks. Instead of having the musician pull his own stops, the selector switch acts as a variable piston. Thus for each position of the switch there is a preselected group of tones which are collected and fed to the preamplifier.

In addition to providing the audio mix, the selector switch provides the wiring schedule to the rotary motor driven switch shown in the upper right hand side of Fig. 4.

For a given rotational speed of the tempo wheel, there will be a tone pattern mix, previously selected and a fixed rhythmic interruption of the tone pattern.

It is through such ingenious wiring techniques that the ten oscillators can provide rhythmic patterns for all of the musical groupings shown on the control panel. In addition, 72 variations of block

and cymbal patterns are available in the fox-trot section.

The speed changing mechanism is the familiar disk and rim drive. (See Fig. 8.) The position of the Tempo Lever determines the position of the rim drive and hence its speed, i.e., the tempo.

The design of the power amplifier is such that the internal amplifier and speaker system can be bypassed. This should not be done for best audio results. The organ and Side-Man sounds should come from different sources.

With the Side-Man and an electronic organ you can be a soloist and a rhythm combo all by yourself. It is an interesting experience, try it for yourself.

Schulmerich ChimeAtron

The Schulmerich ChimeAtron is a combined mechanical and electronic musical instrument. The faint musical sounds of the electro-mechanically struck bars are picked up through inductive coupling. The electrical signal is then amplified and converted to sound at the speakers. The chime sound is such that it cannot be readily simulated by oscillators and filters.

In Fig. 9 we see part of a tuned set of the Schulmerich ChimeAtron bars, cut to such lengths so that slightly more than two octaves of fundamentals can be sounded. This figure also shows the amplifier chassis.

Note that the well-engineered suspension (Fig. 10) permits the bar to act as if it were completely free at both ends. The bar is actually supported at the bottom by nylon threads and spring supports.

An appealing feature of the Schulmerich system is the controlled diminuendo. A fine wire V is inserted into the end of the hammer. In the normal rest position, the V rests against the hole in the anvil of the rod. When the coil is

(Continued on page 60)



Fig. 6. Control panel and tempo level bar of Side-Man.

What a crazy, lovely, naive, ingenious company.

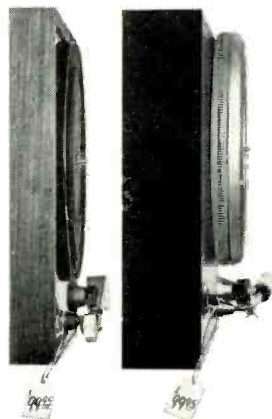
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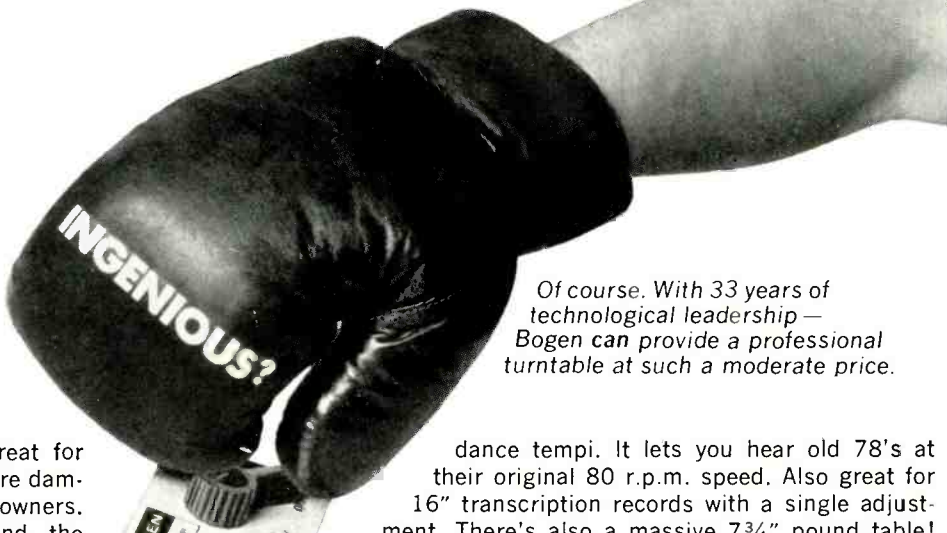
The B62 is only \$69.95. That's very lovely. If anyone else made the B62, it would sell for at least \$99.95. (Read on. You'll agree.)



Of course. You've got to be to make anything as great as the B62. Crazy like Galileo, Fulton, Edison.

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Sure. Bogen actually expects people to believe they can own a professional turntable for under \$70.00!



Of course. With 33 years of technological leadership — Bogen can provide a professional turntable at such a moderate price.

The B62 has automatic cueing. Great for the man who's "all thumbs." No more damaged cartridges or records for B62 owners. Instead of lowering the arm by hand, the cueing lever does it for you. It lets the arm down with feather lightness into any groove you choose. It also has variable speed control; 59 speeds, from 29 to 86 r.p.m., with click stops at 78, 45, 33 $\frac{1}{3}$ and 16 r.p.m. For those who like to "perform" with records, and for dancers and musicians, the B62 changes record pitch to match that of voice, instrument or

dance tempi. It lets you hear old 78's at their original 80 r.p.m. speed. Also great for 16" transcription records with a single adjustment. There's also a massive 7 $\frac{3}{4}$ " pound table! Rumble is inaudible, and the professional balanced tonearm accepts all popular 4-pin plug-in cartridges.

For more complete specifications, of the B62 and other new Bogen components write: Bogen, Dept. C-2, Paramus, N. J.

BOGEN  **LEAR SIEGLER, INC.**
COMMUNICATIONS DIVISION PARAMUS, NEW JERSEY



The Tape Guide

HERMAN BURSTEIN

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

Herman Burstein
280 Twin Lane E., Wantagh, N.Y.

Solving the Stretched Edge Problem

Colonel W. D. Tiffany (5906 Accomac Street, Springfield, Virginia) writes the following about the problem of prerecorded tapes with a stretched edge, discussed in the November 1964 issue:

"This problem has plagued me since 1961 when I was stationed in Korea and obliged to buy my prerecorded tapes from the Post Exchange. The relatively long storage and shipping times resulted in considerable dehydration of the plastic tapes used by virtually all of the recording companies. I found that some tapes had 'stretched edges' at the time I purchased them; other developed this fault after having been played and then stored after in Korea's alternately dry and humid seasons and secondly in Washington D.C.'s similar cyclic variation in humidity.

"I have concluded that my trouble lies in habitually playing only the first side of some tapes, and then rewinding and putting the tape away. I believe the stretch is due to the tendency toward a tighter wrap near the hub of the reel during rapid rewind, and an appreciably looser wrap toward the outside of the reel. This may permit more absorption of moisture in the loosely wrapped portion. As an experiment I reversed a stretched tape on its master reel (3 rewinds) so that what had been toward the outside of the reel was now toward the hub. After four days of storage I found that from 90 to 100 per cent of the trouble had been corrected.

"The ultimate solution lies in inducing the tape recording companies to use Mylar, preferably 1.5 mil. My own tapes (that I have recorded) have never exhibited this irksome problem.

Input Level

*Q. I am feeding the signal from a ceramic cartridge directly into my **** tape recorder, but the signal is weak and*

forces me to set the recording gain control quite high. Therefore I am not getting as good a signal-to-noise ratio as I should be getting. Would it be better if I took the input signal from a point in my audio system where there is a higher signal level, instead of directly from the cartridge?

A. In the case of the **** tape machine, the high-level input goes directly to the recording gain control and does not first go through a preamplifier stage. Therefore the setting of this control should make no difference in the signal-to-noise ratio, provided there is enough signal to drive the tape machine to maximum permissible recording level as shown by the level indicator. Possibly you are getting an inadequate signal-to-noise ratio because of distortion in the bias waveform when recording; such distortion produces noise. A top quality machine employs great care in the design of the bias oscillator and the quality of components used in the oscillator so as to minimize waveform distortion. To improve the signal-to-noise ratio you might try high output tape, which can improve the ratio about 6 to 8 db. However, such tape tends to bring on other problems, including greater print-through. But these other problems may be less offensive than the noise which now bothers you.

Is IM an Indicator of Quality

Q. In a modern phono system it is possible to keep IM distortion no higher than 2 per cent. Yet reputable tape recorders produce IM measuring several times as much. At the same time, tape appears to handle the large climaxes so much more easily than records. Hence is IM distortion measurement realistic?

A. I am not sure that 2 per cent IM is the most you can get on a phono system. This may be what you get at an average recording level, but it may rise a good deal higher on peaks. The extent to which distortion affects the ear depends not only on the magnitude of distortion but also on the frequencies of the distortion components. In the case of a tape system, higher order distortion components may be greatly attenuated because of the inability of the tape head

to respond, whereas a phono system may be less limited in this respect. Thus distortion that measures the same on two systems may be easier on the ear in one case than in the other.

Tape Head Output

Q. In attempting to play directly from a tape head into the magnetic input of my audio amplifier, the sound level is virtually inaudible unless I advance the volume control very high. My tape machine has no output jack for feeding an external amplifier.

A. All tape heads put out an extremely low signal, on the order of a very few millivolts or a fraction of a millivolt, depending on frequency. The high setting required of the gain control is therefore understandable. By feeding the tape head to the magnetic phono input, you are getting incorrect playback equalization, resulting in insufficient bass and in treble cut. This too may account for the amount of gain that has to be supplied. Try taking the tape playback signal from across the volume control of your tape machine, and feed this signal into a high-level input of your audio amplifier.

Head Wear and Pressure Pads

*Q. Recently I purchased a **** tape recorder. The only item that I am not too pleased with is the tape tensioning device, which consists of a foam backed plush pad that comes into contact with the three heads during record and play. My question is this: Does this type of pressure pad increase wear on the heads as compared to other systems in the same price class (\$400 to \$500). Perhaps you can suggest ways to minimize excessive head wear.*

A. It is generally considered that pressure pads cause faster head wear than a system of tape guides and tape tension (exerted by the reels) to provide close tape-to-head contact. However, it is easier and less expensive to achieve good contact through pads than by other means. Hence only the top bracket machines avoid pads altogether. Some of the better machines limit the use of a pad to the erase head or to a tape guide. To minimize the consequences of using pressure pads, I suggest that you use top quality tape, which will contain suitable lubrication to facilitate passage of the tape across the head. You might also employ one of the special fluids sold in audio stores for lubricating tape heads.

European Equivalents

Q. What are the European equivalents of 7.5 ips speed and 1/4-in. tape?

A. 19 cm/s (centimeters per second) speed, and 6 mm tape.

(Continued on page 67)

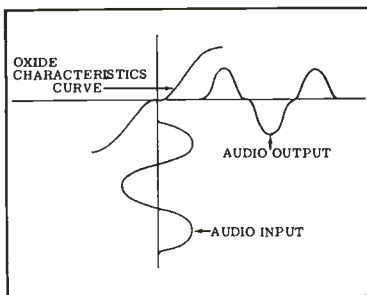
Some plain talk from Kodak about tape:

Bias transfer characteristics and dependent parameters



Ever heard the story about the pilot on his first solo flight? Unfortunately the engine failed. But fortunately he had a parachute. But unfortunately the chute failed to open. But fortunately he landed on a haystack. But unfortunately there was a pitchfork in the haystack. Except for the unhappy ending, this might be the story of how gamma ferric oxides respond to magnetic fields. Everything about it is fortunate with one exception. *Linearity.* The oxide needles used in the coatings have atrocious linearity characteristics. Feed in a clean, pure sine wave and out comes a non-sinusoidal complex waveform that looks something like a demented snake trying to bite its own head off. How does it sound? About as pleasant as Junior's first violin lesson.

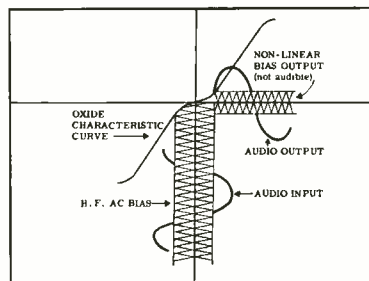
How then is magnetic recording possible? Fret not—there's a way out. The entire problem is solved by one wonderful, mysterious phenomenon called bias. The transfer curves tell the story.



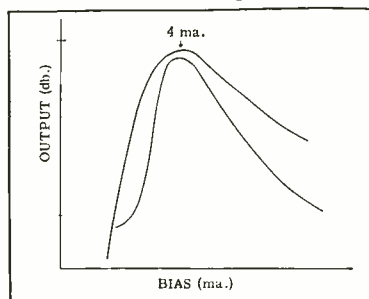
The slightly twisting curve at the upper left represents the oxide response. The lower curve is a pure, sine wave input. At the upper right we have the result of the response curve on the input . . . a mess.

The reason it looks the way it

does is because the sine wave input is affected by the non-linear characteristics of the gamma ferric oxides. But look closely. Note that while the oxide performance is non-linear when taken over its entire length, we can find linearity over selected sections. In other words, we can get rid of our distortion if we can put the signal on the linear section of the oxide's characteristic curve. And that is exactly what bias does. It "lifts" the signal away from the convoluted central area on the graph and moves it out to linear areas.

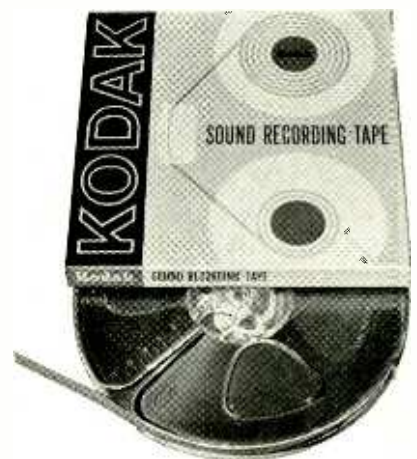


The amount of bias (that is the current in milliamperes) applied to the head is highly critical if top performance is to be achieved. Bias affects output, high and low frequency sensitivity, signal-to-noise ratio and distortion. This curve explains it.



The steep curve represents low frequency sensitivity (measured in db.) at varying bias levels for many tapes. Note that you get good performance

providing you have a bias setting of about 4 milliamperes. (Curves for the other magnetic parameters are similar in shape and all peak at about the same bias level.) Vary one milliampere and you "fall off the curve" and suffer severe losses in sensitivity. Now look at the broader curve. You can vary a milliampere with hardly any change in performance at all. Here's the point. *Kodak tape has that broad curve.* It gives you top performance even though your bias settings aren't perfect. And if your tape recorder is more than a year old, then chances are enough shift has taken place to push you off the cliff. That's why we designed a broad bias curve. And that's why you need it. It's just one more way that Kodak tape gives you an extra bit of assurance of top performance.



KODAK Sound Recording Tapes are available at all normal tape outlets: electronic supply stores, specialty shops, department stores, camera stores . . . everywhere.

©Eastman Kodak Company, MCLXII

EASTMAN KODAK COMPANY, Rochester, N. Y.

A New Look at FM

HARRY E. MAYNARD

After many years of "genteel poverty," FM broadcasting seems destined for a greater measure of success in the next decade.

A FEW MONTHS AGO FM radio received what most observers of radio regard as a major shot in the arm. The Federal Communications Commission proposed that every AM-FM radio station in America in cities of over 100,000 population, program at least 50 per cent original material on its FM outlet by August 13, 1965.

Up to now, if you listened to a major AM-FM station, you usually heard the same programming on FM as you did on AM. With this new ruling you may have at your fingertips the equivalent of half a new station.

To some observers in the communications industry, this new ruling is dynamite. The most important question it raises among those concerned (and this includes the listener as well as the program director and the station owner) is what sort of investment are the major radio interests such as NBC, CBS, ABC and major independents going to make in separate radio programming—aptly described as "Radio for Grownups" by Nat Hentoff in *The Reporter* (May 1, 1958).

Some people in the broadcasting industry fear that the FCC rule limiting FM duplication of AM broadcasting is only the first step in a move to separate AM from FM, and eventually to separate TV station ownership from either or both (when all three are owned by the same group). The Commission did not, in the adopted ruling, deal with the problem of (AM-FM) dual ownership in the same community, although it did express the view that separate ownership of local AM-FM stations is a desirable long-range goal.

Apparently, the FCC regards necessity as the mother of investment. So far, the independent FM station has led the way in demonstrating that it can offer more variety and quality than has often been available on AM. The FCC also hopes that FM with community-oriented radio stations will lead the way in meeting the need for night time coverage in places where there have been gaps in radio coverage, especially in smaller cities and towns.

Perhaps there is a parallel in the FCC's recent ruling requiring that all TV sets now manufactured be equipped to receive ultra high frequencies (UHF).

This ruling was generally interpreted as an attempt to promote wider station ownership and a broader spectrum of programming, which might include more adult programming and also break up the semi-monopoly that the major networks have had in most big cities (not to speak of the hinterlands).

The FCC seems to believe that FM has arrived. This ruling could supply a much needed impetus by relieving FM of its Cinderella role with respect to AM radio. No longer . . . being used as a give-away to sell or reinforce its AM sister and sitting at the hearth forced to mouth her every word (or sound).

The Harvard Study

Last year, Harvard Business School did a massive study of FM, which predicted a happy future for it. The substance of the report was that FM radio would catch up with AM radio, in all revenues, and pass it in the early 70's. The Harvard projection indicated that both AM and FM racked up 5.83 per cent of the national advertising dollar in 1962. From this base, the Harvard researcher projected advertising expenditure for all media from \$13 billion in 1963 to \$18 billion in 1970 and finally to \$20.5 billion in 1973.

Using a constant multiple of 5.83 per cent of total national advertising expenditures (for rate of growth) for both AM and FM, the Harvard report showed the future of combined AM-FM radio growing from \$762 million advertising revenue in 1963 to \$1,198,000,000 in 1973.

The Harvard report becomes even more significant and believable because its projections were based only on growth of independent FM stations and did not include figures for combined AM-FM outlets, which represent a much more significant financial element in the radio industry today. Added impetus for FM's separate growth should come from major radio stations in our large cities.

By 1973, according to the Harvard predictions, the growth of FM will be spectacular. FM radio revenue will then stand at \$374 million as compared to AM's \$500 million plus. The pivotal moment for FM comes in 1974 when its

revenue passes that of AM radio, whose predicted trend line should start downward in 1970.

The Harvard crystal-balling is based on FCC broadcasting revenue information. Their basic premise is that combined AM-FM radio will remain at the present growth rate of 33 per cent. This growth rate has prevailed over a five-year period (1956-1961) and rose to 36 per cent over the 1958-1961 period.

Are Harvard's projections realistic? AM-FM owners, according to *Broadcasting Magazine*, were "inclined to wonder if the Harvard study might be on the optimistic side . . . and the advertising world took a let's-wait-and-see attitude."

Is the Harvard study confirmed by other evidence? Yes. Perhaps the biggest confirmation is indicated by the present sales of FM versus AM receivers.

FM receiver sales have exceeded most industry projections, from two million sets a year in 1960 to a total of 6,400,000 units by the end of 1964. By 1967, there is every indication that sales of FM and FM-AM receivers will surpass the sales of AM-only sets. By 1968, total FM or FM-AM receiver sales will have caught up and passed AM only receiver sales at 11.4 million, as compared to 9.2 million AM receiver sales.

Another reason for giving the Harvard study credence was that the study predicted a sale of 3.36 million FM sets in 1963, 4 million in 1964, and 5.75 million in 1965. Actually, 5 million sets were sold in 1963, and sales could easily reach 6.4 million units for 1964.

So far, the evidence demonstrates that the Harvard predictions have been conservative. Sales of FM receivers are already a year ahead of what Harvard projected.

Another trend line, perhaps not too important because of the three-year-old freeze on new AM licenses, is the sale of transmitting equipment to the broadcasting industry. Last year, sales of FM and of AM transmitters were about equal, but by 1965 sales of FM station transmitters are expected to be about 60 per cent ahead of AM transmitter sales. Apparently, the radio industry, too, believes the future of FM is good.

Another important aspect of the Har-



CROSS FIELD ADVANCES TAPE TECHNOLOGY

By Cliff Whenmouth, President
Magnetic Tape Duplicators

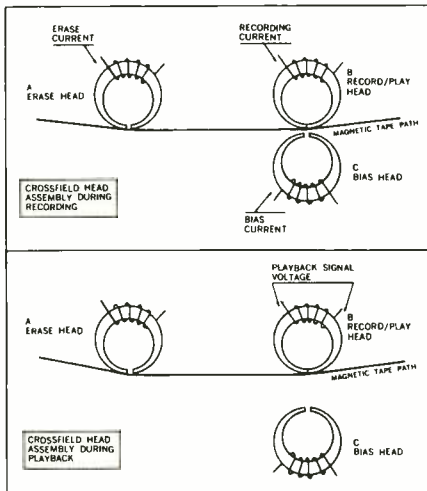
An audio engineer reports on the capabilities of the Cross Field Concept

Is the Cross Field concept of tape recording a "gimmick"? Or is it, indeed, the long-sought-after solution to the problem of high frequency losses at slow speeds? Along with most audio men, I have watched the performance of the Cross Field concept closely since its introduction a year ago. After exhaustive testing—in the studio, in home sound systems and out in the field—there is no doubt but that the Cross Field is a brilliant success.

As applied by Roberts Electronics, in that firm's Cross Field Model 770 4-track stereo tape recorder, the problems of loss of high frequencies at slow speed and of excessive head wear are neatly resolved. In fact, the performance of this remarkable instrument may very well set a new standard for the entire tape recording industry!

Unique Cross Field Head Assembly

To achieve its high frequency response at slow speed, the Roberts Cross Field 770 employs an unique recording and playback technique involving three heads:



1. A conventional Erase Head, which erases the tape immediately prior to recording, as is normal practice.
2. An extraordinary Record/Play head with the highest resolution in the industry—a gap width of only 40 millionths of an inch. During playback, the narrow gap

width picks up the very short recorded wave lengths necessary to provide high frequency response at 1 7/8 IPS. (These short wave lengths cannot be picked up by wider-gap heads in conventional recorders.)

3. The unique separate Bias Head which provides the bias field during recording, and which automatically swings out of the field during playback. The tape never touches the bias head, which is therefore not subject to wear.

Opens Another Octave in High Frequency Spectrum

The correct blend of bias and recording fields accounts for the remarkable performance of the Cross Field concept. In the Roberts 770, an entire octave in the high frequency spectrum, which has never before been captured on tape, is recorded and played back. (Other recorders, by combining the recording and biasing functions in a single head, erase these high frequencies as they are recorded.) Frequency response of the Roberts Cross Field 770 has been established as follows:

at 7 1/2 IPS—from 40 to 22,000 CPS ± 2dB
at 3 3/4 IPS—from 40 to 18,000 CPS ± 2dB
at 1 7/8 IPS—from 40 to 13,000 CPS ± 3dB

Pure Stereo at 1 7/8 IPS

With a frequency response of 40-13K at 1 7/8 IPS, the Cross Field 770 advances tape recording technique into the realm of long-play stereo. In test after test with the Roberts instrument, brilliant stereo sound was achieved at the 1 7/8 speed. Recording 4-track stereo at long-play speed, the equivalent of 18 stereo tape cartridges—up to 8 hours of stereo play—were recorded on an ordinary 7" reel of tape. Long-play stereo is indeed a reality!

Heat Problem Also Solved

With the longer in-use periods normal for the Cross Field 770, Roberts has also solved the problem of heat build-up. Their newly-patented blower ventilation system is, in itself, a revolutionary development in electronic cooling.

New Drive System Designed

A new motor and drive system developed by Roberts for the Cross Field

770 reduces wow & flutter at all speeds to a minimum. W&F at 1 7/8 IPS is less than 0.30% rms. Roberts employs a heavy-duty hysteresis synchronous motor with an electrical speed change, a refinement usually found only in the most costly professional recorders.

Many Other Sophisticated Features

The Roberts Cross Field 770 is a highly sophisticated instrument with such professional features as automatic all-off/shut-off and



pinch wheel release; cathode follower pre-amp and 8 ohm speaker outputs; two self-contained 5 x 7 stereo speakers; mute-monitor Public Address switch; pause lever; 4 stereo headset and speaker outputs; exclusive Roberts multiple adjustment head for precise selection of all record/play functions; new high-speed fast forward/rewind (1200' in 75 seconds); horizontal or vertical operation.

Roberts Cross Field 770 is priced at \$499.95 (slightly higher in Canada), and is available at Roberts Franchised Dealers throughout the United States and Canada. Currently the world's first hi-fi stereo 6-hour LP tape (a valuable Collector's Album of music by famous artists reproduced on the new MTD Bionic Duplicator) is being given away free with each Cross Field 770.

See and hear the Cross Field 770 demonstration at all Roberts Dealers throughout the United States and Canada. Or write direct to the plant for complete information.

Roberts Electronics, Division of Rheem Mfg. Co., 5922 Bowcroft St., L. A., Calif. 90016. Dept. RT-9

In Canada: J. M. Nelson Electronics, Ltd., 2149 Commercial Drive, Vancouver 12, B.C.

ROBERTS

vard study was their look at operating costs and station profits. After many years of genteel poverty, the Harvard study predicts, FM radio will for the first time in its history pull out of the red and put black ink on its ledgers. Over 400 independent FM stations will have a profit of \$1,500 per average station. The number of FM stations will grow at about 15 per cent a year (this has been the growth rate starting in 1958) to 2,000 in 1966, to 2,200 in 1967, and ultimately to a total of 3,200 stations in the early 1970's.

The Present—and Future

What is the current FM situation? In March of this year there were 1,159 licensed and operating FM stations, an increase of 67 over a year ago.

Advertising billings this year were \$40 million as compared with \$13.5 million a year ago. Next year, they are expected to jump dramatically to at least \$100 million.

Already, 555 AM-FM stations are programming separately. As of July 1, over 300 stations were broadcasting stereophonically (multiplexing). Equipment manufacturers have a huge backlog of orders for new transmitters capable of broadcasting stereophonic sound.

Why do FM's future advertising prospects look so good? Many alert advertisers know that advertising and marketing have become, for many products, highly selective. This means a marketing strategy aimed at a highly segmented society for many products. The advertising trade journals are filled with the need to talk to people in terms of their special interests. Marion Harper, President of Interpublic, the largest advertising agency in the world, put it thus: "segmented marketing is taking over . . . its strategy recognizes that markets are people—with individual characteristics. (It) focuses on differences in tastes, habits, beliefs."

Only the biggest companies can afford to blanket all major media with their advertising. A segmented marketing strategy is a must for the advertiser who must spend his money judiciously.

Up to now, the biggest hurdle faced by FM radio has been selling the major advertising agencies and their clients on its special marketing and advertising virtues. FM radio has lacked the research-managerial-entrepreneurial talent and the capital to match its superior sound and its sometimes superior programming for the class mass market. Too often, the average FM station has been run by dedicated people with limited resources.

The major networks, impressed by the easy profits of TV, have seen the growth of their network radio advertising revenue in AM dramatically declining. Noticing this, they have not invested money

in AM and certainly they have not been inclined to put their best foot forward in programming even when they program separately. The independent FM stations, have led the way usually by programming for select audiences, their true metier. But often they have sounded off-beat, perfunctory, and as canned-classical juke boxes, pretentious and boring.

One of their greatest shortcomings has been in the area of the background informational coverage and news available to the major networks, publishing companies and other communications outlets. Also, they have frequently failed to capitalize on their superior transmitting ability, particularly with respect to stereophonic sound, in broadcasting live musical performances. They have failed to do this because they have not had the advertising revenue to support this luxury. So they program records and tapes instead. The remarkable thing is that FM stations have given us such good programming with such limited resources.

As previously mentioned, their financial and managerial talents have been so limited that they were unable to supply the magic numbers that Madison Avenue requires to sell this service to their clients. They have, thus, been caught in a vicious circle. Without advertising, they have lacked the revenue to take advantage of their true potential.

Their problem in selling advertising was well articulated by Herbert Zeltner, Vice President and Director of Media at Lennen and Newell, a large advertising agency. He said: "There seems to be a school of thought which calls for numbers, numbers and still more numbers. Good, bad or indifferent, some buyers of media just want statistics for use as a crutch when making recommendations. Or the assumption that any number, no matter how dubious its origin, is better than the exercise of judgment." He might have added that in today's big business organizations very few business bureaucrats want to stick their necks out too far, even though we know a turtle only makes progress when his neck is out.

However, several studies done in the last few years by agencies, companies and the FM industry itself are beginning to refute the fashion of a few years ago which was to write FM radio off as a nonexistent or a mysterious medium existing on a fringe of more normal availabilities.

Here are some statistics the marketing world has found hard to ignore:

- Sets sales increasing 25 times within the last eight years.
- An average penetration of over 42 per cent in the 10 leading cities in the U.S. For example, 55 per cent in New York

City; 45.3 per cent in Los Angeles; 44.7 per cent in Chicago.

- A separate and distinct medium, which is an unduplicated audience as far as radio is concerned. (51 per cent of FM listeners do not listen to any AM radio.) FM listeners are poor TV viewers which makes them good for the advertisers who want to reach an audience not well covered by TV.
- Pulse, Incorporated, in a 1961 study, showed that in the top ten markets there are close to 10 million FM receivers—66 per cent turned in weekly.
- 76 per cent of the homes with FM receivers have incomes of up to \$15,000 and over.
- 60 per cent have incomes from \$10,000–15,000.
- FM's audience in New York City, the largest radio market, is larger than Chicago's (the second largest radio market in the U.S.) combined AM-FM audience.

The conclusion of current research shows clearly that FM must be bought as a separate advertising medium. Its use, according to Zeltner of Lennen and Newell, must be "planned for by the media supervisor to fulfill completely different strategic objectives than those usually assigned to AM radio." This may not always be true because FM shows signs of becoming the class mass market of the air and well worth considering as a separate mass market.

Reactions

Not everyone in the radio industry is happy about the growth of FM, long considered the caboose on the train. Some forces would like to have the FCC reconsider its recent ruling. For instance, CBS objects, saying that it will discourage diversity and lower the quality of non-musical fare on FM. The National Association of Broadcasters, according to *Electrical Merchandising Week*, says "FCC has pre-empted a management decision that must be based on whether the FM station can independently generate advertising revenue to support separate programming." One can appreciate the dismay of the major radio-TV operators as they watch their recent prodigy, Television, syphon off advertising revenue from their older child, AM network radio. However, it must be pointed out that total billings of radio today exceed those of radio pre-TV. This is because of the growth of local radio and national spot radio.

A quick spot check by this writer showed schizoid tendencies among major operators on the new FCC ruling. Here is how one of them responded to a query on the ruling: "This hurts. Now we have to invest more money for this separate programming though for years we have not made much money with AM network

don't let the price tag fool you!



THE NEW ELPA PE-34 IS A LOT MORE TURNTABLE ... FOR A LOT LESS MONEY... ESPECIALLY WHEN YOU REVIEW THE FEATURES!

The NEW ELPA PE-34 4-speed Turntable combines features that up to now were found only in higher priced professional transcription-type turntables.

Features like: Belt *PLUS* idler wheel drive the reason for the low, low rumble) • 4 Speeds • Built-in lowering (cueing) device that saves record and cartridge wear • Powerful four-pole induction motor (with plenty of Torque) • Heavily weighted, non-magnetic Turntable • Vernier speed control • Rugged, precision-built professional type tone arm.

What do all these features add up to?

The Elpa PE-34 not only meets, but *exceeds* the National Association of Broadcasters (NAB) specifications required for professional use in broadcast stations.

That means the NEW Elpa PE-34 will satisfy your strict requirements too. AND not because of price either.

Examine these Specifications:

PLATTER & DRIVE SYSTEM

- A heavy-duty precision-built 4-pole induction motor floats in a triple rumble isolation system.
- A heavy cast and machined non-magnetic platter on a precision bearing assures accurate speed and minimum wow and flutter.

- A vernier speed adjustment (3%) for perfect pitch or "tuning" the turntable and record for perfect pitch or any accompanying musical instrument.

TONE ARM

- Low resonance balance arm with double precision-bearing suspension (vertical and horizontal planes) minimizes arm drag.
- All modern cartridges can be easily mounted in a cartridge mounting slide.
- Complete 4-wire system.
- Cartridge mounting slide pulls out for quick stylus inspection.
- Built-in spring loaded stylus pressure adjustment gauge.

CONTROL SYSTEM

- Automatic tone arm lift at end of record.
- Semi-pneumatic cueing and indexed (7", 10", 12") tone arm control at start or at any point during play.
- Automatic fool-proof glide to and from record groove.
- Cueing lever incorporates positive tone arm lock.

PHYSICAL DIMENSIONS

Width: 13"
Depth: 10 $\frac{3}{4}$ "
Height: 3" above mounting board
3 $\frac{1}{2}$ " below mounting board

The specifications prove it: There's a new concept in turntables—the PE-34 (backed by 50 years experience) . . . just like other Elpa Marketing Industries products that have set new hi-fi standards.

Don't let the price tag fool you . . . you can't do better at \$72. (\pm \$25.00 or 35%)

Stop in at your Franchised Elpa dealer and ask to see the new PE-34 in action.* Price includes: Full Year Guarantee, Strobe Disc and 45 rpm adapter. Satin Walnut base optional at \$6.00. Base dimensions: 4" High x 15" Wide x 12 $\frac{1}{2}$ " Deep.

NEW DUST COVER AVAILABLE!
Style PC-34 Sturdy Plexiglass \$9.00



PERPETUUM-EBNER

a new division of

Elpa Marketing Industries, Inc.

New Hyde Park, N. Y.

Circle 119 on Reader Service Card

radio." For those who own TV stations, there is an added complaint: "Along with this increased investment in FM programming and stereo equipment, we also have to invest more money in color TV transmission and programming.

Such are the pangs of progress. If one looks at the balance sheets of combined AM-FM and TV properties, it is evident that the major owners have not been doing badly.

The Advantages of FM

Behind all the commercial facts and figures, the biggest factor that has led to the incipient FM boom has been the essential satisfaction of many a listener. One of the virtues of FM radio for the listener, up to now, has been its very lack of advertising clutter. This lack of advertising clutter and the taste of its advertisements, as compared to AM, has been apparent to the listener and is now becoming apparent to the advertiser. With prosperity perhaps just around the corner for some FM stations, their owners will be hard pressed to abandon the previous standards of advertising spacing.

A combination of good sound, good talk, good music and a modicum of cerebral content has attracted an ever-growing number of better-educated, better-heeled listeners. Too much of AM radio today has abdicated to "Formula Radio in the Pursuit of the Big Beat," the title of a recent article by Richard Doan, editor of the New York *Herald Tribune* Radio and TV Guide. Of course, there have been some outstanding exceptions in this field, WOR in New York and KNOX in St. Louis among them, found success with what the trade calls "the talk formula."

For many years, the better educated and literate portion of radio's audience, not finding what it wanted musically on AM radio, has been retreating to records, tapes and hi-fi equipment. Various marketing and media studies show that hi-fi stereo equipment is one of the most popular of semi-luxury products, particularly among magazine audiences.

But the general public and even musicians have had to educate themselves to appreciate wide frequency ranges. In 1945, the general public voted against hi-fi five to one. Surprisingly, even musicians have been unappreciative of wider frequency ranges until recently. Many studies show that growing to appreciate better sound is, for most people, a learned response.

Roger Kirk of Ohio State recently confirmed the result of the pioneering CBS test in 1945 which showed that People when exposed to three systems of musical frequency responses: One, a wide range of 40-10,000 cps; two, a moderate range of 80-7,000 cps; and three, a restricted range of 180-4,000

cps (approximately AM's usual frequency response), preferred the restricted range system.

However, Kirk went further than most researchers in the field of psycho-acoustics. For six weeks, Kirk exposed one group to a considerable amount of wide range listening, another group to medium range listening, and the third group did no test listening. The original test was given again. Now the wide range group liked better sound, the mid-range group liked better sound, but the third group had not changed its opinion.

Other recent tests have demonstrated the same appreciation-learning phenomena are true of stereophonic sound. Most people prefer the familiar. It takes a little time and exposure to appreciate FM or its latest refinement, FM stereo. As some wit described it: "We are usually down on what we are not up on." It takes an educated ear to appreciate better sound.

Some FM broadcasters realize that superior sound is one of their strongest listener appeals. Stations, recognizing this, have been going stereo at the rate of three a week since the middle of September last year. For example, in the larger markets such as Los Angeles and New York, there are already over 15 stations broadcasting stereophonically either full time or part time.

The National Association of FM Broadcasters expects 150 new stereo program sources to be available to the listener in 1964. Transmitter manufacturers report a backlog of orders from 32 stations for stereo transmitting equipment.

Most new stations start up fully equipped to broadcast stereo. WTFM in New York, a station only 2½-years old, has since the start programmed its entire broadcasting day in FM stereo. Result: it has already captured the largest FM audience of any strictly FM station in that area. In some instances, it has already begun to crowd the leading AM stations in terms of its penetration of the New York Metropolitan market.

Perhaps part of the reason for FM's success is that it is a new gadget. We are a gadget-oriented society. For example, there are already 9½ million stereo receiver sets in use, and they are among the hottest items in department and radio-TV stores. However, stereo is more than a fad, just as color TV is more than a fad. Stereo gives added dimension to sound as color TV gives an added dimension to visual images.

The serious music lover has up to now generally been more interested in the musical content rather than in the sound. But even this audience has succumbed to the virtues of stereo, realizing that no one has yet been able to separate sound from music. A good performance is only enhanced by improved sound. Edward

Tatnall Canby stated the new attitude of the musically literate when he said, "I myself am a music lover and a musician who is so thoroughly convinced of stereo's values in purely musical terms that I rarely hear any recorded music in other than the stereo form these days. When I listen to a monophonic disc now, it honestly sounds strange to me, false and lacking in realistic impact, until, of course, I re-adjust my ears to its musical values."

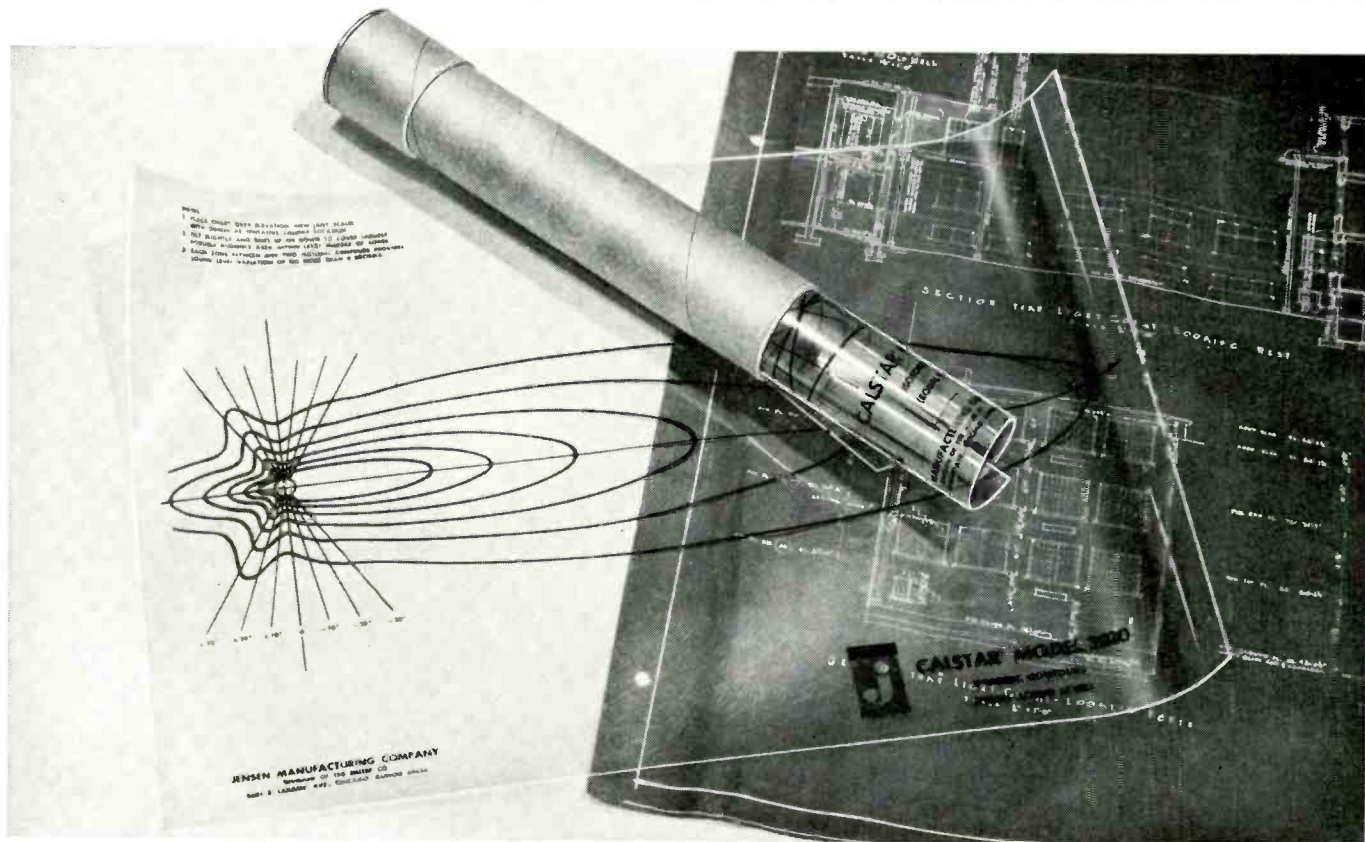
Stereo's better sound values improve all music whether it is a solo piano, a solo guitar, or a full symphony orchestra. It brings out the subtleties of musical composition by adding an infinitesimal but very important quality of separation even of musical tones in a solo instrument, the separation that every living performance has. It gives you clarity of musical texture which the living performance has. Even the piano sounds better when compared with the monophonic reproduction. To quote Canby again on stereo's values "Stereo produces the separation which makes a group of first violins sound as a body yet minutely separate, undetectably so, but over-all more life-like in imaginative terms than any monophonic group of violins could ever sound." Here it must be said that all stereophonic sound has not been an improvement. Much recorded sound is horrible and mediocre, designed just to exploit the musically uninitiated.

In sum, FM radio is but one beachhead of excellence in our society. And, its long-range future will remain problematical until the leaders of America's communications industries see in it both a challenge and an opportunity. But, it would appear that FM is about to reap some financial success after many years in financial purgatory. After horrible birth pains, such as having its band suddenly shifted to another portion of the broadcasting spectrum, an FCC decision which almost overnight antiquated eight million FM sets, its new-found prosperity can be largely explained by one fundamental thing: Its superior sound and technology. Many astute observers believe that FM stereo is on its way to becoming the dominant broadcasting medium.

Technologically, FM has been an integral part of many recent electronic advances. FM will also soon span the entire world as the carrier wave for all satellite and space communications. Already all microwave relay is on FM multiplex, all tropospheric scatter transmission necessary to military networks is FM. The reason is simple. FM is the superior, static-free, high-fidelity transmission system. FM's great opportunity lies in the American education explosion. America represents the largest class mass market

(Continued on page 53)

EASY to LOCATE and AIM Jensen CALSTAR^{T.M.} COLUMN SPEAKERS with ISOSONIC CONTOUR TEMPLATES



SIMPLE AS 1-2-3!

- 1 Place chart over elevation view (any scale) with origin at tentative CALSTAR location.
- 2 Tilt slightly and shift up or down to cover largest possible audience area within least number of zones.
- 3 Each zone between any two Isosonic Contours provides sound level variation of no more than 3 decibels.

Jensen Isosonic Contour Charts are 14" x 20" transparent plastic templates for Jensen CALSTAR Column Speakers Model 55 and Model 1010. Set of two templates in mailing tube, \$1.00 postpaid. Write for Jensen Technical Bulletin No. 45.

Choose Jensen CALSTAR Column Speakers to assure the uniformity of coverage angle throughout the frequency range so necessary for uniformity of sound quality and speech intelligibility (understandability) throughout the audience area.

Use Jensen Isosonic (equal sound) Contour templates to quickly and accurately determine the location and aiming angle to achieve the desired uniformity of sound level.

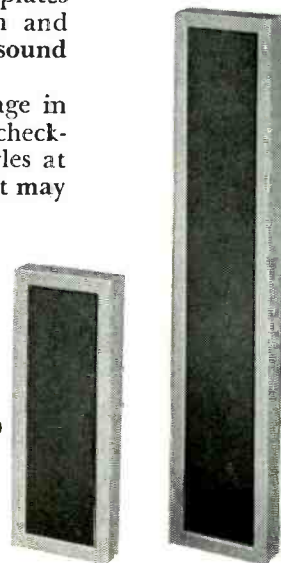
Determine speaker layout to meet desired coverage in minutes—no longer need you spend tedious hours checking levels at various distances and for various angles at several discrete frequencies—or worse yet, guess what may work.



JENSEN CALSTAR Controlled Angle Lobe Suppressed Twin-Array Reproducers are the unique new column speakers using special "shaping networks" to control the radiation patterns of two line sources (woofers and tweeters) to achieve constant vertical coverage angle throughout the frequency range of interest and thereby attain uniformly high speech intelligibility throughout the audience area.

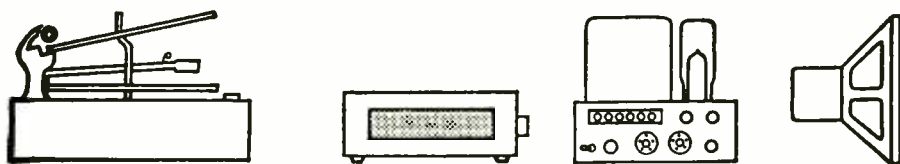
MODEL 55 (left)
10-Element
Twin-Array
60°, 30-Watt, 8-ohm
Column Speaker.
List \$133

MODEL 1010 (right)
20-Element
Twin-Array
30°, 60-Watt, 8-ohm
Column Speaker.
List \$233



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EQUIPMENT



PROFILE

McINTOSH FM-STEREO TUNER, MODEL MR 71 and SOLID-STATE STEREO PREAMP, MODEL C 24

The MR 71 FM-Stereo Tuner

In February, 1964, we profiled the McIntosh MR 67 Stereo Tuner, and during the course of the description it was stated that it "is unexcelled by any other tuner we have had occasion to test in recent years." This is no longer true. It is excelled by the MR 71. Of course, it should be, since the MR 71 is essentially the same as its predecessor (in time, since both are now in the line) with minor improvements which are the result of continuing development work.

When one reads the specifications, one finds comparatively little difference between the two models with respect to performance. The MR 71 has a slightly better capture ratio of 1.5 as against 1.7; it employs five i.f. stages instead of four; it has 8 db more suppression of the multiplex products (primarily because of the new, extremely sharp SCA filter), different tuning indication, automatic stereo-mono switching, and three extra pounds of weight. It still uses a 6DS4 Nuvistor combined with $\frac{1}{2}$ of a 12AT7 as a cascode front end, albeit it does use top-end inductor coupling between the first two tuned circuits instead of an inductive link. The principal differences begin with the fourth i.f./first limiter which feeds a first discriminator used to control the muting circuit which acts upon the fifth i.f./second limiter so

as to be faster acting when one tunes off a station. The second limiter feeds the signal discriminator in the usual fashion. The multipath distortion indicator now serves only one purpose—meters indicate signal strength and tuning—and does not have to be switched. The recovered composite signal feeds the MX amplifier, with 19 kc appearing in its plate circuit while the audio appears at the cathode, whence it goes through the new SCA filter and thence to the decoder.

The SCA filter is undoubtedly a very complicated device, since its response curve drops at the rate of 275 db per octave beginning at 54 kc, reaching an attenuation of 50 db at 60 kc and remaining flat at -50 db to beyond 74 db where it rises some 10 or 15 db to about 85 kc before falling off gradually. This filter was computer-designed, has no adjustments, and effectively eliminates any SCA interference without affecting the flat transmission of the stereo subcarrier up to the limit at 53 kc. Because of its sharpness, this filter remains in the circuit at all times, thus eliminating one more switching operation required on some tuners. The decoder circuitry remains the same, and the MR 71 retains the dual outputs—one of "fixed" level and one variable, controlled from the front panel.

The 19-kc pilot signal, aided by some audio derived from the first discriminator, actuates the stereo indicator light amplifier which, in turn, drives a transistor which actually turns on the indi-

cator in the presence of a stereo signal. A second light in parallel with the first illuminates a Raysistor in the cathode circuit of the 38-kc oscillator, turning it on or off without any audible sound and without any attention from the user. A front-panel stereo-mono switch disables the switching circuit when it is desired to receive mono exclusively, although the indicator light still functions. The remaining front-panel controls are a variable afc and muting on/off. Sliding the whole chassis forward in its Panloc mounting (so glowingly described in the profile of the MR 67) provides access to a slide switch which controls panel light brightness.

The rear apron mounts the 300-ohm antenna terminals, 75-ohm coaxial antenna jack, the "fixed" and front-panel-varied audio output phono jacks, the output-adjusting dual pot for the "fixed" outputs, the muting adjustment control, power fuse, a.c. receptacle, and one of the two test points to which the MI 2 Multipath/Tuning Indicator accessory can be connected (the other connecting point is on the top of the chassis). This device employs a cathode-ray tube in an elaborate circuit to permit visual monitoring of stereo signals and multipath interference.

To the casual observer, the MR 71 performs as well as the MR 67, which is saying a lot. In every category—sensitivity, hum, frequency response, channel separation—there does not appear to be a great difference. It is more effective, perhaps, in freedom from noise, but beyond that there is very little difference which is apparent to the ear—and not *very* much on the test bench. Where it does excel, however—and this is apparent to even the non-technical listener—is in the ease of operation. In the profile of the MR 67, credit was given to the unusually high quality of components and construction as being the main factor in making the MR 67 a "superb" product. If there were such a word, we would only say that the MR 71 is "superber." Beside that, it is most attractive with its greenish illumination of dial scales and meters, the green fluorescence of the multipath indicator tube, and the red stereo indicator light. Even the distaff side will thrill over it.

It would be unfair not to mention the high quality of the Owner's Manual which accompanies the MR 71. It is handsomely executed from the graphic arts standpoint—good paper, good printing and so on—it has a table of contents on the front, covers technical description, installation, and operation clearly and simply, and is well illustrated. Three pages of FM Station Log are provided in the back, with spaces for frequency, logging scale, call letters, city and state, antenna direction, and remarks. Last but not least, in our esti-



Fig. 1. McIntosh FM-Stereo Tuner, Model MR71.

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

STANTON

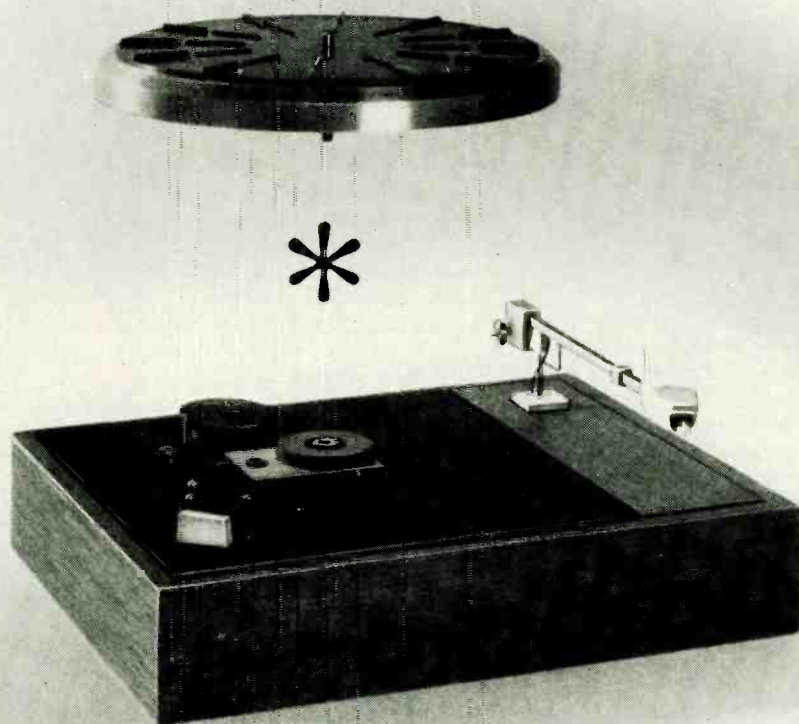




Fig. 2. McIntosh C24 Solid-State Stereo Preamp.

mation, is the inclusion of a schematic. Though all audiophiles do not do their own servicing, it is not likely that any technician called in would have a schematic at hand, and if the owner can supply one, so much the better. We feel that a schematic should *always* be included with any hi fi tuner, amplifier, or receiver.

The C 24 Solid-State Stereo Preamp

This unit is being included with the MR 71 tuner profile because a preamp is generally used in conjunction with a tuner, because it is very similar in appearance, and because its performance is similarly superb.

The McIntosh C 24 employs a total of 18 silicon planar transistors—eight in each of the two channels (which are identical), one in the “center-channel” (L+R) output, and one as a voltage regulator in the power supply section. The phono/tape head preamp employs three transistors, with RIAA or LP equalization selected for phono by a slide switch, followed in turn by the mode-selector switch, loudness control, channel balance, the first section of the volume control, and an emitter-follower which drives a Baxandall-type tone-control circuit. This is followed by two more amplifier stages, the rumble and noise filters, and the output amplifier using two transistors. The second section of the volume control is next, followed by a voltage divider/mixer network feeding the L+R amplifier stage. Two silicon diodes serve as the power rectifier, and the voltage is regulated to 75 volts by the 18th transistor, and further regulated to 10 volts by a zener diode. A four-second time-delay circuit is provided to ensure that the full voltage is not applied to the circuit abruptly, thus allowing the various capacitors to charge up without the usual annoying “thump” which is generally heard when a non-delayed transistor amplifier is first turned on.

So far, nothing particularly new or startling has been said about the C 24, which is as it should be. What is unusual about the over-all philosophy of the C 24 is the channeling of the power amplifier output through the preamp chassis before going to the loudspeakers.

This feature is to permit switching of the speakers, as well as to provide a panel-mounted jack for headphones, and to permit reversing the phase of one speaker from the control position, rather than in back of the speaker itself, which is often enough of a chore as to preclude its being done, even when it might improve the listening. (Not all sources—tape, records, or broadcasts—are always perfect in this regard). In less careful design, this proximity of high-level outputs might cause trouble, but in this unit the shielding effectively precludes any trouble from this arrangement.

With the speaker switch, headphone jack, and phase-control switch at the control center of his system, the user has almost every possible flexibility that he might need—or want. This feature has been encountered before in receivers, but so far we have not seen it in a preamplifier/control unit.

Performance

There is little need to state that the C 24 is flat within 0.5 db from 20 to 20,000 cps or that the equalization curves follow the prescribed values within ± 2 db throughout the audio spectrum—we have learned to expect that from any good preamp over the past few years—but the distortion figures are somewhat remarkable. The output is rated at 2.5 volts, and at this value the distortion is less than 0.1 per cent from 20 to 20,000 cps. Even at a 10-volt output the distortion measures less than 0.3 per cent over the same range. What is especially important is the amount of phono (or tape head) input this unit will handle without clipping. We have learned by now that this is one figure that should be measured first in any test of transistor amplifiers.

Before describing the phono performance of the C 24 in this respect, let us examine the possible amplitude of the signal from a modern pickup cartridge. We have actually measured stylus amplitudes of more than 40 cm/sec on some phonograph records—not many, we’ll admit, but on some. The usual output from a stereo cartridge is in the vicinity of 1.0 to 1.5 mv per cm/sec of

stylus velocity—some as much as twice that. We have been told by some record companies that their *peak* recording level was 5 cm/sec, (which we do not believe), and by others that the *average* level was 5 cm/sec. Assuming it is average, and with an estimated increase of peak over storage of 10 db, this would mean a peak level of 16 cm/sec. A clearance of 16 db is usually considered safer as the margin between average and peak program levels, which would imply that peak velocities of 30–35 cm/sec could be reached easily. At an output from the cartridge, of, let us say, 1.1 mv per cm/sec, this would mean that the signal applied to the input of the preamp could reach 33–38 mv. Now if the preamp should clip at an input of 30 mv (we are speaking only of a 1000-cps signal) distortion would certainly result. With the high-frequency boost in modern recording techniques, more efficient microphones in the high-frequency region, and the inclination of A and R men to feature trumpets and strings, overload of the preamp can cause breakup which is extremely unpleasant.

None of this is likely to occur with the C 24 because under the worst combination of volume and loudness control settings, the preamp will not clip (at 1000 cps) until the input signal reaches 100 mv. Under most conditions of settings, the clipping level is 135 mv. Equalization takes care of the high frequencies, and rolloff of the bass in the recording process takes care of the low frequencies. We feel this is a most important problem, and it seems to have been solved in the C 24 quite satisfactorily. At least, we have not ever heard any evidences of clipping on phono. We can not see much application of the 10-volt output capability of the C 24, but if it can supply this much signal with less than 0.3 per cent distortion, it should be able to coast along nicely at the usual 0.25 to 1.0 volts required for normal room levels.

From its Ivory tower, McIntosh modestly claims 99.9 per cent perfection—we’ll give ’em only $99^{44}/_{100}$ per cent. We would make only one minor change—that of reversing the direction of rotation of the contour control. At present, clockwise rotation increases the amount of equalization, but decreases level. We would prefer it the other way. In the maximum position, there is a boost of approximately 10 db at 30 and 10,000 cps with respect to 1000 cps, which follows general contouring practice.

Tone controls give a range of ± 18 db at 20 and 20,000 cps. Lo-cut starts at about 100 cps and its down 11.5 db at 30 cps, 32 db at 10 cps. Hi-cut starts at 3000 cps and is down 7 db at 10,000 cps, 16 db at 20,000. In the flat position of all controls, over-all response is down

If it wasn't for this
monstrous 1,400 lb., \$1,740
"Voice of the Theatre"®



you could probably never afford to enjoy the no-compromise big sound of these **FULL-SIZE PLAYBACK** speaker systems from Altec

Because their no-distortion mid-range (with highs and lows to match) which embraces 90% of all musical material would be beyond the reach of anybody except people in the industry: the recording and broadcast studios, and the networks. Most of whom use them. (Who else in the hi-fi industry can make a claim like this? Manufacturer A, B, E, F, F, J, K, K, L, P, Q, S, T, U, W?)

And maybe even these discriminating speaker buyers couldn't afford to help us amortize the research and development costs of developing **PLAYBACK** systems like our beautifully furniture-styled 843A "Malibu", 838B "Carmel", and A7W. Thank goodness they (and you) don't have to. Theatre owners the world over have done it already. Ever since 1945, when Altec introduced the first (and only) commercially-available speaker systems approved by the Research Council of the Academy of Motion Picture Arts and Sciences.

So unless you have room for two of our 1,400 lb. "Voice of the Theatre" Systems, we'd suggest you consider the only next best thing: **PLAYBACK** systems like the ones available to recording and broadcast studios *and you* at the same reasonable, R&D-prepaid prices.

For example, the new Altec 843A "Malibu" is a bargain at \$356.00 because it contains speaker components that are nearly identical to our giant two-way theatre models: two low frequency speakers, a horn-loaded high frequency driver with low crossover, and a two-section dividing network. The "Malibu" is first and foremost a beautifully hand-crafted furniture piece tailored into a space-saving upright walnut enclosure that will do credit to any living room. For a horizontal version of the same thing, try the 838B "Carmel" at \$337.50. Or, for \$384.00, you can own the new Altec A7W which is identical, in every way but looks, to our famous "baby" "Voice of the Theatre", the

A7. The difference is that the A7W comes in walnut finish, while the A7 comes in a rather spartan utility cabinet (though at only \$288.00 who will complain?) for built-in installations. Other full-size Altec Speaker Systems available from \$204.00 for the space-saving 841B "Coronado" to \$411.00.

What more can we tell you? Just to "A-B" these **PLAYBACK** systems against anything and everything you can find at your nearby leading Altec Distributor's.

In the meantime, get your copy of *Hi/Fi Stereo Review's* Great Debate: "Is a good big speaker better than a good little speaker?" The affirmative, quite naturally, is presented by our own Chief Engineer of Acoustics/Transducers, Alexis Badmaieff. The negative is presented by a well-known manufacturer of little speakers. So find out for yourself why full-size speakers are now the rage. Merely write Dept. A2.

NEW! 100A BASS ENERGIZER!
Specially designed for people who like over-emphasized instrumental bass. This extreme low pass filter connects between amplifier output and speaker input. Suitable for use only with high efficiency speakers. Price: \$30.00

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only 6 db at 100,000 cps, if that should matter to anyone.

On high-level inputs, noise and hum measured 78 db below rated output with the volume control at maximum. In the minimum position of the volume control, the noise drops to 112 db below rated output—as it should, of course, since one section of the volume control immediately precedes the output jacks. On the phono input, noise measures 64 db below rated output at the maximum setting of the volume control. At a volume control setting which gives an output of 1 volt at a phono input of 10 mv, the noise and hum were down 72 db.

With these impressive performance figures, the C 24 is truly a fitting companion for the “superb” MR 71 stereo tuner.

Circle 220

DUAL 1010

The usual trend for automatic turntable manufacturers has been to build up their model inventory by adding a “super” changer. Dual has chosen to reverse that trend. The Model 1010 is a lower-priced version of their “super” unit, the Model 1009. At \$69.50 it is \$30 under the top-of-the line.

Naturally, this new unit shares much with the 1009. It has the same record changing mechanism, the same heavy-duty four-pole motor, and the same cartridge mount slide. The major differences are that this unit has a lighter platter and a completely different arm.

The Dual 1010 is a four-speed automatic changer/manual player. Record change is accomplished entirely with the center spindle. This spindle has three arms that support a stack of up to eight records. At the correct moment the spindle arms will retract, dropping the lowest record. To prevent the rest of the stack from following suit, the spindle has an expandable collar that grips the stack above the bottom record and lifts it slightly before dropping that bottom disc. All-in-all, a reasonably fool-proof spindle system that is very gentle on record centers. This system is dependent upon record companies that produce discs of standard center hole dimension and thickness. Our tests with a number of contemporary discs revealed no change problems at all.

For manual play, the large spindle can be exchanged for a short one. The automatic spindle has a pin on the bottom that fits a slot in the turntable spindle hole. With the pin in the slot, the record release arms are pulled out and in at the end of each cycle. Thus, this spindle cannot be used for manual play (the record can only go down over the support arms at the beginning of the cycle). This is no problem since most people will use the 1010 for automatic play only, but if you bounce back-and-forth from manual to auto, you may find



Fig. 3. Dual Model 1010 Record Changer.

this system somewhat of a nuisance. Of course, for manual play only, the short spindle, which simply drops in, solves all problems.

A switch on the side of the table selects record size. You cannot intermix sizes in a single stack, but you can play the three popular disc sizes, 7, 10, and 12 inch as long as segregation is practiced. (Note that this is true of all the better changers on the market. Ironically, only the less expensive units can intermix sizes automatically.)

The basic control for automatic or manual play is a slider of unusual smoothness. It is possible to activate the reject mechanism while a disc is playing at a light stylus force, without the slightest upset.

The tone arm is quite basic in principle. In this system, the arm simply hangs from its canted horizontal pivot without a counterbalance weight, and a spring is used to pull back and provide stylus force. A screw with a coin slot located on the side of the arm, near the pivot, is utilized for adjusting stylus force. It has click stops at regular intervals, which are no more than general indicators, since stylus force per click will vary according to the weight of the specific cartridge used.

The spring used is linear throughout most of its range. No more than half a gram variation may be expected from top to bottom of a stack of discs. The spring apparently becomes less reliable below 1.75 grams; thus, this would be the lowest recommended force we would suggest.

Performance

Using a very-high-compliance cartridge we substantiated the 1.75 minimum tracking force. Less than this, which the cartridge could do, caused some mistracking of heavily modulated passages. All subsequent tests were made at 2 grams.

System resonance was at 20 cycles and was slight. At 2 grams there was no mistracking at the resonance. Bass rolloff was rapid below this point. It is worthy of note that the trip mechanism can operate at forces considerably lower than the arm's capabilities, so no problems should ever occur on this score.

Turntable flutter and wow were unusually low for a unit in so modest a price category. Flutter was under 0.1 per cent and wow was 0.35 per cent.

Total rumble was 35 db below a 3.54 cm/sec, 1 kc stereo signal. This figure is very close to what we have measured on top-grade manual tables.

Our sample was 2 per cent fast, under load, at a line voltage of 120v. The drive motor proved extremely immune to minor voltage variations. At 100 volts the 1010 was 1 per cent fast. At 90 volts speed had dropped to -0.5 per cent. A load of several records had no appreciable effect on these speeds. Those who are familiar with the Model 1009 know that this unit has a vernier speed adjustment knob that allows you to correct for speed variation. The 1010 lacks this feature. However, the speed variations quoted are quite acceptable for a good changer.

All-in-all the Dual 1010 impressed us greatly. It must be considered in its price category. As such, it represents very good value indeed. Its performance is close to a good manual table, the changer mechanism is of the very best, only the arm falls short of allowing us to suggest this unit for the best systems. Although the 1010 will not get the ultimate from a cartridge, it is not intended for use with the ultimate cartridges either; the 1010 is designed for the moderately-priced system. As such it fulfills its design goals.

Circle 221

“NETWORK” SPARK INJECTOR

With the curiosity indigenous to a long-time hi fi enthusiast, this observer was naturally intrigued by the advertisement of this product in the December issue. “High Fidelity” performance from an automobile appeared to be a new category of criteria.

Accordingly we undertook to obtain one for “test,” not knowing just exactly how one would measure performance of such a device with the sort of objectivity we attempt to attain with the usual hi fi component.

In the first place, installation is slightly simpler than claimed in the advertisement, since it took just eight minutes to put it in place, connect the four wires, and start the car—a 4600-lb 1961 model. It started off immediately, better, if anything, than usual. Then, before essaying any long-trips, we “broke it in” around town for long enough to have confidence that it would continue to work—no real problem if it hadn't, really, since it is only necessary to move two wires from their usual terminals to a third one, all of which are readily accessible, to restore the normal ignition system to operation.

After sufficient local driving to establish confidence, we went on a couple of 450-mile trips. There was no noticeable



Get in the groove - any groove...

gently!



New Miracord 18H single record play turntable operates manually or automatically. Offers new cueing record band selector. Gently lowers arm and sets stylus in desired band or groove. Includes famous Miracord features: automatic pushbutton controls, Papst hysteresis-synchronous motor, heavy balanced turntable platter, transcription arm, four speeds.

Your hi-fi dealer will soon be showing the new Miracord 18H alongside the now famous Models 10 and 10H. Be sure to see it. Price is \$119.50 (less cartridge and base). For further details, write direct: Benjamin Electronic Sound Corp. 80 Swalm St., Westbury, N. Y. Sole U. S. distributor Miracord turntables, Elac cartridges and other Electroacoustic® audio components.

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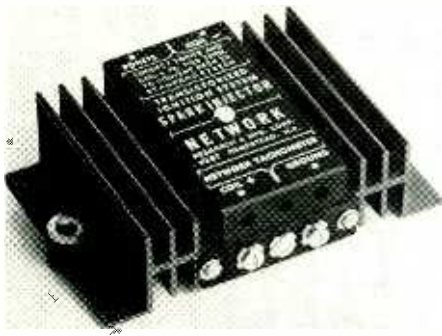


Fig. 4. Network Spark Injector Set

performance difference up to 60 mph, but above that when acceleration usually drops off, it was another story. Step on the gas at 60 and the car simply jumped,—about like it usually did at 30. With the usual test figure of time to reach 60 from a standing start, we measured 10 seconds, and another six from 60 to 80,—sport car performance from the “family sedan.” A more important figure for the user is the gasoline consumption, which showed an increase of 13 per cent over the normal ignition system. This was on a reasonably accurate controlled test. On a 500-mile trip, one way was with the Spark Injector and the return on normal ignition.

We had previously used another type of transistorized ignition for some 15,000 miles without changing plugs or points, and both were still like new—no point wear at all. With no stress on the points they should last until mechanically worn out, but not from pitting of the contacts.

Later we had the opportunity of observing a bench comparison of the Spark Injector with a normal ignition system. At engine speeds of over 4000 rpm, the normal system spark became erratic, and ceased altogether at about 5000. With the Spark Injector, the spark was still “fat” up to 7000 rpm, which is well above any speed a normal engine ever reaches.

With increased gasoline mileage, snappier acceleration at high speeds, easier starting, and longer spark plug and point life, we are most enthusiastic over the Spark Injector. **Circle 222**

ACOUSTECH III SOLID-STATE STEREO POWER AMPLIFIER KIT

The Acoustech III is a power amplifier intended to satisfy the need for high power at low distortion, and with the solid-state bonus of relatively little heat. Imagine a 40-watt-per-channel (rms mind you) amplifier weighing only 25 pounds. Simply unheard of in a tube amplifier.

This is certainly one of the new breed!

The Acoustech III features several innovations made practical by solid-state technology; plug-in printed circuit boards, direct-coupled circuit. These

high-quality glass-epoxy plug-in boards are the type which are commonly seen in military applications, plugged into a Blue Ribbon connector. The cost is high but so is the reliability. The advantage of this type of construction is the ease of service and replacement of defective electronics. The consumer need merely unplug the defective board and bring it to the appropriate service station. He can even perform some elementary troubleshooting by reversing boards. If other manufacturers adopt this approach, it may solve one of the difficulties facing the component consumer: the general unavailability of service comparable in quality to the component.

The circuit of the Acoustech III is not unusual, the output stage being of the well-known single-ended push pull persuasion, with the drivers in Darlington connection. Silicon transistors are used throughout, and the electrolytics are high-grade units (Acoustech calls them computer grade). All of the electronics except for the output transistors and the power supply are on the printed-circuit boards.

Although the amplifier we received was factory assembled (by accident we were told), examination of the assembly manual and the amplifier leads us to believe that it would take no more than a few hours to assemble. Especially since the printed circuit boards are factory assembled even in the kit.

The kit packaging is truly excellent, encompassing individual bags of components for each stage of assembly, plus an ample KitKloth to work on. A valuable plus if you must use a furniture-finish table as your work bench.

Performance

The Acoustech III is a top quality performer which meets its published specifications with ease and then some.

First of all, through the range from 20 to 20,000 cps it provided a minimum of 40 watts rms before clipping, and throughout most of the range it provided in excess of 60 watts *per channel*. This power was delivered to a 10-ohm load, with both channels operating. Distortion at rated output (40-watts rms) into a 10-ohm load was 0.22 per cent at

1000 cps. At 100 cps it was 0.28 per cent, and at 15,000 cps 0.3 per cent. Intermodulation distortion with the same load and using 60 and 7000 cps tones mixed in a 4:1 amplitude ratio was 0.49 per cent at rated power. Square wave response was truly excellent at both the top and bottom of the frequency range exhibiting no trace of overshoot or ringing. 1.7 volts was required to drive the amplifier to its rated output. Hum and noise were 82 db below rated output.

Listening to the Acoustech III proved to be a highly satisfying experience. We were especially impressed with the ease with which it handled transients and orchestral peaks. We can't recall having heard such open sound. The bottom end was truly superb. Altogether it is one of the most musical amplifiers we have experienced to date.

We must recommend a modicum of caution in certain modes of operating the amplifier. It exhibits an annoying, but harmless, tendency to pop fuses in the presence of non-musical transients which occur when the tonearm is dropped on a record or when a tuner is scanned across the dial. Of course, if you use the III with the Acoustic IV preamp this is no problem since the latter unit has a muting circuit built in.

However, we inserted it into our regular setup which has a different preamp with no muting provision. We managed to pop several fuses before we learned to exercise caution.

In sum, the Acoustech III is a truly first rate amplifier which merits careful consideration by the perfectionist. In its kit form it is easily buildable by the rankest novice. **Circle 223**

BENJAMIN STEREO 200 RECORD PLAYING SYSTEM

The Benjamin 200 is one of those new record playing systems which include in one package an automatic turntable, an amplifier, a control center, and a handsome case. In this instance the case is very handsome indeed, as illustrated in Fig. 5.

The turntable in this system is the well known Miracord Model 10, which is certainly one of the finest automatic turn- (Continued on page 69)



Fig. 5. Benjamin Stereo 200



Mr. Saul Marantz discusses his revolutionary new model 10-B FM Stereo Tuner

Q. Mr. Marantz, your new 10-B tuner is quite revolutionary. Do you feel it will obsolete all other tuners?

Mr. Marantz: In one sense, yes. The performance of this tuner is so dramatically superior to conventional tuners that anyone who wants or needs perfect FM reception today has no choice but to use the model 10-B. Its superiority, however, does not necessarily *obsolete* conventional tuners. Rolls Royce, of course, makes superior cars, but they haven't obsoleted Chevrolets.

Q. Is this superior performance discernible to the average listener?

Mr. Marantz: Very much so. The difference is quite dramatic. As you know, conventional tuners have never been able to pick up and reproduce broadcasts which could match the quality of a fine disc or tape playback system. This has often been blamed on *broadcasting* quality. But the new 10-B disproves this theory. It reproduces the *broadcast* of a disc or a tape with the same clarity and separation as if played through a playback system — proving that broadcast quality is generally excellent.

Q. Is this true with weak broadcast signals also?

Mr. Marantz: Yes. In fact the model 10-B will reach 55 db quieting at only 3 microvolts! This is better than most conventional tuners will reach at 1000 microvolts. With a 25 microvolts station the Model 10-B reaches a phenomenal 70 db quieting which is about 20 db better than most conventional tuners can achieve at *any* signal strength. This means that with the Model 10-B there will be excellent reception even in fringe areas, particularly so because of the tuner's high sensitivity, its extremely sharp selectivity and reduced susceptibility to multipath effects, which on other tuners cause distortion.

Q. How are such improvements accomplished?

Mr. Marantz: The answer to that question is very complex, because the 10-B is far more than an improved tuning system; it is a completely new *design concept* with *many* technical innovations developed by Marantz engineers.

Q. Can you give us some examples?

Mr. Marantz: Yes. The RF section, for example, contains a balanced-bridge di-

ode mixer — a technique used in modern sensitive radar designs to eliminate a major source of noise, harmonic distortion and other spurious interference. The whole RF circuit is balanced-tuned, using a precision tuning capacitor with four double sections, for further reduction of spurious images.

For the critical IF strip, we've developed the first commercial application of the "Butterworth," or phase-linear filter. This new concept provides a number of distinct characteristics essential for good results. The passband, for example, is phase-linear for extremely low distortion — especially at high frequencies — and it remains essentially phase-linear at all signal levels.

Cutoff slopes beyond the passband are extremely steep, allowing unprecedented selectivity; it is much less subject to the effects of multipath, and it doesn't require realignment with tube changes or aging. The old standby coupled IF circuits currently in use do not have any of these characteristics.

Q. Are there any innovations designed specifically for multiplex?

Mr. Marantz: Yes. For multiplex reception we've developed our own unique

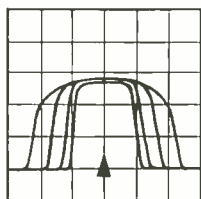
variation of stereo demodulator, which permits phase correction to maintain a very advanced order of stereo separation throughout the whole audio band.

Q. What is the purpose of the tuning and multipath indicator?

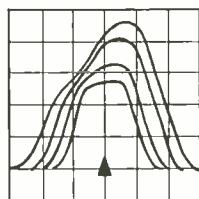
Mr. Marantz: This oscilloscope device is so versatile its single trace tells many easily understood stories. It shows when a station is tuned exactly to the center of the passband. The height of the pattern shows the signal strength. The indicator shows how much multipath is present, making it easy to adjust the antenna for best reception. It shows if the station is creating distortion by over-modulating. Also, technically informed users can check stereo separation of transmissions, discs and other sources.

Q. And how soon will the model 10-B be available in quantities?

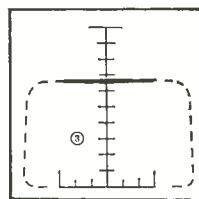
Mr. Marantz: The Model 10-B is a laboratory instrument of extremely high quality which will never be *mass* produced in the usual sense. However, production has been stepped up fourfold and all back-orders are now being filled by Marantz franchised dealers.



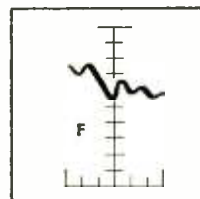
IF Passband retains phase linearity and sharp slopes at any signal strength for low distortion, sharp selectivity.



Conventional mutually-coupled IF circuits change characteristics drastically depending on signal strength.



MARANTZ MULTIPATH/TUNING INDICATOR
Station tuning is simply and accurately adjusted by centering the trace.



Multipath (Ghosts) shows up as 'wiggles' on the tuning trace. Antenna is simply rotated until trace is smooth.



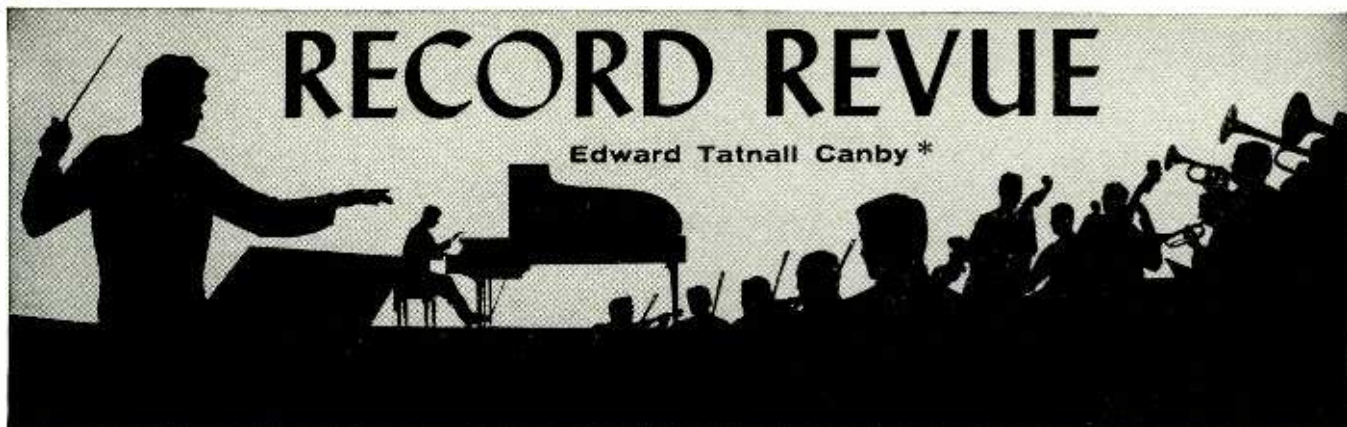
marantz

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RECORD REVUE

Edward Tatnall Canby *



Opera by Handel

Handel: Rodelinda: Stich-Randall, Forrester, Young, Roessl-Majdan, Watts, et al., Vienna Radio Orch., Priestman.

Westminster WST 320 (3) stereo
(booklet-libretto)

Lord! Handel, one of the top "greats," wrote forty six operas and this is only the second to show itself on records here. About time.

The music in all of them is first-rate, mostly, but as stage productions they have been entirely impractical—we like a different kind of opera now. Moreover, the voice requirements—for *castrati*, singing soprano and alto, in the male leads, for fancy vocal acrobatics largely beyond our singers' abilities—have kept producers away from the stuff. But things are changing. What with our burgeoning male countertenors and rock-and-roll male sopranos, the idea of a soprano-hero isn't so zany any more—and the techniques for singing this Baroque music are definitely on the return. Also—records make the ideal medium for the music, what with LP and stereo, plus bookletsful of pictures and background along with the libretto.

This is a happy and effective production, above all sparked by the superb Stich-Randall, whose voice is as nimble as a canary's—or an oboe, let's say—and whose musical ear is absolutely peerless. The rest of the cast does its best to emulate her leadership as the heroine, Rodelinda. (There is a bass, and a tenor too.)

The music is largely a series of recitative (sung) dialogues followed by arias (complete musical pieces) for solo voice with orchestra. Each is a gem of music and the opera can be listened to piecemeal as a six-sided LP concert of Handel's song, loosely tied together by the classic tragedy of the story, which, by the way, has a "happy" ending after an appropriate quantity of wailing and lament. (Quite a gory story, at that, if you feel like keeping track of it en route through the music.)

Operatic Armful

Purcell: Dido and Aeneas. Mary Thomas, Helen Watts, Honor Sheppard, Maurice Bevan et al; Oriana Concert Choir and Orch., Alfred Deller.

Vanguard BGS 70664 stereo

Henry Purcell's superb little opera, England's very first (and written for a pack of schoolgirls), has long been on a pedestal of too much fame, like "Messiah" or the Saint Matthew Passion, or Corelli's "Christmas" Concerto or "La Folia." They have become grotesque, one and all, in overblown Romantic arrangements to which we are still sentimentally attached. Dido's famous Lament, as she dies of disappointed love, has been particu-

larly ill treated, in smoochy, snail's pace horrors styled like Isolde's. The little opera has desperately needed restoration into a proper historical perspective.

This one does it, at last! Just wonderful. It is light, lively, energetic, especially in the splendid choruses, in the witches' macabre scenes right out of "MacBeth"; the soloists sing naturally and at a normal "speaking" speed in both the recitatives and the brief arias and concerted numbers—the whole thing moves along briskly with far better effect than the antiqued and dismally slow earlier versions.

Even the orchestration benefits. The instrumentation, at last—and what a brilliant idea!—is no more than the original, without "modernization"! Very streamlined, and much of the music is with simple continuo, just harpsichord and a single cello. The singers perform with zest to this agile accompaniment, freed of the orchestral encumbrances attached to so many turgid "modern" versions of the opera. Here, things really move.

The piece is transformed, mightily. Even the clumsy plot and text by the ill-famed Nahum Tate, long reviled as dreadful, here finds a new respectability; it is, we find, a deliberate (and unforeseen) satire, as entrancingly explained in the annotations by Wilfrid Mellers. The horrid witches with their very bad English—"Our plot has took, the Queen's forsook!"—turn out to be much more than that, a picture of the vindictive, small-minded common people of the world in the presence of heroism and greatness, no more than "middle class Restoration gossips or harridans who are horrid only because they are grossly inane." Their famous cackling "ha-ha-ha-ha-ha" chorus is spine chilling. Dido herself is the too-noble heroine, victim of her own high-minded obstinacy—she will die and that is that; Aeneas is a satire on the Restoration hero, who in real life often had feet of clay as he does. And the head Witch, the Sorceress, is Dido's negative number. All perfectly balanced, and surprisingly urbane and literate, now that we see it anew. The performance backs up Mr. Meller's thoughts straight through, note for note.

Alfred Deller, of Deller Consort fame, conducts. He never sings a numberling note.

Johann Strauss: Die Fledermaus. Wächter, Leigh, Rothenberger, Risé Stevens, Konya, Kunz, Majkut; Vienna State Opera Orch. and Chorus, Danon.

RCA Victor LSC 7029 (2) stereo
With booklet-libretto

I really enjoyed this one, to my mild surprise. It's terrific. The reason was that on the face of it this was another of those mixed-up, mixed-cast affairs, à la Metropolitan Opera, in which the idea seems to be to get in as many nationalities as possible in the singing cast, and (sometimes) as many different styles as well.

Not so this time. RCA's version, recorded in Vienna, is beautifully styled and integrated and the spirit of the whole production is fresh, energetic and as eloquent as a first-night show. The "foreign" names, like Risé Stevens, are judiciously placed, the high-speed spoken German dialogue goes to those who can reel it off just as it should go, and there's not

a bit of inconsistency anywhere that I can hear. Just a whale of a good stereo show and all the Strauss you can wish for. I didn't even notice any baleful effects from Dynagroove.

Virgil Thomson: Four Saints in Three Acts (Gertrude Stein). Soloists, Cho., Orch. conducted by the composer.

RCA Victor LM 2756 mono.

What a pleasure! This ever-zany, utterly improbable collection of nonsense-English goes down the musical gullet as smoothly as a draft of good ale, as sung by the revival "original cast" in RCA's recording of 1947, some 13 years after the premiere of the opera at Hartford, Conn. in 1934. (Do I remember that occasion! All the literary lights of the U.S. were invited, in honor of Miss Stein, and my father, whose musical ear was the purest tin, attended the thing and came back speechless. Went right in one ear and out the other.)

Here's the famous "pigeons on the grass, alas," sung most delectably in its musical form, and here is the all-Negro cast (for no particular reason, except that Mr. Thomson liked the sound) and the plethora of Saints, including Saint Theresa I and Saint Theresa II, as well as Saint Settlement (??) and Saint Ignatius, not to mention two characters called Commère and Compère.

"It was a magpie in the sky," (what kind of pie—?) carols the Chorus joyfully, and Saint Ignatius answers, "If a magpie in the sky cannot cry if the pigeon on the grass can alas and to pass the pigeon on the grass and the magpie in the sky on the sky and to try and to try alas the pigeon on the grass and alas . . ." whereupon Chorus I and II say firmly, "They might be very well very well very well they might be very well they might be" and "Let Lucy Lily Lily Lucy Lucy, let Lucy Lucy Lily Lily Lily." Compère then announces in earthshaking tones, "SCENE ONE," and Saint Plan says "One and One." After awhile, Saint Stephen says "Too much too much"; but Saint Chavez will have none of it and remarks, in song, "There are very sweetly very sweetly Henry very sweetly René very sweetly there are many very sweetly. Foundationally, marvellously, aboundingly, illimitably with it as a circumstance. Fundamentally and saints fundamentally and saints and fundamentally and saints." After more of the same, Saint Chavez concludes pointedly, "The Envelopes are on all the fruit trees."

Maybe it doesn't read well, but in Virgil Thomson's bland, hymn-like, dead-pan music the whole thing is utterly delightful and the Negro cast gets the raffishly zany spirit of the piece just marvellously marvellously marvellously. Best party-record of the year, of the ear yuf the yeare ruv theyear. . . .

Wings of Song

Britten: Serenade for Tenor, Horn and Strings (1943); Young Person's Guide to the Orchestra (1946). Peter Pears, tenor; Barry Tuckwell, horn; London Symph., Britten.

London CS 6398 stereo

This is an absorbing record in a historical sense—for it is, I think, the third successive recording of the redoubtable Serenade with its

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original tenor, Peter Pears, and the composer himself conducting. The first version appeared here as one of the very earliest 78 rpm London albums, soon after the war. I have never forgotten that album's music, which convinced me that the Serenade is one of the masterpieces of the 20th century.

There was an LP version, I think, with Mr. Pears a little older; now comes the stereo version, still with the same singing voice. But Peter Pears is some twenty years older now and time has begun to tell. The horn solo in this recording, Barry Tuckwell, is astounding. (Who says the Brains, Aubrey and Dennis, were the end of a dynasty of horn players in Britain?) The strings are superb too, under the composer. But the hypnotic fire of Mr. Pears' original performance, a tour de force if there ever was one, is now reduced a lot in temperature; the sound is older and thinner, the breath control less good, the drama watered down, even though the musical understanding is still there.

Nevertheless, most of the emotional magic of the music remains. Not many tenors, youthful or otherwise, can match Mr. Pears' sympathy for this music that was composed for him. (But if you know where there's a copy of the 78 rpm album, just try *that*.)

The Young Person's Guide, here in its non-spoken version, is just one more of dozens of recordings through this, to be sure, is under the composer's own direction. A good piece to have around your collection. It moves right along at a brisk tempo, this time. I think maybe the composer is a bit tired of it. Like Rachmaninoff and the Prelude in C Sharp Minor, or Sebellius and "Finlandia."

Palestrina: Two Masses, "Sine Nomine" and "Ecce Ego Johannes." Choir of the Carmelite Priory in London, John McCarthy.

L'Oiseau-Lyre SOL 269 stereo

Palestrina's music often has an almost too "white" sound for our addicted modern ears; these two Masses are a good antidote, since they are well contrasted and quite differently colored. One, the "Sine Nomine" (it isn't actually nameless—the music is based on a popular tune which, as we would say, "shall be nameless") is a dark, shadowed work, modally in the minor, rather subdued for the most part and, for Palestrina, somewhat "antique" in sound. Interesting. The other, "Ecce Ego Johannes" ("It's me—John!") is all the opposite, cast in an opulent six-part G-major-with-lowered-seventh, a sound that is also gloriously effective in the similar motet "Assumpta est Maria" and the Mass derived from it.

As the Italians manage to make Palestrina sound vaguely like Verdi, so the British convert him into a good Elizabethan. No matter; for the British-type choir, complete with hooting boy trebles and solemnly screeching counter-tenors, can bring out the musical sense as well as any type, even if it does suggest something out of Westminster Abbey or Saint Paul's Cathedral.

Gregorian Chants. Choir of the Vienna Hofburgkapelle, Schabasser. Booklet by R. D. Darrell.

Vox SDBX 5206 (3) stereo

Ambrosian Chants. Choir of the Polifonica ambrosiana, Biella. Booklet by Mons. E. M. Caglio.

Vox DLBX 207 Mono only

There is only one way to tackle Gregorian (or Ambrosian) chant—that is to tackle it in bulk. If you can call a mere six LP sides "in bulk."

Gregorian is the mother-chant of all Western music, born with Christianity and the Catholic Church, brought to refinement in the earliest Middle Ages and written down in the notation that developed into *our* notation. It became debased and run-down after the Renaissance, but the tradition wasn't lost (and the notes were still in print and in manuscript); the present century has seen the whole corpus of this splendid world of music revived, in many areas of the Western world. Ambrosian chant, an enormous body

of music in itself, is merely a side-shoot in the immense living structure, though once (the Fourth century) it was for awhile a major branch.

To sing all the Gregorian (and Ambrosian) music straight through just once might well take a dozen years. It's that extensive. Six LPs, though, do give us a brief taste of it—and the two booklets that accompany these heroic albums are absolutely splendid.

The Austrians' Gregorian album makes a lovely addition to the already extensive Gregorian recorded literature. Their singing is closer, more personal, warmer than, say, the austere beautiful French Solemnnes singing (where Gregorian was first restored). Their earnestness is everywhere apparent, their musicality is first rate and sensitive. R. D. Darrell's booklet is the best "layman's" account of the whole business I have ever run into and though complex, necessarily, will make a lot of listeners happy.

The Ambrosian music is sung by a Milanese choir, including women and (I think) children—that was the Milan tradition, established by Ambrose in the Fourth Century and zealously maintained ever since. The singing is not as pure as the Austrian; there is inevitably a faint touch of "La Scala" and Caruso in the sound, the pitch is less accurate and the ensemble is not as good as the Viennese, with more wobbles, slides and individual voices standing out. Not bad, even so. The immense booklet (both books have complete texts and translations) has a certain air of special pleading; for Ambrosian chant is not, alas, the "official" church chant though recognized and accepted. Still, a very interesting historical survey and account of the Ambrosian style.

Bach: Cantata No. 80, "Ein Feste Burg"; Motet "Jesu meine Freude." (a) Soloists, Figuralchor of Stuttgart Mem. Church, Württemberg Ch. Orch., Rilling. (b) Stuttgart Hymnenschorknaben, Stuttgart Bach Orch., Gerhard.

Vox STLP 514.150 stereo

Time we've finished listing all these Stuttgart performers, there's hardly room left for a review. They're good performers, though.

The great "Ein Feste Burg," with the familiar hymn tune on which it is based ringing out above the immense musical complexities of its fabric, is given an impetuous, earnest, sincere performance, that is also very modern in its exactitude of proper forces and the currently-proper fast, no-nonsense tempi, without sentimental romanticisms, the chorale sung at speed and minus pauses at the ends of the phrases. A first-rate performance, even if the solos, as always, are swept along by the great river of music with hardly a chance to get a breath—but that's Bach's fault, not the performers'. The river itself is what counts, and it's enormously effective here.

"Jesu meine Freude" at last is sung correctly and easily in the way it was intended, the voice parts doubled throughout by instrumental support. For long, these Bach motets were mistakenly sung as a cappella works, i.e., for voices alone. The job was almost superhuman, what with the unremitting struggle to stay on pitch and to delineate the complex harmonies without the help of an instrumental bass. Few performances managed to make much sense of the music. Now, these excellent little boys sing the thing joyously, easily, buoyed up by the instrumental aid, and the piece comes through, with all its density of expression, as a tremendously effective Bach work. This is the way Bach himself meant it.

Trio Flauto Dolce (Music of the Renaissance and Baroque). Robert White, tenor; Martha Bixler, Eric Leber, Morris Newman.

Flauto Dolce TFD 1 (stereo)

This small group is launching its own record, one of those earnest projects that still, today, persist in competition with the slick releases from the big outfits. More power to them! The music is one of those now-common "old music" programs, ranging through vocal works and instrumental combos of recorders,

harpichord, bassoon, featuring in a good many pieces the voice of Robert White, relieved from monotony by all-instrumental interludes. Side 1 gives us music from the court of old Henry VIII, including a work by His Royal Self, who was a good composer between wives; there follows some post-Elizabethan-period, Jacobean music—equally interesting. A big jump takes us into the Baroque with Schütz, in German, and on Side 2 similarly to France, with Campra and Boismortier. The in-between period is filled out via a group of Elizabethan Ayres.

Mr. White's voice is a bit hard to take at times; he is a very modern tenor, taut and dry in tone with a tight wobble, and his pitch-sense is not very discerning. He seems best in the Elizabethan music, where he somehow relaxes and opens out. The recorders, harpichord and bassoon twitter and gurgle away most musically in many combinations. They're fine.

Acoustics, in a smallish room, are dead for today's taste though the music is made clear in detail. Sounds amateurish—though this is strictly a matter of aesthetic preference, of course. Odd—the record doesn't say if it's stereo (though "two mikes" were used plus a "compatible" groove). All I know is it sounded best on stereo; there were cancellations and a thinner effect on mono. So make it stereo, then.

Handel: Israel in Egypt. Adele Addison, Florence Kopleff, John McCollum, Louise Natale; Musica Aeterna Orch. and Chorus, Waldman.

Decca DXSA 7178 (2) stereo

The great Handel oratorios, "Messiah" in particular, have always been the property of the big chorus, amateur and semi-amateur. Here we have a modern professional performance using pros in the small chorus (a fraction of the old taken-for-granted size) as well as pros for the solos. The effect is somewhat un-Handelian by familiar standards; the big, rich, wobbly modern choral voices, all trained to the gills, are not what the music needs in tonal quality, making it sound physically a bit on the "Il Trovatore" side, or maybe "Die Meistersinger."

Nevertheless, the ensemble is led by a hardened old pro from Europe who has a heart of gold—and knows how to get over the essential drama of this most exciting of all the Handel oratorios, as well as the musical sense in detail. The first part, detailing the famous plagues, is imaginative without being a bit corny (the jumping frogs, the buzzing flies, are perfect) and the second half, devoted to magnificent and high-minded rejoicing in sacred terms, has the proper broadness of scope. The soloists, modern of course, nevertheless are intelligent and awake in their relatively small role (the double chorus does almost all the work). And the instrumentation is "authentic," with both an old-type organ and a harpichord for the continuo.

The Decca recording is not entirely a happy job; in their efforts to get the double chorus effect down clearly the engineers have somehow forced everything into two-sidiness, with a lack of good middle ensemble. And the "portative" organ (portative like, say, ten Ampex 350s) is too close and squealy. Chorus and solos are fine.

The recording makes an interesting comparison with (1) the Vox version (Dessoff Choirs), equally dramatic though with the traditional large chorus and orchestra, and (2) the incredibly soggy, undramatic, monumental, elephantine British recording from Angel, sung by the enormous Huddersfield chorus, which must have 350 singers at least. This Musica Aeterna chorus has maybe 30.

Contemporary Choral Works (Kay, Roem, Flanagan, Wuorinen). Kings Chapel Choir of Boston, Cambridge Festival Strings, Pinkham.

Cambridge CRS 1416 stereo

I've never been very enthusiastic about the foundation-commissioned modern work, even if composers must live somehow. It's against

human nature. This somewhat mixed program is the direct result of a Ford grant to Mr. Pinkham, and it's just what I would have guessed it might be—a mixture of styles and manners and techniques without the slightest relevance, each piece to the next, nor any reason (that I can hear) for being offered as one unit on an LP record. Except that the grant paid for all the music.

There's a mild, quite sweet pair of Psalms and a Proverb by Ned Rorem, then a whopper of a serial piece, by Wuorinen, dreadfully solemn as I hear it, all about Jonah being vomited up out of the whale's insides. (It may be "simplified" as the composer says, but it sure isn't simple.) Then there's a big three-part Triptych by Ulysses Kay that grew out of its third part, an Alleluia, skillfully written for voices, and some Chapters from Ecclesiastes by Rorem's cohort, William Flanagan, these two being of a not-very-dissonant persuasion. It all hangs together barely—by virtue of the all-sacred texts, the common chorus and the capable solo voices upon which all but Mr. Rorem thought it wise to count for their more difficult ideas.

'Course I might be wrong, and there's nothing inherently unfair about being complex and dissonant. Or writing in your own style regardless of the next man. But today just isn't a very good time for choral music, as Mr. Pinkham's Ford-grant productions show only too well. Composers' ideas are now technically as precise as our engineers' in other areas, geared to the extreme precision of modern musical instruments. To expect these men to write music for chorus is like trying to build a Ford V-8 with hacksaw, hammer and hand hoist, plus maybe a T-square and a ruler.

Mozart After Hours. Maureen Forrester, vocalist; Vienna Akademie Choir, Members Vienna State Opera Orch., Jazz Rhythm Group, Kingsley.

Vanguard VDS 79165 stereo.

This studied travesty of good Mozart seems to have been improvised, ever so artlessly, by the batch of distinguished performers you will note above during the off-hours of their Vanguard sessions with Bach, Haydn, et al. I say travesty deliberately—for compared to the work of the Swingle Singers (whose Mozart recording is due shortly), these items are pretty painful. That is, if you know the Mozart originals. Not very improvisatory either; I'd call them full-fledged commercial arrangements. But what really is sad is the chopped up Mozart sense, the half-baked harmony, following Mozart just far enough to matter, then fobbing off with commercial-type clichés, dropping the little composer in midstream each time. Nope, I found it awful, as well as very dull.

I'd say our classical musicians had better stop showing themselves up in this fashion. They'll do better where they belong, following the notes. Mozart's notes.

FM

(from page 40)

in the history of the human race. A large proportion of U.S. citizens are better schooled, better informed and more alert than any group in human history.

For the marketer this well-heeled group of educated elite represents a mass market of enormous proportions. There are 16 million "executives" and their families in the U.S. These males represent 25 per cent of the male working force and they are the people whose tastes and education have already made culture a more popular pastime than sports. They partly account for America's current cultural binge. The U.S.

citizen is sprouting cultural wings, and the trend can only go one way, toward more and more of this world's good things.

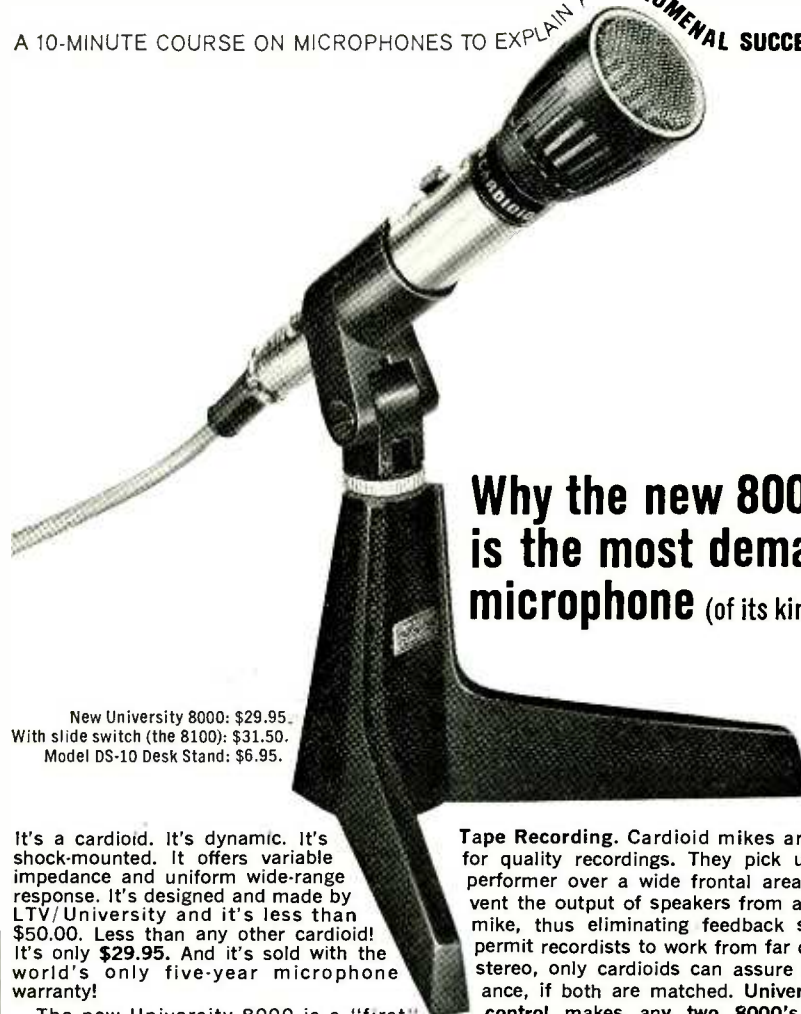
This cultural revolution is FM's opportunity. It also represents an opportunity and a challenge for the leaders of our communications industry. **Æ**

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It's a cardioid. It's dynamic. It's shock-mounted. It offers variable impedance and uniform wide-range response. It's designed and made by LTV/University and it's less than \$50.00. Less than any other cardioid! It's only \$29.95. And it's sold with the world's only five-year microphone warranty!

The new University 8000 is a "first" and "only." For those who like to be exclusive, that's one reason for buying it. The important reasons may be found in the following microphone buyers' guide!

There Are Cardioids...and Cardioids. All cardioids are essentially "deaf" to sounds originating from the rear. They're invaluable for eliminating background sounds, for use in noisy and reverberant areas, for reducing feedback and for permitting a higher level of sound reinforcement before feedback would normally occur. BUT—not every cardioid uses rugged dynamic generating elements. There are crystal cardioids which offer high sensitivity and output. But their response is limited; deterioration is rapid due to heat, humidity, rough handling. The University 8000—a cardioid dynamic—is virtually indestructible.

Tape Recording. Cardioid mikes are essential for quality recordings. They pick up only the performer over a wide frontal area. They prevent the output of speakers from affecting the mike, thus eliminating feedback squeal, and permit recordists to work from far or near. For stereo, only cardioids can assure proper balance, if both are matched. University quality control makes any two 8000's absolutely identical "twins" to assure full stereo effect.

Realism. The new 8000 offers wide-band response, extremely uniform to eliminate sibilants (hissing S's), bass boom and tinny treble. Its reproduction quality is virtually indistinguishable from the live performance. The 8000 has variable impedance—250 to 20,000 ohms, and comes with a 15-foot cable.

For complete specifications, ask your dealer for literature or write LTV/University, 9500 W. Reno, Oklahoma City, Oklahoma, Desk R-25M

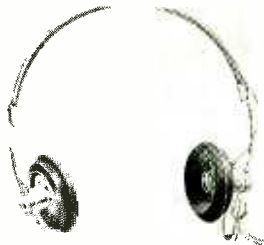


9500 West Reno, Oklahoma City, Okla.

Circle 126 on Reader Service Card

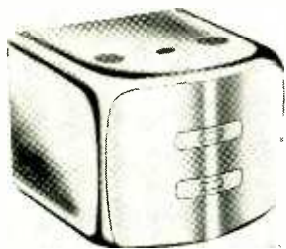
NEW PRODUCTS

● **Lightweight Stereo Earphones.** AKG K-50 is the designation for a new high fidelity stereo earphone that weighs all of 3.8 oz. Frequency response of 20 to more than 25 kc is claimed. Also claimed, is full bass response without requiring a tight air seal. The result, combined with the ultra-light-weight, is a significant reduction in the usual fatigue experienced from



protracted use of earphones. High efficiency and very low distortion are also claimed. Specifications call for 0.156 milliwatts for a sound pressure of 95 db. At the same time the devices will handle 90 milliwatts per unit with distortion from 20-25 kc under 3 per cent. The phones are available in impedances of 400 ohms per unit. Also available are 200 and 75 ohm units. Price for the AKG K-50 with 5 feet of four-wire cable, is \$22.50. **Circle 200**

● **8 Track Heads.** Nortronics announces a new 8-track stereo tape head for ¼-in. tape. The Model B2L stereo head offers twice as much playing time as the standard 4-track systems. A fine, 100-micro-inch gap assures excellent performance at 3¼ ips. The head is mechanically indexed to four discrete positions to provide four stereo or eight mono channels. The heads will be available in either solid or



laminated core versions. The B2L head has a hyperbolic, all-metal face with special, close fitting mu-metal shielding to eliminate external noise. In addition to its playback capability, Model B2L can be used as a record/playback head and is available in various impedances to accommodate all types of circuitry. **Circle 201**

● **Dust Cover.** Owners of Dual record players can now purchase a complete base/dust cover of attractive styling and proportions.



This DCB-1 enclosure has side panels of oiled-walnut to match the base, with rigid smoke-tinted plexiglass on the other surfaces. The cover can be lifted off the base

at any time, or left in raised position. Price of the complete unit is \$29.50. **Circle 202**

● **New Stereo Receiver.** Allied Radio has just announced a new stereo multiplex FM-AM tuner-amplifier. Knight Model KN-370 combines on a single compact chassis a 35-watt-per-channel stereo amplifier, individual FM and AM tuning sections, special multiplex circuitry that automatically switches to stereo, and dual preamplifiers. FM sensitivity is given as 2.5 µv for 20-db quieting; i.f. bandwidth is 300 kc; amplifier power is 70 watts IHF, 32



watts per channel, steady-state; frequency response is 20-20kc ±1db at full rated power. THD at full power is less than 0.6 per cent with hum and noise down -60 db on phono and -75 db on aux or tuner. Full program source control is offered. Outputs include 4, 8 or 16 ohms for speakers, hi-Z combined channel output, and low-Z front panel switched earphone connections. Price of the KN-370 is \$279.95 less case. A walnut case is \$23.95 and a brown metal enclosure is \$12.95. **Circle 203**

● **New Tape Line.** Superscope, American distributors of the Sony tape recorder lines have begun shipments of a new polyester-based tape. Sony PR-150 tape is wound on computer typereels for easy threading. Distinctive markings have been designed on each side of the reel. Side one is marked in gold; side two in silver. The



tape leader is green and the tail is red. Owners of Sony tape recorders can receive upon application, discount books for the new tape. New recorders will have these books enclosed. PR-150 is the only tape announced thus far. It is a 1-mil polyester offering on a standard 7-in. reel, with 1800 feet of tape. **Circle 204**

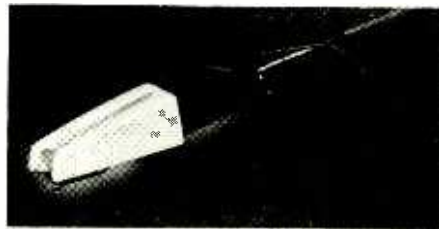
● **Reversible Stereo Recorder.** Full automation has been built into the new Concord model 994 stereo tape recorder. This model will play and record four-track



stereo in either direction, reversing direction at the end of a tape automatically. A built-in "Electronic Memory" enables the

user to program the recorder for such manual or automatic operations as: single play, automatic reverse, and continuous play or record. The 994 can be programmed to play for any length of time, half-hour, hour, or all day, as desired. Three-speed operation (7½, 3¾ and 1½ ips). Two erase and two record/playback heads operate in either direction of tape travel. Frequency response at the 7½-ips speed is 40-16,000 cps ±2db. Flutter and wow at this speed is less than 0.15 per cent rms. Solid-state electronics. Two VU meters are used for level indicators. This model is a complete recorder with built in dual 7.5-watt amplifiers. Built in 8-ohm speakers. Weight is 44 lbs. and dimensions are 15½" w x 11½" h x 17" d. The 994 will also be available as a deck only—designated the model 990. The 994 complete unit is \$339.50. **Circle 205**

● **New Cartridge System.** Euphonics Corporation has just released a new phono transducer that operates on the principle of an external current modulator, rather than a generator itself. The results, it is claimed, are substantial reduction in tip mass concurrent with high output. The system uses silicon elements smaller in volume than the diamond stylus tip itself. It is being promoted as a perfect match for the low impedance inputs of transistor amplifiers. An external power source is required to supply current for the silicon



elements to modulate. Each of the silicon elements requires 10 milliamps d.c. for a power of 0.1 watts. Under these conditions, output is about 25 mv with a source impedance of only 600 ohms. Frequency response is claimed from d.c. to beyond 30 kc. Separation is quoted in excess of 25 db. A bi-radial diamond stylus 0.9 x 0.2 mils, is utilized. Outputs of the system are RIAA flat for ceramic inputs and equalized for magnetic preamps. The cartridge system will be available in an integrated low-mass arm balanced in all coordinates. Compliance of this integrated system is 30 x 10⁻⁹ am/dyne. **Circle 206**

● **Revised Speaker Systems.** New versions of old favorites have just been announced by AR. The AR-2 and AR-2a speaker systems have their tweeter and mid-range, respectively, replaced. What was formerly a two-speaker array for top end in the AR-2 (mid-range on the AR-2a) is now a single 3½-in. broad-dispersion cone tweeter, heavily damped by Fiberglas on both sides of its diaphragm. The main improvement is in dispersion, although there is also some improvement in smoothness and, for the AR-2, in high-frequency range. These new speakers are designated the AR-2^x and the AR-2a^x. For identification they will be supplied with a new grille cloth. They are stated to be completely compatible with the older units in stereo use, but the older units will still be available to those that wish exact matching. In addition owners of older units can have them converted to the new driver with the purchase of a \$15 kit from AR dealers or directly from the company. The prices of the new speakers remain unchanged from their progenitors. They are \$89 to \$102 for the AR-2^x and \$109 to \$128 for the AR-2a^x. Prices depend on wood and finish. **Circle 207**

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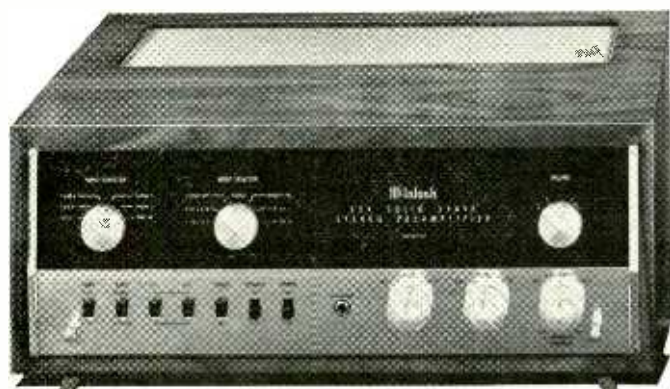
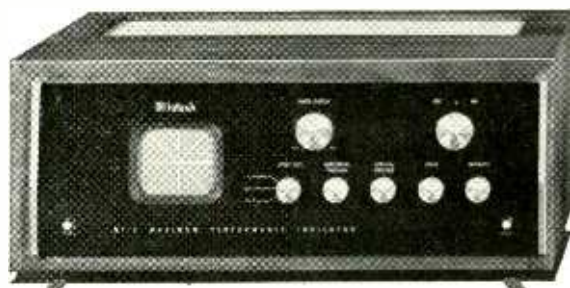
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NEW LITERATURE

● **Lamp Guide.** Tung-Sol has announced the availability of a new 24-page guide covering their full range of miniature, sub-miniature, and sealed-beam lamps. Designated form A-21, this guide illustrates all elements of the design and configuration of the Tung-Sol product line so as to aid in the engineering and design of equipment for which the lamps are applicable. The guide also supplies a complete listing of electrical and physical characteristics of the several hundred lamps in the Tung-Sol line. **Circle 209**

● **Heathkit Catalog.** Heath has just announced the 1965 edition of their annual electronic kits catalog. This year there are over 250 products listed. The Heath product line is designed to appeal to a wide range of electronic interests. Toward that end, the catalog shows stereo components, electronic organs, both a color and b & w TV receiver, a photo enlarging computer, recording electrometer equipment, a line of SB amateur transmitters and kits, CB equipment, electronic test gear—and then some. Every kit is listed in this free new 108-page color offering from Heath. **Circle 210**

● **RCA 'Transistor Manual.'** A second edition of the "RCA Transistor Manual" featuring technical data on more than 600 semiconductor devices and 45 "easy-to-build" circuits is off press. This latest printing of the manual (SC11) is bigger and better than its successful first edition, and has been enlarged to 384 data-packed

pages covering all types of semiconductor devices. To the designer, student, hobbyist, or anyone interested in the dynamic subject of semiconductor devices, the new edition offers more data, more easy-to-read basic theory and more do-it-yourself circuits. Some of the typical circuits included in the popular manual are: two portable radio receivers, two automobile radio receivers and two automobile ignition circuits (for both 6- and 12-volt systems), a three-band radio receiver, earphone and phonograph amplifiers, two stereo amplifiers, citizens-band transceiver and transmitter, a silicon-controlled rectifier light-dimmer circuit, and many other circuits. More than 80 pages of revised, descriptive text in the SC-11 manual are devoted to bringing the reader up-to-date on the latest semiconductor-device technology and applications. Copies of the new RCA Transistor Manual are available through local RCA distributors or from Commercial Engineering, RCA Electronic Components and Devices, Harrison, N. J. Price of the SC-11 is \$1.50.

COVER STORY

This component system sounds off in the home of George Colton who lives in the Tomahawk Hills section of Kansas City, Kansas. The main control panel is slanted at an angle of 12-deg. for ease of operation. Incorporated in this panel are auxiliary speaker switches and a jack for stereo phones. Both record and tape storage is provided, as well as

an open compartment for a portable TV set. Components used are a McIntosh C11 preamp, McIntosh 240 power amplifier, Fisher FM-1000 tuner, Bogen B61 turntable with a Shure M7D cartridge containing the N21 stylus, and a Sony 500 tape recorder.

The layout was designed by Fred Hulen of Contempera Stereo in Kansas City. He noted that it is particularly intended for people with limited space availability, such as apartment dwellers.

SHUNTED DOTS

(from page 21)

and some of these will prove useful. Computation of the simpler cases will not prove too onerous a task, particularly if the simplified "relativistic" notation here employed is used. Computation of the characteristics of the more complex cases may be extremely involved; and there are a few that, like lens computations, must still be worked out by successive approximations. Æ

¹ Pender, Harold, and Warren, S. R. "Electric Circuits and Fields," McGraw-Hill, 1943.

² Guillemin, E. A. "Introductory Circuit Theory," Wiley, 1953.



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SOUND REINFORCEMENT

(from page 26)

before feedback.¹¹ In practice, the frequency shifter was utilized for only one weak-voiced speaker. It was not necessary for amplification of organ and piano. Also, we found it inadvisable to use the shifter when Billy Graham or anyone else with an extremely wide dynamic range spoke, since the dynamic range of the remainder of the sound system exceeded that of either commercially available frequency shifter.

Without the frequency shifter feedback stabilizer, sound energy directed from the choir distributed loudspeaker system picked up by the microphones actually determined the feedback point of the complete system.

Press comments on the sound system may be summed up by one *Boston Globe* report, "Clearest sound ever heard in the Garden."

Some modifications to the temporary system would be required for permanent use in the Garden. Loudspeakers suspended on cables would have to be relocated to under-balcony soffits, and horns would have to be added to the central loudspeaker cluster to insure complete 360 degrees of coverage, when required. Also, experience suggests more stages of time delay in the under-balcony distributed system as desirable to further improve naturalness and intelligibility; two delays were sufficient to insure sufficient intelligibility, but the localization of the under-balcony loudspeakers was obvious in some of the side locations.

¹¹ M. R. Schroeder, "Improvement of Acoustic-Feedback Stability by Frequency Shifting," *JASA*, vol. 36, No. 9, September 1964, pp. 17-24.

We have frequently heard sound system contractors rationalizing poor results in temporary sound systems on the basis of inadequate time to plan an engineered installation. The two sound systems employed for the Billy Graham Greater Boston Crusade indicate that fine results are possible even in temporary installations. The equipment and over-all system designs used in the systems described are not, of course, applicable to every situation; but the articles of recent years in this magazine and such technical journals as the IRE-IEEE-PGA and the *Journal of the Audio Engineering Society* have provided a wealth of information that can be applied to sound system design and installation problems encountered in such situations that have been discussed here.

It goes without saying that the fine results achieved in these two systems would not have been possible without the complete cooperation of many participants: The staff of the Billy Graham Greater Boston Crusade; the installing contractor, Lake Systems Corporation of Watertown, Massachusetts; the various manufacturers of the equipment employed in these systems;¹² and the staff of the Boston Garden; and, of course, James Galvin, the operator of the Garden system. Æ

¹² Altec Lansing Corporation, Anaheim, California; Audio Electronic Products, Detroit, Michigan; Audio Instrument Co., New York, New York; White-Austin Company, Austin, Texas; (System design was accomplished by Professor James Bruce of M.I.T. and Douglas Steele, Wilfred Malmund, and the author, the latter three of BBN.)

LETTERS

(from page 6)

(ASCAP), cannot assume the responsibility of legally issuing a blanket license to make non-commercial tape recordings of copyrighted material and performances. The copyright laws in the U.S.A. are vague and loosely worded in this respect and are not in accord with international copyright conventions prevailing in Europe and particularly in England, where the question is a bit "sticky".

The Music Publishers Protective Association takes a different view, claiming the law protects them and on this basis may or may not accept payment or royalties permitting the use of copyrighted material.

The question naturally arises as to who may have a case and to what extent enforcement or licensing may be pursued. I, like most recorder hobbyists, am not inclined to disrespect the copyright laws

nor infringe on legal rights which a copyright might guarantee. Currently, the unresolved question is an unmitigated nuisance and, as such, will remain so until remedies are forthcoming. Obviously, if some form of blanket license could be legally granted, through the payment of a stipend one-time fee, or membership in a record club, and so on, every fairminded tape recording fan would be relieved and the controversy adjusted.

Could it be possible that the Music Publishers Protective Association in New York City may have some views on the matter, pending a revision of the U.S. copyright laws, that may be a reasonable guide to the solution?

FREDERICK C. BERLINGEN
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CIRCLE 129

AUDIOCLINIC

(from page 4)

channels. Therefore, the channels are not balanced. A sensitive meter can be used to obtain rather precise balance.

However, this arrangement cannot be used for "ping pong" records in which there are times when only one channel is operating. Offhand I see no way for you to balance such records except aurally, at least when this latter scheme is used. The meter might well be overloaded.

Remember that I suggested the use of a sensitive meter. This means that the meter can be readily damaged by overload. Therefore, when beginning the balancing procedure, start with the signal level down. If the meter swings above zero, readjust the balance control till it reaches the zero position again. Then increase the volume and again adjust the balance control if necessary.

Of course, a bridge rectifier must be used at the amplifier "hot" leads in order to provide the d.c. needed to operate the meter.

The third approach makes use of the zero center feature of your meter. It might be possible for you to work out a

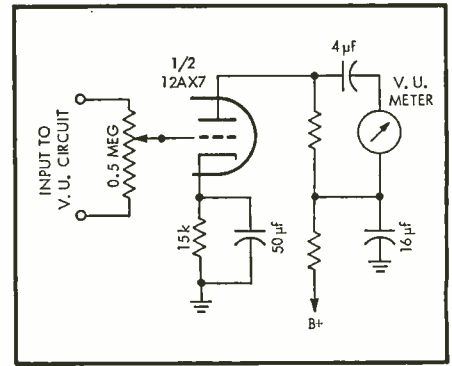
circuit in which there are two rectifiers, one for each channel. The rectifiers must be a matched set so that each channel will provide equal output when the system is balanced. The rectifier for the left channel can be made to rectify and give you filtered, negative voltage and the right channel can be setup to give you filtered, positive voltage. The time constants of the rectifier and filter circuits should be so chosen as to give you good meter damping, but not too much which would mask program changes. Start with 250 milliseconds.

You may find it necessary to shunt the meter with diodes wired in parallel, with the anode of one connected to the cathode of the other.

Do not confuse these latter rectifiers with those used to obtain the d.c. required to move the pointer of your instrument. These latter devices are chosen to allow full scale meter reading without significant conduction, but must conduct heavily very shortly after the full-scale reading has been passed.

The final phase of your letter concerns obtaining balanced signals from the output of your preamplifier. This is most easily accomplished by means of a VU meter and the auxiliary amplifier circuit shown in Fig. 1.

Power for the unit may be obtained directly from the preamplifier or may be

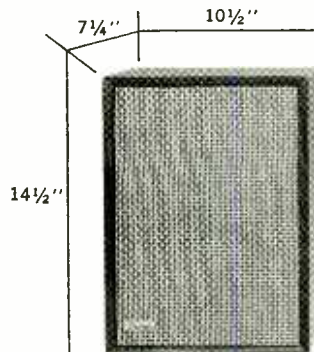


obtained by means of a separate power supply. 250 volts d.c. at 20 ma is sufficient for B voltage. Filament requirements are 6.3 volts at 0.3 amp or 12.6 volts at 0.15 amp.

After the unit has been constructed, the potentiometers should be adjusted to provide equal meter scale indication on each channel for a given input signal voltage. The amount of voltage used as your zero reference will depend upon the nature of your requirements.

I recommend this circuit to be used in conjunction with one of the three circuits discussed earlier. You will then be in a position to monitor your power amplifier output and your preamplifier output simultaneously. If you wish to use the

great sound



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rich audio coverage. Handsome to behold, too—a sculptured look and modern cane grille set off the oil-finished walnut cabinet. It's the ideal complement in your stereo system. Less than \$90 a pair (\$44.50 each). Also hear the velocitone Mark IV stereo cartridge (less than \$25), at your hi-fi dealer. For descriptive brochure SAH-90 write.

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same meter to monitor both amplifier output and preamplifier output levels, appropriate switching and calibration networks must be provided. If you use the third scheme proposed here, a somewhat more involved circuit will be required.

This discussion should provide you with sufficient information to enable you to carry out additional experiments.

Muting Stereo Systems

Q. What is a simple way of muting a stereo audio system without turning down or in any way touching the volume control of the preamplifier, as when changing a record or tape.

I would prefer some pushbutton switching method that would not entail getting into the internal wiring of the preamplifier if possible.

Another restriction here is that transient noises, such as "pops" are not heard when switching. Henry T. Sugiura, Phoenixville, Pennsylvania.

A. The way I go about muting the audio during the time I change discs or tapes is merely to use the selector switch. I move it to a position which is not being used, say the tuner position. When the tape has been started or the tone arm placed in the lead groove of a disc, I reset the selector switch to the appropriate input and I hear the sound with proper level, free from hum or the thump

of the stylus coming to rest on the surface of a disc.

If your selector switch is "clean" insofar as transient clicks are concerned, you will not hear any clicks during the switching process. If you do have some transient clicks, they often can be removed by placing 5-megohm resistors at the outputs of all signal sources. When these sources are switched in, their capacitors will already be charged because of the ground path through the resistor, and no "pop" should be heard.

If transient clicks are heard when an early stage of a preamplifier is switched into the circuit, the same treatment can be applied. The switch side of the coupling capacitor is the point at which the resistor is connected, with the other end of the resistor grounded.

Note

When writing to me, please address your letters to the address shown in this column rather than to **AUDIO Magazine**. Sending letters to the magazine only slows their delivery.

On the plus side, thank you for sending the stamped, self addressed envelopes with your letters. It makes answering you proceed much faster than otherwise would be the case. However, many of your envelopes bear your own return address. Actually they should contain my return address because I am the one

sending the letters; if you were sending a letter to me, your return address would be on the envelope.

As you know, many of the questions I answer, are tricky and I can guess how to solve your problems more accurately only when you provide me with as much information as you can as to what you see or hear and as to what steps you took to correct the condition. I also need to know what happened to a particular circuit when a corrective step was taken. By doing this you will help me answer your letters more quickly and more accurately.

To illustrate what can happen I recently ran into a problem in which I was told that a certain record changer was used in a radio and could this changer be transferred to a component system. I assumed that this transformation could be easily accomplished. It turned out, however, that the record changer motor was a special unit whose voltage requirements were such that it was used as ballast in a series heater string. When the questioner connected this motor to the line, it overheated and almost burned out. Had I been given all of the facts, model of radio, and so on, this wouldn't have happened. Fortunately, the motor did not burn out, and it was possible to recommend that a resistor be inserted to act as the heaters and absorb the over-voltage.

Thank you

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SPECIAL ELECTRONIC ORGAN TONE SOURCES

(from page 32)

energized by depressing a key, the hammer strikes the anvil and holds the V out of contact with the anvil. The chime tones generated by this striking action will continue to ring naturally until the tone dies out, or the coil is de-energized by releasing the key.

There is one inductive pickup coil for each bar so that it is possible to play several or all of the chimes together. Mechanically, the keyboard is usually fastened close to the great manual. The amplifier is of conventional design.

The Schulmerich ChimeAtron is a genuine musical instrument, the chimes are of delicate timbre and yet their charac-

ter can be changed almost completely by changing the amplified audio output level. It is rather striking to hear these chimes at very high audio levels. The attack, the decay and the harmonic content make the Schulmerich sounds pleasant contrasts to the organ sounds. It is not at all surprising to note that many professional organists include chimes for a cadenza, a refrain or as an interesting solo voice.

The ChimeAtron that is available from Schulmerich or their dealers includes a small oval speaker. The Schober Organ Corporation also supplies a Schulmerich Chime set, but less the speaker.

There are two difficulties associated with the purchase of the complete package if you already own a hi-fi system, or an organ with a self-contained audio system. In both cases, your speaker is far superior to the oval speaker contained in the Schulmerich. This is not to be interpreted as a discredit to the integral unit, because the oval speaker is adequate for the tonal range of the chime set.

The second problem comes into being because the integral unit is subject to a 10 per cent excise tax. The Schober unit is identified as CH-1 and sells for about \$400.00 f.o.b New York, whereas the Schulmerich with the integral speaker lists for about \$475.00 with an additional 10 per cent for the excise tax, making a total about \$522.50.

The three specialized musical instruments that we have just described are not solo instruments, but tonally they do provide complementary sounds to the electronic organ. The controls of each are such that the organist can easily operate them without difficulty.

TO BE CONTINUED

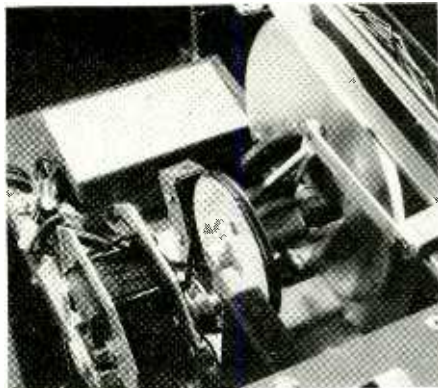


Fig. 8. Tempo wheel disk and rim wheel drive of Side-Man.

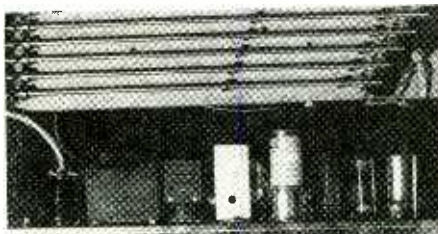


Fig. 9. Tuned bars and electronics of Schulmerich ChimeAtron.

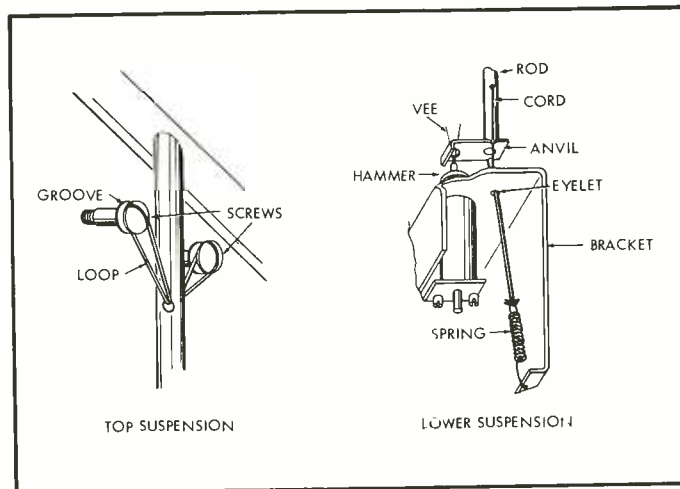


Fig. 10. Suspension of Schulmerich ChimeAtron.

LOW-FREQUENCY OPERATION

(from page 22)

the change. In the case of power amplifiers where the last one or two stages are of a push-pull configuration, the B+ (or corresponding supply line in a solid-state design) has more filtering as one progresses toward the input of the system. Thus the time constant of the supply voltage to individual stages differ greatly with the push-pull stages receiving the least filtering or, in reference to time, the shortest time constant. In this manner it is quite easy to observe that a drop or rise in supply voltage would vary the respective supply voltages of all the individual stages different amounts and at different times. If the unit were d.c. coupled such variations would no doubt cause a complete upset of normal operating conditions, possibly to the extent of blocking the amplifier. In amplifiers that have a low-frequency bandpass with an over-all time constant greater than the time constant of the power supply itself, the above condition can and does readily occur. Such is the case of many "dual channel" amplifiers where a signal in one channel causes the supply voltages to vary and produce a corresponding signal on the other even though the second channel is not receiving a signal at its input. In lower-priced single-channel systems this same effect is noticeable by poor recovery times from large signal levels. In some cases it is actually cheaper to make an additional push-pull stage preceding the output stages with the idea that an equal in-phase signal will be introduced that will be canceled out in the output transformer.

Unfortunately this does not materially aid the situation because the output stages must now handle the amplified supply variation in addition to the desired signal. As a result the power-handling capability of the system is reduced sometimes by as much as one fourth of its rated output. In amplifiers that possess this type of problem the use of additional filtering or a greater degree of supply regulation can raise the handling capabilities up to 100 per cent or more. It must be remembered that the power responses of the output tubes and associated components cannot be exceeded. However, if the associated components can withstand the added currents and the chief limitation is now the output tubes, they can be replaced with different types having a larger handling capacity. One must also remember that as the plate currents rise through the substitution of different output tubes or by bias changes, these changes manifest themselves as an added load to the power supply and as such further raise its time constant.

The only practical manner to minimize this is to employ a fully regulated supply. Further improvement can be had by making the regulated supply "negative impedance" (as the load increases the output supply voltage also increases). Supplies of this type are not easily applied to equipment not intended for them. In general a "zero impedance" supply, one where there is no change in output voltage for any load condition should provide the best improvement for existing units. The effects of supply variation are more apparent at the low end of the frequency range although similar effects occur elsewhere in the frequency range.

In some cases of instability the problem was traced to the supply components themselves. Lower-priced equipment used fewer filter capacitors each with a higher capacity. As these capacitors get larger in capacity, two things occur: First the interval leakage currents rise resulting in a shorter life span; and second, and even more important, they develop larger amounts of interval inductance. Thus while the capacitor may provide a low impedance to frequencies at or near the ripple frequencies, it may appear much higher at the upper frequency limits of the amplifier. When this happens a condition such as described earlier can and does occur. This effect can be minimized somewhat by the addition of a small ceramic or mica capacitor in parallel with the output electrolytic capacitor. Usually a value of 0.1 μf is sufficient. Again a properly designed and built regulated supply offers a low impedance to all frequencies that are capable of being passed by the amplifier. In fact the supply must exhibit a frequency range in excess of the basic amplifier if correct operation is desired.

It is quite interesting to note that the present method of rating commercial amplifiers in the hi-fi category is to replace the existing power supply with a regulated supply and then to establish their advertising specifications. In most cases the existing supply would be incapable of providing even a close approximation of the results obtained in this manner.

In summary the development of amplification equipment has proceeded at a respectable rate as far as the amplifier assembly itself is concerned. However, the application of suitable power supplies has not kept up with this degree of development. The result is the sad fact that in many cases the power supply is the chief limitation on the quality of the complete assembly. Æ

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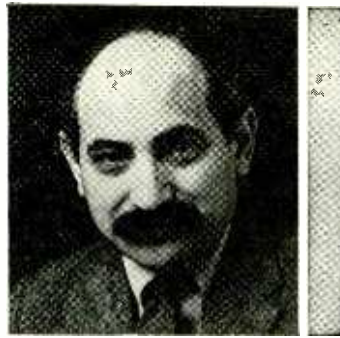
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JAZZ and all that

Bertram Stanleigh



Joe Pass: For Django

Pacific Jazz Stereo ST 85

Pass has made a very substantial impression on the jazz scene in the last three years, but nothing on his previous recordings has prepared us for the deeply felt, finely executed performances on this tribute to the late Django Reinhardt. With the exception of *Django*, by John Lewis, and Pass's own composition, *For Django*, all of the tunes are either by Django or are familiar specialities. There is much of the same improvisational approach in Pass's performances as there was in those of Django, but these are more vigorous, extrovert interpretations. They do, however, have that gentle quality that was a hallmark of Reinhardt's work, without being in any way imitations. For accompaniment John Pisano plays rhythm guitar, and the quartet is completed by Jim Hughart, bass, and Colin Bailey, drums. They supply a solid rhythmic background with none of the arch effects that so often marred the work of the Quintet of the Hot Club of France. Sound on this release is up to the high level of the performances, with Pass solidly placed midway between the speakers, bass and guitar on the left and drums on the right.

Herbie Hancock: Emyrean Isles

Blue Note Mono 4175

Four numbers by Herbie Hancock receive flawless performances by Freddie Hubbard, cornet, Hancock, piano, Ron Carter, bass, and Anthony Williams, drums. As in previous releases, Hancock and Hubbard play with imagination and work superbly together. The liner notes offer a detailed programmatic description of the four numbers, relating them to a fanciful legend of four islands in the "Great Eastern Sea." While the story is not without charm, it would be a mistake, I think, to try to relate the legend to the music. The music is strong and stands on its own, without need of a literary crutch. The recording, as is usual with Blue Note, is exemplary.

Les McCann: McCanna

Pacific Jazz Stereo ST 84

According to McCann's own liner notes, the inspiration for this set was found in some Zulu performances that McCann saw and heard in the African Pavillion at the New York World's Fair. Several of the numbers by McCann have been awarded African titles—*Zulu*, *Basuto Baby* and *Narobi Nights*. Bonga, Conga and timbales have also been added to some of the rhythm accompaniments to heighten this African effect. But somehow it doesn't come off. It's not that the record isn't a good one. Les McCann is a first rate pianist, and the present platter compares favorably with his other work. But somehow no special quality of African nature gets across.

John Wallowitch: This is John Wallowitch

Serenus Mono SEP 2005

Well, not every Philadelphia-born musician seems to have come under the Coltrane influence. Here's a Philadelphian whose background would appear to be classical, rather than pop. He's represented by a collection of pop and standard numbers that are billed as "where pop music will go when it finally gives up. He is what happens when you get tired of jazz." What happens in this case is a series of improvisations in the style of Rachmaninoff. That they rise above mere routine is largely due to an impressive technique and

a large, round tone. There is much enjoyment to be derived from the sheer sound of the instrument and the excellent reproduction it receives in this recording.

DePaur Chorus: Songs of New Nations

Mercury Stereo SR90382

These are fresh, bright, vigorous performances of African and Israeli songs and dances performed with excitement by an excellent group of singers augmented by native drummers and percussion. The recording is rather a surprise to one who is used to hearing music of this type in technically inadequate field recordings. The present release is the ultimate in up to date recording technique with some of the best sound I have yet to encounter on an lp and with an ideal stereo spread from speaker to speaker. The music ranges from a 15th century Ashanti war chant from Ghana, with a stunning drum accompaniment, to a poignant 19th century Zionist song from Israel, to a rollicking fun song from the Congo, to a strongly rhythmic courting song from Nigeria. All of the numbers are unfamiliar and unhackneyed, and the collection presents a wide variety of interestingly contrasted material. The arrangements are simple and effective, and the total impact of this recording is truly awesome.

Richard Dyer-Bennet: Songs of Ships, Seafaring Men, Watery Graves, Card Sharps, A Giant Ram, An Indian Scalping, and One Edible Rat

Dyer-Bennet 12

Richard Dyer-Bennet is an endless source of stylish, impeccably polished performances of folk material. The present disc—which probably offers the longest title of any disc in the Schwann Catalog—is a collection of largely familiar sea chantes, with a few extra items added for spice, among them Dyer-Bennet's own setting of a Bret Harte poem, *Plain Language from Truthful James*. Both the virtues and shortcomings of this major folk artist are too well known to bear repeating in each review. This is an artist who has set a special high standard for himself, and through the years he has been able to maintain that standard. His is an unchanging art, and his vocal resources remain both as flexible and limited as ever.

Galax, Va., Old Fiddlers' Convention

Folkways Mono FA 2435

Fiddle and banjo combinations were probably the earliest American musical ensembles. They have both a long tradition as accompanying instruments for group dancing and as instruments for concerts and home entertainment, and the tradition of performing competitively is almost as old as their popularity. The Old Fiddlers' Convention at Galax, Virginia has been held for the past twenty-eight years. Sponsored by the Galax Lodge of the Loyal Order of Moose, it attracts an abundance of old time performers—more than a hundred contestants compete each year—and both traditional and bluegrass banjo styles are represented in separate categories. The present recording was collected at the 1961 to 1963 Conventions and includes such well known performers as Tom Ashley, Larry Richardson and The Stony Mountain Boys. Many performers with impressive local reputations are featured, among them, mandolinist, Ivor Melton and old time banjo player, George Stoneman. Perennial

favorites at the Convention include fiddler Sonny Miller of Wilmington, Delaware and George Pegram of Union Grove, North Carolina, whose three-finger banjo picking won him the 1961 prize. The recordings were made at the Convention, in a local radio station and in an open parking lot during the Convention. Under such circumstances, a variety of background noises could not fail to insinuate themselves onto some of the bands, but these do very little to detract from the very high quality of the performances. Careful selection and editing has resulted in a collection of twenty-three tunes that offer not only a remarkable representation of the Convention but also a widely varied collection of first rate talent.

Roland Kirk: Gifts & Messages

Mercury Stereo SR 60939

Most of the authorities are agreed that Kirk's simultaneous performances on flute and manzello and on stritch and slide whistle are serious creative works to be pondered diligently for their cerebral content, but this listener can find little in Kirk's instrumental gymnastics other than flashy exhibitionism and a prodigious technique employed for its own ends. Certainly he manages to contribute nothing in *March on Swan Lake* or *My Heart at Thy Sweet Voice*. His flute solo of Bechet's *Petite Fleur* is not only dull but too closely miked and overly breathy. On the other hand, *Hip Chops* and *Gifts and Messages* seem pleasantly agreeable highjinks that can be enjoyed in a superficial way by those of us who lack the insight to appreciate their more profound message. Aside from a tendency toward extremely close miking that results in overly directional stereo, the recording is fine.

Richard "Groove" Holmes: Book of the Blues, Vol. 1

Warner Bros. Stereo 1553

This record is a real sonic experience with strong, low pedal notes, bright, crisp cymbal shots, a very wide dynamic range and excellent separation. The music's good, too. Holmes fingers his way through a collection of traditional blues numbers that includes *See See Rider*, *Mean Old Frisco*, *I'm Gonna Move on the Outskirts of Town* and *How Long*. He conveys all of the proper low down qualities, he swings and he even adds a bit of boogie. This isn't jazz for purists, but its highly enjoyable music for audio fans, particularly those who are anxious to show off their woofers. Equipment dealers would be wise to keep a copy on hand.

Rev. Robert Wilkins: Memphis Gospel Singer

Piedmont Mono PLP 13162

From 1928 to 1935 Reverend Wilkins recorded a number of Gospel songs for Victor, Brunswick and Vocalion, then, like a number of jazz and folk performers, he disappeared from public view until early 1964 when he was located by Piedmont Records, acting on a tip from Bill Givens of the Origin Jazz Library that Wilkins was rumored to be living in Memphis. A check in the Memphis phone book and brief correspondence led to a trip to Washington for the present recording. Since I'm not familiar with Wilkins' earlier waxings, I can only judge from the present disc. The strong rhythm of his own guitar accompaniment and the depth of feeling in his performances suggest that in his earlier days he was a powerful singer of gospel blues. In his sixty-eighth year, Reverend Wilkins has a voice somewhat rough and small, but he is a skillful performer who manages to achieve a great deal of variety in spite of his limited vocal resources, and his command of his guitar cannot be faulted. In addition to two traditional numbers, *Just a Closer Walk with Thee* and *Do Lord Remember Me*, Wilkins is heard in six of his own compositions. Most interesting is *The Prodigal Son*, a highly individual retelling of the Old Testament story that extends for ten minutes over the greater portion of side two.

Valentina Felix: Song of the Sea and Other Portuguese Songs
Monitor Stereo MFS 421

A collection of currently popular Portuguese *fados* and one or two other pop numbers that were getting lots of local air time in Lisbon during the past year, the present disc features one of the most promising of the younger *fadistas* with an orchestral accompaniment that is more likely to appeal to the average Portuguese platter buyer than to the folk music purist in the United States. If these are not classic *fados*, they are nonetheless, well knit, tastefully arranged performances of a type more popular in their native country than those with the typical guitar background. Miss Felix nods twice in the direction of her American audience, once in a number called *Fado Twist* and a second time when she offers the brief final stanza of the title tune in English. I was secretly pleased to note that her pronunciation of our language is almost as inept as mine is of hers.

Mike Hurley: First Songs
Folkways Mono FG 3581

Back in the United States—Frederic Ramsey Jr., whose field recordings in the backwoods of the South have brought to light some of this country's most interesting, authentic folk talents, has made an exciting new find—not on southern safari, but in his native Bucks County, Pennsylvania, where he encountered Mike Hurley. At 22, Hurley was worn out from too much hard living in Greenwich Village and New Orleans and had retired to a small stone house in the country to recuperate, following six months in Bellevue Hospital where he was treated for hepatitis, tuberculosis and mononucleosis. On his first disc, Hurley makes a strong impression as an imaginative creator of highly original songs on a variety of personal experiences. His subject matter extends from interrupted local railroad service, to interplanetary flight, to werewolves, to the consumption of tea, of wine and to a number called *You Get Down by the Pool Hall Cluckety-Clack* (Sister Song), whose theme is expressed in the telling couplet:

*You wrote my sister a twelve-line sonnet
 There's a train leavin' here, and I want
 you on it.*

Imagination as a song writer is Hurley's strongest claim for recognition. At a time when most young folkniks are content to rehash the same old tired themes that reflect the experiences of other persons, rather than their own problems, this young man has found a variety of new subjects on which he can express himself in a strongly personal manner. Both as a writer and as a performer he displays less control than one expects in a mature artist, but this is only his start, and any lack of polish is more than compensated for by an abundance of talent. Mike Hurley has so much to say that further recordings are eagerly anticipated.

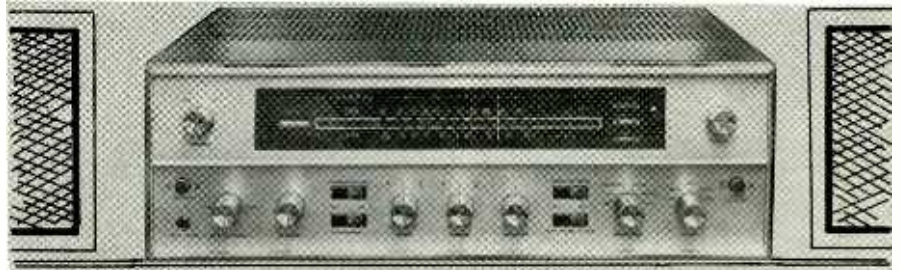
Yulya Sings Kalinka and Other Russian Folk Songs
Monitor Mono MF 422

In her fourth recital on Monitor, this charming young singer digs into more of the standard Russian folk song repertory with decidedly happy results. In addition to *Kalinka*, she contributes idiomatic versions of *The River Flows, I Planted the Little Garden Myself* and eleven more folk ballads. To each of them she contributes not only the proper style and expression but also the personality of a dynamic performer and the voice of a talented singer. Her dark, throaty sound can be languid and caressing in a romantic number or vigorous and robust in a rhythmic tune. As on all Monitor folk records, full song texts are supplied in English and the language of the performances. In this instance, the Russian texts are given in both the Cyrillic alphabet and in a Roman transliteration.

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AMERICAN CANCER SOCIETY

InZide Audio

LARRY ZIDE

This month will be devoted to a *pot pourri* of things audio. First among these is mention of a press preview I recently attended. This was produced by Empire's energetic President, Herb Horowitz. A number of audio editors and columnists were gathered together at Alitalia's VIP lounge in Kennedy International to act as judges in a revival of a highly successful contest held once before by Empire. In this contest, the consumer must match a list of Grenadier speaker qualities against a composite master list arrived at by the judges. Each judge rated the features he considered most important on a 10-point scale. Since the composite master list is to be compiled by an "independent agency," the judges do not know what the master list looks like.

The prizes of this contest include a trip to Europe with a tour of the music festivals as the principal feature.

I applaud this. It is good to see a major component company demonstrate its belief that the high-fidelity component purchaser is (or ought to be) a music lover. I dwell on this subject because I feel it to be important to the future of componentry. I became involved in the high-fidelity field because it was a means to an end. That end, for me, is the most natural and realistic recreation of *music in the home*.

Some manufacturers have wandered away from this basic. It is time to return. *Music* is the end. *Components* are the best way toward that end. It is gratifying to see Empire building a campaign around music. May their tribe increase!

What Price Progress?

I often find myself asked, by interested friends, if a particular piece of equipment is worth the asking price. Something of a peak in frequency has been reached on this question with the long-awaited release of the \$650 Marantz tuner. At that price this tuner stands well above the pack. The question is, of course, is it worth it?

An answer must be based upon an assumption. That being that this tuner is a significant and recognizable improvement in the state of the art. In other words, if the tuner will perform better than others we can draw a conclusion as to worth. Let us then proceed based upon this, as yet unproved, as-

sumption. Audio components today are pretty sophisticated devices. Of course there is always room for improvement, but most improvement today is the kind that is audibly subtle. Any dramatic breakthrough means (almost of necessity) a radical approach to design. This is what Marantz purports to have done.

There have been "state-of-the-art" components before, which have been succeeded by new units during the inexorable march of time. But no truly great product can ever be totally obsolete. Here lies the heart of the price question. I believe these super units to be worth the money that is asked for two reasons. First, because you really cannot set a price on a true advance in listening and performance pleasure. Second, these units, just as a Rolls-Royce, offer a unique grade of *continuing* satisfaction. This quality is priceless.

Some Thoughts on "Solid State"

There has been much written about "transistor sound," particularly as applied to amplifiers. I must agree with much of the commentary. The best solid-state amplifiers certainly sound different from the best vacuum tube units. I have heard instrumental clarity from solid-state amplifiers that has been very gratifying indeed. At the same time, I have heard some solid-state equipment which left something to be desired. Why? Some say high IM at low output levels, others say crossover distortion, still others say, "Nonsense," its all in the mind of the listener. Nobody really knows for certain.

I want to emphasize that transistor amplifiers are not necessarily inferior to tubes nor vice-versa. Rather, that "transistor sound," when very noticeable, may not be an improvement in sound reproduction but rather the opposite. Of course new solid-state amplifiers are being issued at a furious pace. And I have heard preproduction units that meet the promise of transistors and then some. In amplifiers, then, I feel that transistors have not yet reached full promise. But I expect to eat these words any day now.

Preamplifiers, on the other hand, are a different matter. I have heard several solid-state units that are, in all musical respects, sonically superior to the best tube units. But, some care in selection has to be made. Many solid-state preamps do not have as much dynamic

range at the phono input as do the best tube units. In other words, the phono inputs of such units may be overloaded and start clipping when fed from a high output cartridge playing a record with a high recorded velocity. To be more specific, good tube units will not overload until 150 millivolts or more are fed in. Some of the transistor units will overload at 35 to 50 millivolts, and, as a result, can produce distorted sound with some cartridges playing some records.

It is said that an average magnetic cartridge has an output of only 4-5 millivolts. True enough, but this is an average output. Musical peaks can run as high as 8-10 times that value. This makes 40-50 millivolts a minimum figure. After all there are some cartridges that can put out up to 15 millivolts under average conditions.

Preamp manufacturers must make sure that their products will not overload when fed phono signals of the orders indicated. My experience has been that not all manufacturers have been overzealous on this point.

I have left tuners for last because

they are the most controversial. Solid-state tuners can provide very excellent performance characteristics indeed. The heart of the disagreement seems to center on the tuner's "front end." Here, many engineers contend that transistor tuners suffer from crossmodulation problems and also an inability to handle signal overloads (much the same as phono preamps). The latter can be attended to, in large part, by sensitivity switches; the former is for the engineers to argue. My ears tell me that there are solid-state tuners that perform as well as similarly priced tube jobs. And, the solid-state units have the theoretical edge in reliability and durability.

For the bulk of integrated equipment sold today, solid-state is a distinct improvement over tubes. I have seen several transistor receivers, for example, that in all respects rival (and occasionally surpass) their tube equivalents.

But for the super units, the *best* preamps and amplifiers, and so on, there is still some more to go. I expect that there will be more to say on this subject at regular intervals. Æ

AUDIO ETC

(from page 12)

that my friend the Old Lady of Forty-Second Street, the famed automated subway train, has ceased to exist. She got her skirts severely burned, not to mention most of her circuits, in a big fire last year; since then she has been quietly retired. She was a splendid example, it turned out, of worthy but not-yet-quite-satisfactory computer thinking, an attempt to take over too much from the live sort. As previously described here (from first-hand experience), she bungled the job of being her own motorman. A live, well-trained motorman can still do this kind of control job more accurately, more simply, more responsibly, and more economically (probably). Starting, running and stopping a big train full of perishable people is no joke. The non-human computer "motorman" had no choice (with its limited decision-ability) except to proceed with enormous caution, in fits and starts, wasting an unconscionable amount of time en route. The human mental feedback and action-response pattern of a real motorman here is superior to the computer's. Driving a train is one of those things we can do best ourselves via so-called intuition, which is merely a word for massed, semi-instantaneous decision-making-plus-action out of enormous amounts of mentally-stored memory and experience.

(On the other hand, the elevator people have done an admirable job with their rather simpler computer-type problem, the automation of vertical trans-

port. They are far ahead of any live elevator operator.)

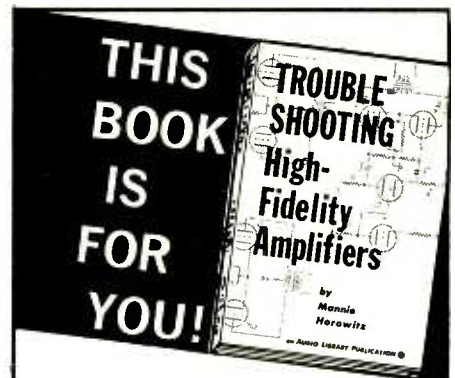
\$0.00

Another humorous instance I'm happy to cite was the splendid snafu of my New York bank account perpetrated recently by my bank's computer system.

It seems that these accounting machines are programmed so that if your balance reaches the mystic figure of \$0.00 at any moment, even for a millisecond, *for any reason*, the account is instantly closed. You disappear. Well, by the sheerest of coincidences last fall I just happened to hit the magic figure, between deposits and withdrawals. I didn't know it, nor did the bank people. So in a fleeting instant of time I vanished from the face of the earth and was no more.

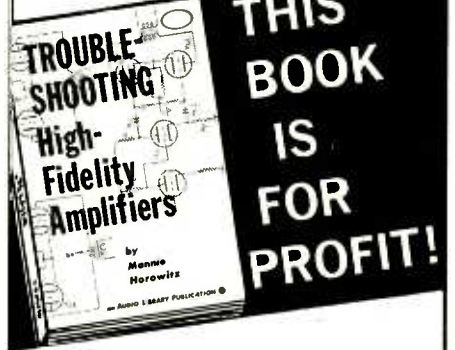
My successive deposited checks were held in abeyance" by the computer, without my knowledge *or the bank's*. Nobody knew, because the machine, not being reasonable, didn't figure it was supposed to tell anybody. It didn't. After a month, it turned out, the computer had decided (according to program) to release me back into this world; but it then made a second silly mistake; it didn't tell the bank what it had done, nor that the bank should please resume sending me monthly statements.

So after three months of no statements and a brace of mysteriously uncredited deposits of cash (I went right on depositing and withdrawing all this time



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and nobody said boo), I went in and made a fuss. Was the computer's face red. So was the bank's.

P.S. I'm still getting no statements. They must need a new model.

Feb. 32nd?

Then there was this New Jersey computer that got is programme mixed and didn't know how to think it out. Reminds me of my brother who as an advanced schoolboy and ready for college still couldn't recite the months of the year in the right order. It was a subject that simply didn't interest him. You can lead a horse to water. . . .

Well, this N.J. computer was the same, or its master was. The machine didn't know about the months. And yet somebody, with callous disregard of its lack of a primary education, put it in a responsible executive position. Terrible.

One fine month, recently, it sent out a million or so (well, thousands) of driver's licence renewal applications, all of which announced that the owner's license was about to expire on November 31. The Motor Vehicle people didn't have an inkling, natch, until some irate human computers called in (via automated dialing) to complain. Or just to guffaw.

I do love computers, I really do. Also people. But people (that is, some people) have better checks and balances than

some computers, and I say that it's still a good idea to use them once in awhile in positions requiring responsive thinking of the human sort.

3. Gray-Flannel Speakers

By the way—I like sound-alike speakers (see AUDIO ETC Dec. 1964).

Some of my good readers got the erroneous impression that because I compared them to so many look-alike impersonal Madison-Avenue executives, I disapproved of their sound. Oh no. Not at all.

I won't venture any opinion as to whether Madison Avenue people should or shouldn't wear gray-flannel suits but, if you did by any chance misunderstand me, I must state in no uncertain terms (imagine having to!) that loudspeakers should sound alike.

That is, unless we aim to deny that there is only one hi-fi god, old Hi-Fi himself, that impersonal ideal of scientific perfection. I'm all for lots of gods when it comes to the matter of taste—say, in recording techniques, liveness. And I can take a lot of assorted distortion when it comes to a working compromise with absolute perfection since, as is well enough known, the human mind and its ears are very good at masking one sort of sound in order to appreciate another which they particularly like. (A tiny, insufficient speaker can make a fine im-



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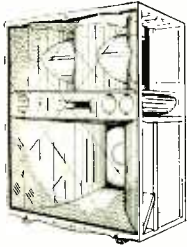
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pression if you put it in an excellent listening place.)

BUT as far as sheer transduction is concerned, the passing along of a given sound-signal, its translation into acoustic motion, I admit only one standard, as don't we all. And by that idealistic standard, all speakers should be "sound-transparent"—pass on the electrical signal with NO change whatsoever in wave-shape, etc. None at all. That's the hi-fi ideal.

So you see, natch, I like sound-alike speakers. And on sheer principle I disapprove of all speaker "color," of whatever sort. But a lot of people still enjoy those colors. And so, since I also like people, I have an indulgent feeling about individually colored speakers. They fill a need! (But I still think they're on the way out, by simple popular preference.)

All clear?

Æ

TAPE GUIDE

(from page 34)

The Right Stepup Transformers

Q. I am using two ribbon microphones and stepup transformers to feed my stereo tape recorder, but cannot get enough gain without placing the mikes unduly close to the instruments to be recorded. Pianos especially lose their tonal balance and produce key thumps at this close distance. Can you suggest any modifications in the system that will provide more gain?

A. It may be that the stepup transformers are not just right for your particular microphones. I suggest that you consult the microphone manufacturer, informing him what transformers you are using and asking if you could do better. It may be necessary for you to purchase an active microphone mixer that provides gain.

Tape Head Gap

Q. I have a tape machine that uses separate heads for recording and playback. However, both heads are of the same type with a gap width of 0.17 mil. Assuming that the electronics is capable of matching the impedance of a different record head, would there be an advantage in replacing the 0.17 mil record head with a wider one, say 0.5 mil? Is there an optimum width for recording and a different optimum for playback?

A. In terms of microinches, heads built specifically for recording usually have a gap between 250 and 1,000 microinches. Those for playback or record-playback have a gap between about 40 or 50 and 150 microinches. Your heads, with gaps of 170 microinches, appear to fall between the two categories. A narrow gap

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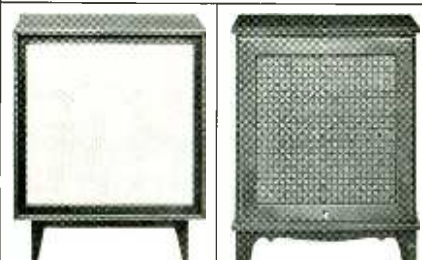
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is requisite for high-frequency response in playback. To maintain playback response to 15,000 cps, the gap should be about 250 microinches at 7.5 ips and about 125 microinches at 3.75 ips. A relatively wide gap is desirable in recording, because the narrower the gap the less efficient is the head. In other words, the narrow gap tends to act as a short circuit. The less efficient the record head, the harder the record electronics has to work to supply the necessary amounts of bias and signal current. If your record electronics has ample driving power at low distortion, I don't see that you have much to gain by changing your present record head.

Crossfield Recording

Q. I have read of a new recording technique referred to as the crossfield system. Can you enlighten me about it?

A. The crossfield head is a development of the Research Institute of the Illinois Institute of Technology, Chicago, Illinois. The development is over 10 years old. As embodied in at least one well-known tape recorder, an extra head

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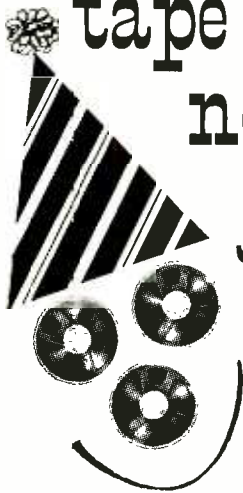
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is mounted opposite the record head and applies bias from the base side of the tape rather than from the oxide side. It is claimed that bias current so applied maintains its benefits so far as increasing output and decreasing distortion are concerned, but results in less high-frequency loss due to "bias erase." For further information I suggest that you write to the Research Institute.

Head Impedance

Q. I am trying to match my tape deck with suitable tape electronics. The electronics which I am considering purchasing is not recommended for low-impedance heads. I don't know the impedance of the head in my deck, which is a record-playback head. Can you advise me?

A. If the head in your tape deck is of the record-playback type, it is high impedance, and the electronics whose purchase you are contemplating should be suitable. At the same time you should keep in mind that in matching tape electronics to tape heads you have the problems of correctly adjusting the amounts of audio signal and bias current supplied to the record head, and of adjusting the record level indicator to give the proper indication.

Lowered Bias Frequency

Q. I have noticed that in a particular brand of tape recorder the bias frequency has been reduced from 100 kc to 65 kc. Why do you suppose this was done? Doesn't the reduction leave something to be desired?

A. The reduced frequency probably permits more efficient operation of the erase head. The higher the frequency of the oscillator current fed to the erase head, the greater are the capacitive and inductive losses of this head. Hence the oscillator has to work harder for a given degree of erasure, resulting in greater oscillator distortion and greater recording noise. A bias frequency of 65 kc is still apt to be high enough to avoid audible beats between audio harmonics and the bias signal. Of course, higher frequencies provide greater assurance against such beats.

EQPT. PROF.

(from page 48)

tables available. We have talked about this table in the past so we will forego discussing it in detail. But it certainly is an excellent start to any record playing system. It is fitted with an Elac STS 222 cartridge which we have also discussed previously.

What is left then is the amplifier-control center. We received our unit minus speaker systems, although Benjamin informs us that they are available. (Model

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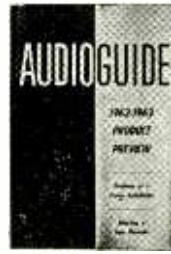
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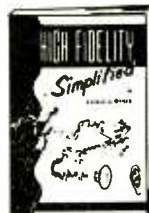
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The performance of the Benjamin Stereo 200 is quite surprising considering the rather modest price of the system. Frequency response was within 1 db from 20 to 30,000 cps. Power bandwidth at 1 per cent harmonic distortion was 30 to 18,000 cps. Power output (rms) into a 10-ohm load, just before clipping, was as follows (plus distortion at specific frequencies):

frequency (cps)	output (watts)	dist. (%)
20	3.6	
30	6.4	
50	7.0	
70	8.1	
100	8.1	0.55
300	10.0	
500	10.0	
700	10.0	
1000	10.0	0.28
3000	9.2	
5000	10.0	
7000	10.0	
10,000	9.0	0.58
13,000	7.2	
15,000	6.7	
20,000	4.4	

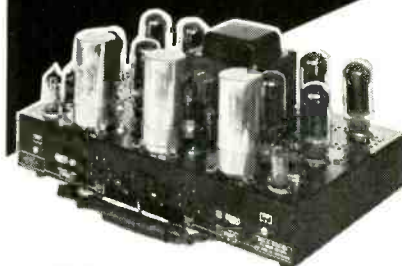
Intermodulation distortion using 60 and 7000 cps tones mixed 4 to 1, and at an equivalent sine wave power of 10 watts, into a 10-ohm load, was 1.2 per cent. The auxiliary inputs require 200 mv to drive the amplifier to 10-watt output with the 10-ohm load. Hum level was 72 db below 10 watts.

Listening tests revealed a solid performer, well able to handle a wide variety of music recorded. Within its power and design limitations it is an excellent music reproducer. Its beautiful and compact packaging should make it very desirable for the record collector with limited space and budget. Circle 224

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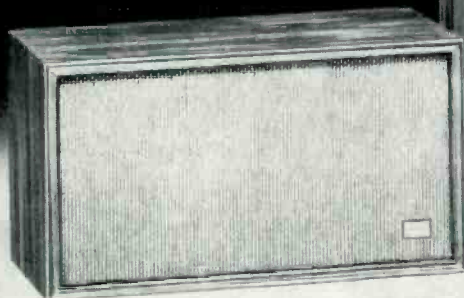
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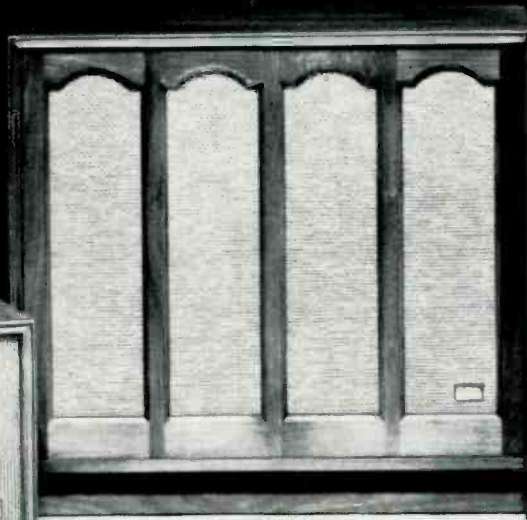
December, 1963

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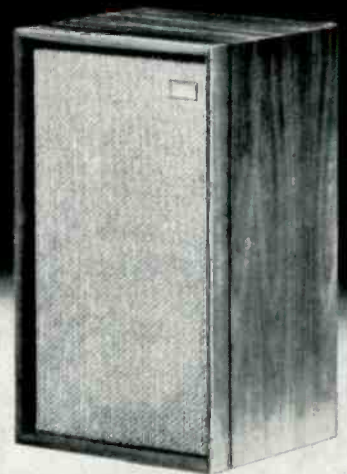
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