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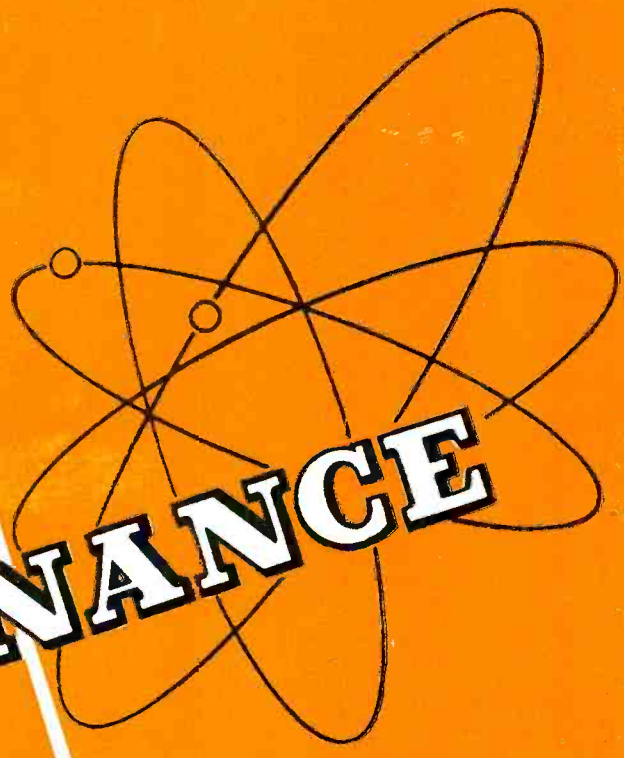

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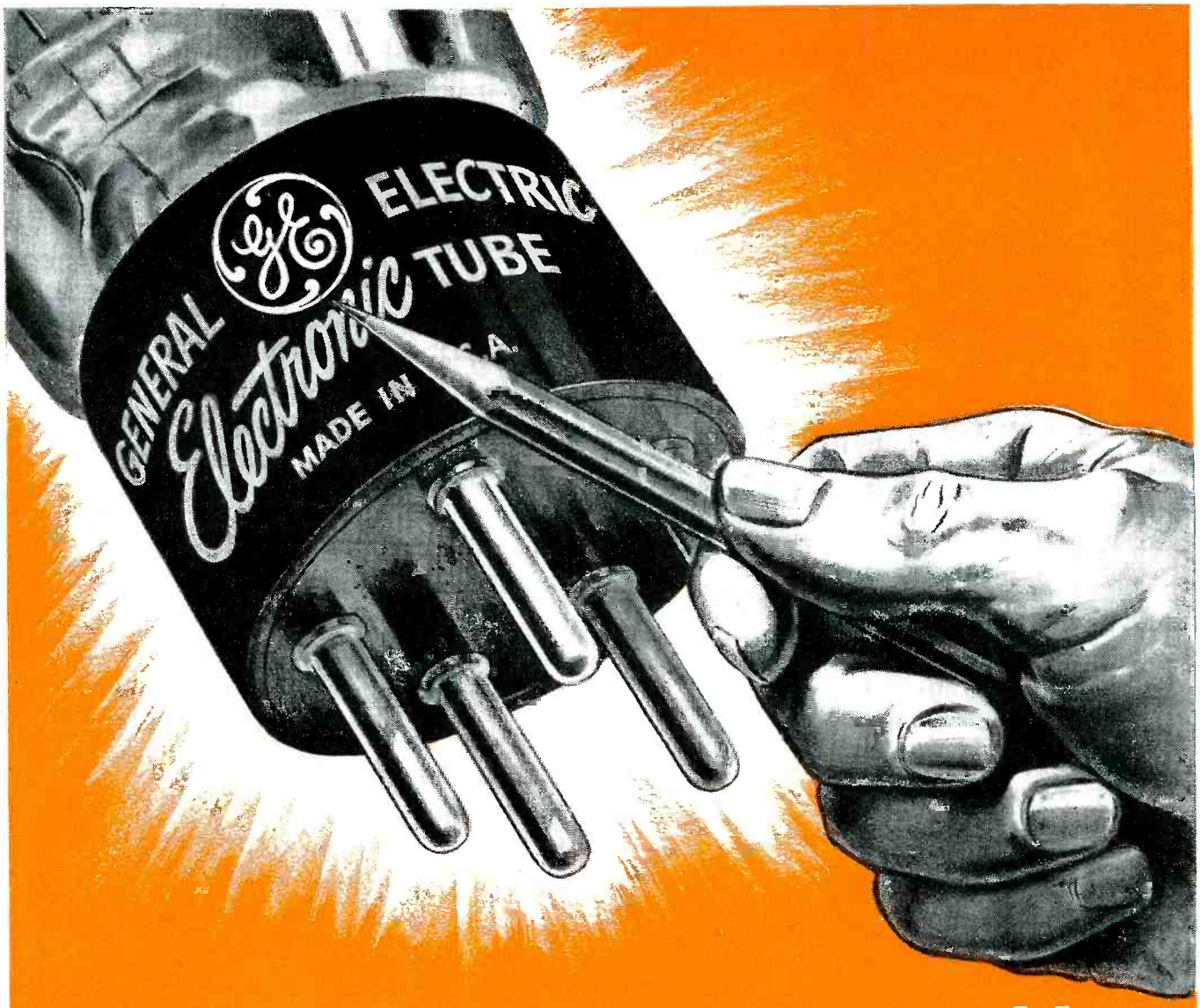

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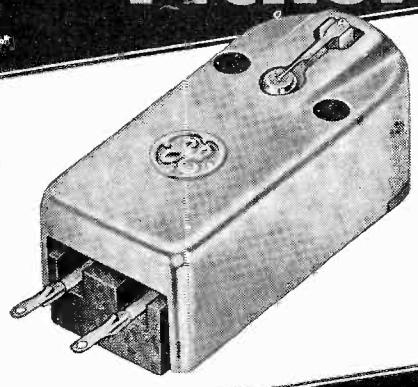

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RADIO MAINTENANCE

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Volume 4 MARCH 1948 Number 3

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Radio Maintenance is published monthly by Boland & Boyce, Inc., at 34 No. Crystal St., East Stroudsburg, Pa., U.S.A.; Executive and Editorial Office, 460 Bloomfield Ave., Montclair, N. J. Subscription Rates: In U. S., Mexico, South and Central America, and U. S. possessions, $3.00 for 1 year, $5.00 for two years, single copies 35 cents; in Canada, $3.50 for 1 year, $6.00 for 2 years, single copies 40 cents; in British Empire, $4.00 for 1 year, $7.00 for 2 years, single copies 50 cents; all other foreign countries, $5.00 for 1 year.

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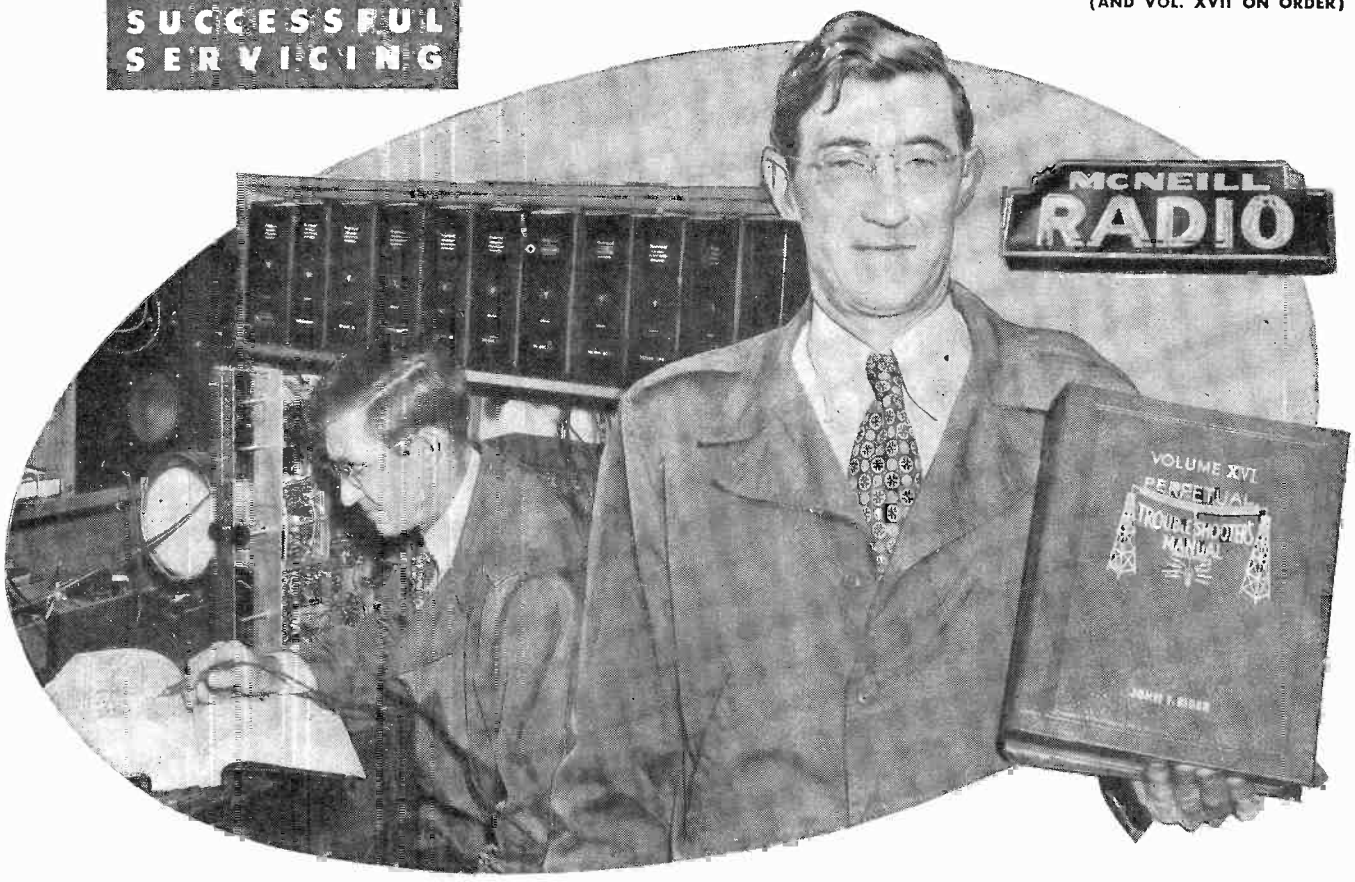

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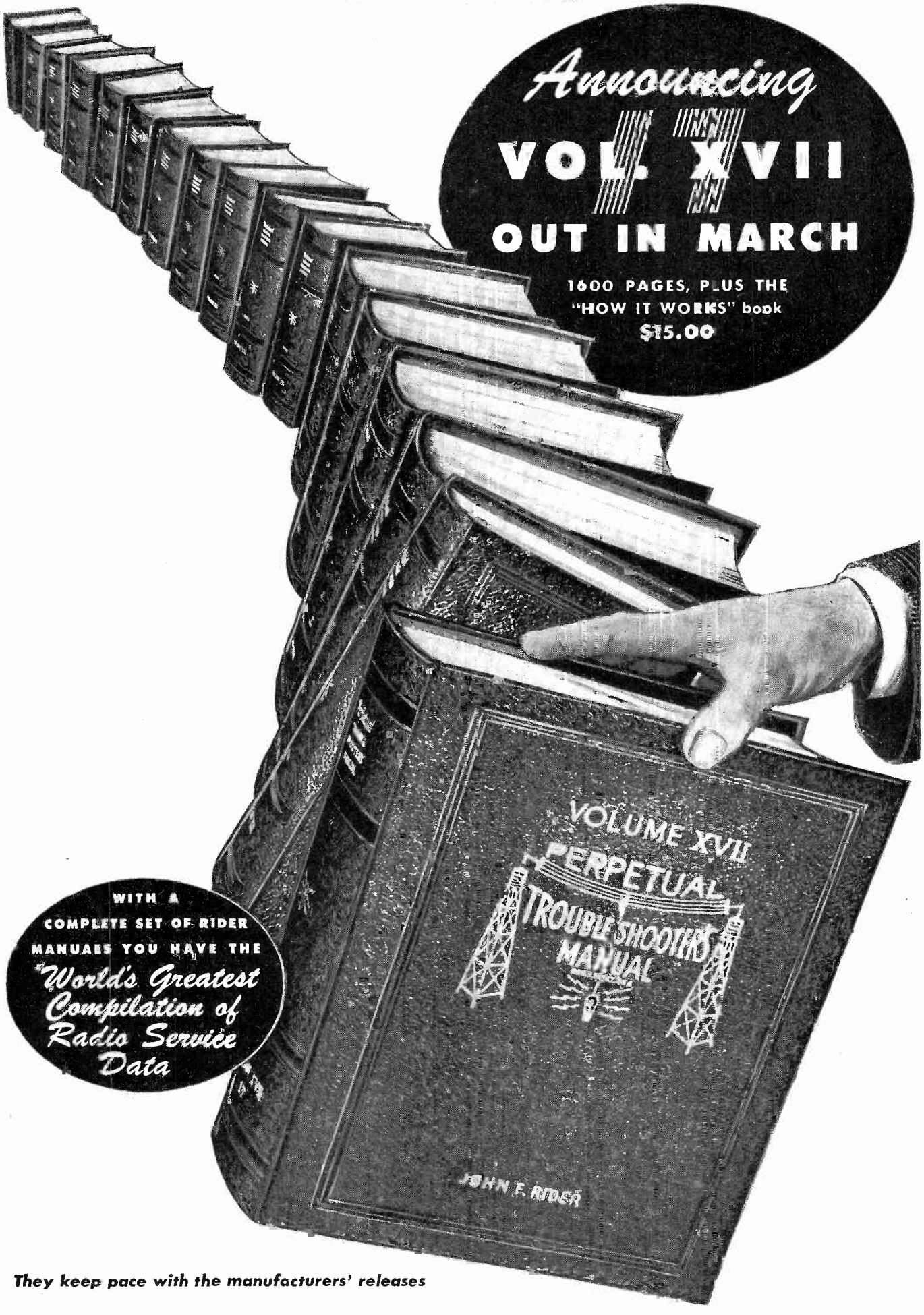

They keep pace with the manufacturers' releases

How to Eliminate Hum

K. E. Stewart

You can send the receivers right back—it's better to eliminate all the hum first and add more customers to your list.

EVER since AC sets replaced the old battery jobs, hum has been an important source of trouble to the serviceman. Usually it can be traced in a matter of time. But time means money and the best way to save it is to review the latest information and methods of attack. Important sources of hum in receivers and how to combat them are considered in the following article.

Filter Condensers

When there is undue hum present in a receiver, it is the usual procedure first to check the filter condensers in the power supply. These can usually be tested for low capacitance by temporarily connecting another condenser of low capacitance (8 mfds. is a good size to use) across each condenser respectively. (See Fig. 1.) In some cases, however, the added capacitance of the test condenser will reduce the hum, although the condenser under test is in perfect condition. In such a case the serviceman may be tempted to install a larger filter condenser in order to eliminate, or reduce, the hum. This is bad policy, and is not to be recommended for the conscientious repairman. If it has been determined that the filter condensers are OK, then the correct procedure would be to determine what condition exists that is responsible for the undue hum: The receiver was designed to operate with the condenser values that were installed at the factory. The chances are good that the hum level is not too high with these values when everything else is OK. There are some AC-DC sets appearing on the market today, however, which have a considerable amount of AC hum. Very often a simple alteration or two in the circuit will help matters a great deal.

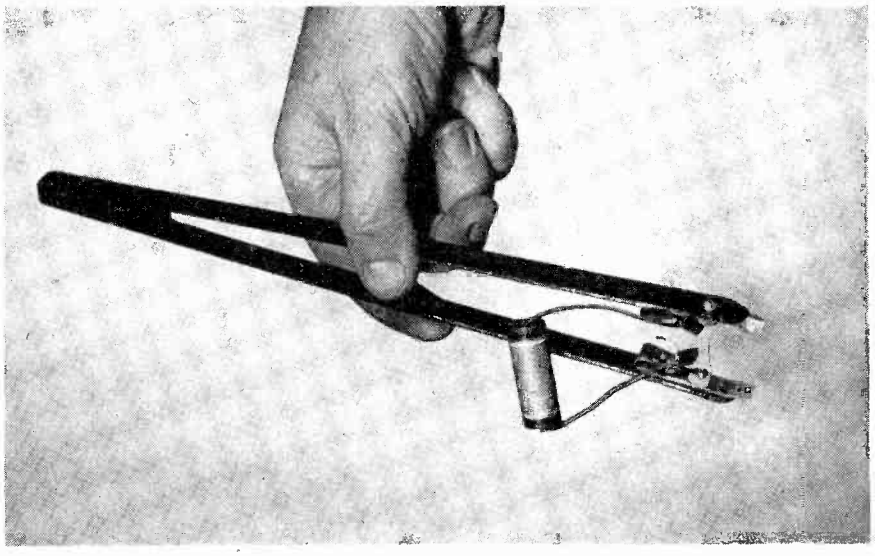

Fig. 1 Condensers can be checked for low capacity by bridging with one known to be good.

AC-DC Sets

Most of these AC-DC hummers feature a P-M type speaker and a simple RC filter in the power supply. Either condenser may range from fifteen to fifty mfds., with the resistor (there is usually only one in the filter circuit) ranging from 500 to 3000 ohms. This is usually a condenser input pi type of filter; see Fig. (2). By adding another resistor and condenser (Fig. (3)) and converting this into a double pi filter, a material improvement can often be effected. We must bear in mind the fact that by adding resistance in the circuit we will reduce the DC voltage output of the power supply. Therefore it may become necessary in some cases to replace the resistor already in the circuit with one of lower value when add-

ing another RC section to the filter. In a particularly stubborn case, one can sometimes help matters considerably (when space permits) by substituting a filter choke for the resistor in the filter circuit. This will also increase the voltage output of the power supply, because of the lower resistance offered by the choke. The result is increased volume from the set. The writer's experience with these hummers has proved that only a few have any cathode by-pass condenser in the output stage. The output cathode condenser may be removed from any AC-DC set using one, resulting in a material reduction of hum; but there will also be a material reduction of bass response and volume available from the set when this is done. The serviceman must decide which, in the particular case, is the lesser of the two evils. A condition which sometimes exists is that of a long unshielded grid lead, in the AF amplifier circuit, with one end connected to the volume control. Any stray hum voltage which is induced in this lead will, of course, be amplified by the audio stages and reproduced by the speaker. Such a condition can be remedied by dressing the grid lead away from adjoining leads or parts. In one portable model, the writer corrected the trouble by taking this lead around over the top side of the chassis. In most cases, however, the lead will have to be shielded. It often pays to replace the original lead with a shielded mike cable, grounding the shielding at one point.

Some AC-DC sets use a voltage doubler system in the power supply. Two of the electrolytic condensers in these power supplies are connected with the negative end of one connected to the positive end of the other, see Fig. (5). It is essential that these two condensers be of the same capacity. If there is any material difference between these two capacitances, the DC voltage output will not be the same for the two halves of the AC cycle of the line voltage. This causes a ripple, or hum voltage to be generated. If one of these condensers is found to be defective, it is advisable to replace them both, unless the receiver is new. By the way, should either of these two condensers become open, there will be no DC voltage output from the power supply.

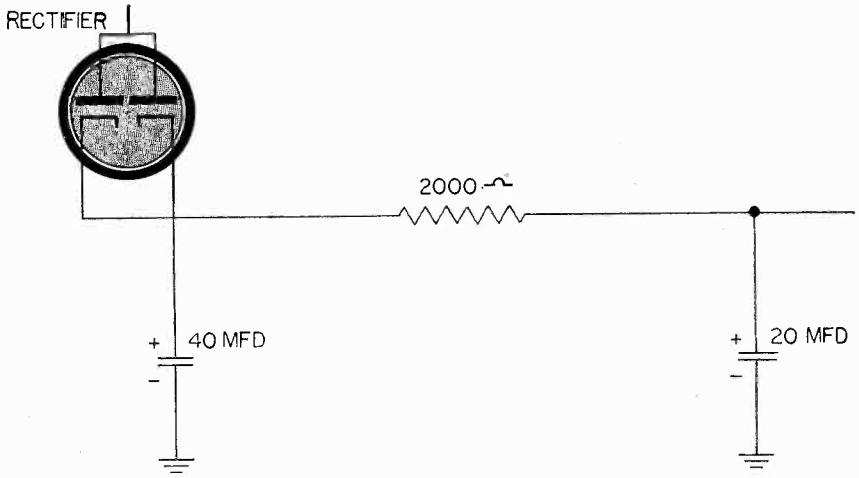

Fig. 2 RC filter of the simple pi type.

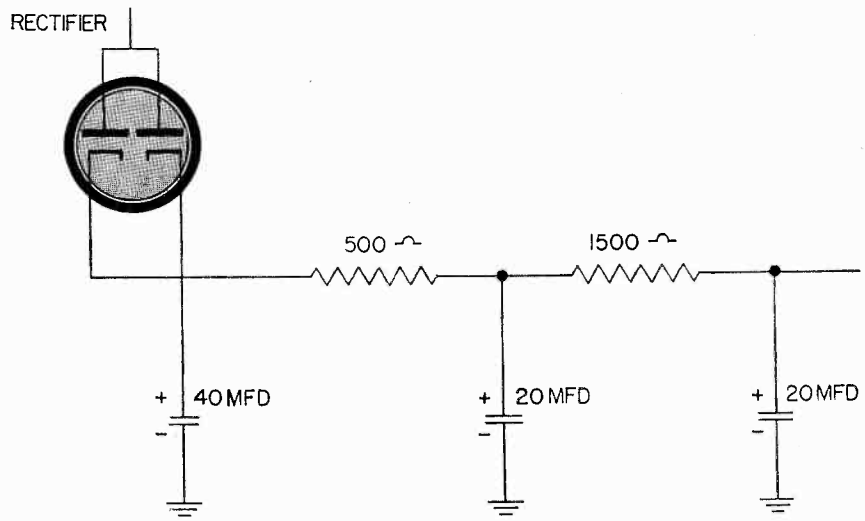

Fig. 3 Double pi type of RC filter. RC filters are often found in the less expensive AC-DC receivers.

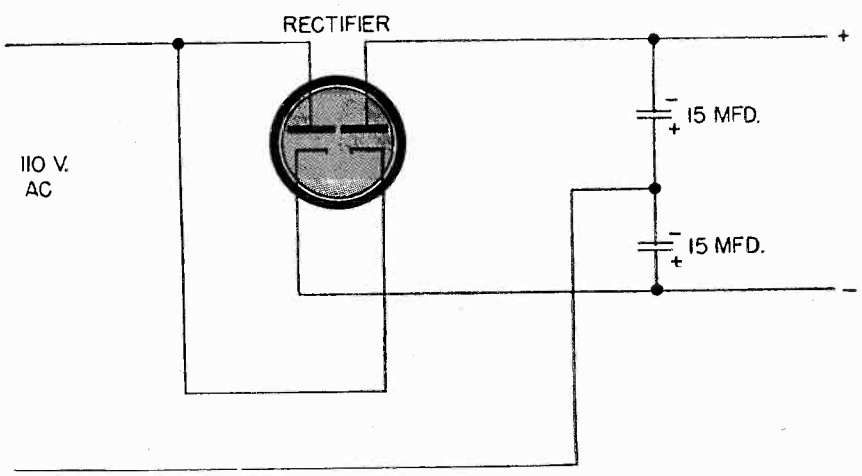

Fig. 5 Typical voltage doubler circuit.

Hum Bucking Coil

Many present day receivers don't use a hum bucking coil in the speaker, as there is wide use of P-M (permanent magnet) speakers. Nevertheless there are a great many that have electrodynamic type speakers

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USING SWEEP GENERATORS FOR FM ALIGNMENT

PART II

By McMurdo Silver

Part II of a complete description of visual alignment procedure by an authority in the field

IN PART I of this series we discussed the theory of FM alignment and the characteristics of the signal generators used. Next we logically proceed to the actual operations involved in the alignment procedure.

To align an FM IF amplifier, connect a good, high-resistance VTVM such as "VOMAX," ground to the grounded end of first limiter grid resistor, "Plus" to the joint between this resistor and last IF transformer secondary. Set meter FUNCTION switch to DC—, RANGE to 12 volts. Connect signal generator output terminals, ground to receiver B— (ground in all but AC/DC receivers), "high" terminal to receiver's mixer tube grid. Mute the receiver oscillator by temporarily shortcircuiting the oscillator tuning condenser. If AVC is present, temporarily short main AVC load resistor to ground. Using an unmodulated AM signal from the generator at specified center-frequency for the IF amplifier being aligned, adjust all IF transformer trimmers for maximum output meter reading. Don't touch discriminator transformer trimmers. Adjust signal generator output controls as may be necessary to yield about 10 volts reading on VTVM when all IF trimmers are aligned for greatest output. (It may be necessary temporarily to open the receiver's mixer grid circuit so the RF transformer secondary connected between grid and ground will not "short" the generator test signal.)

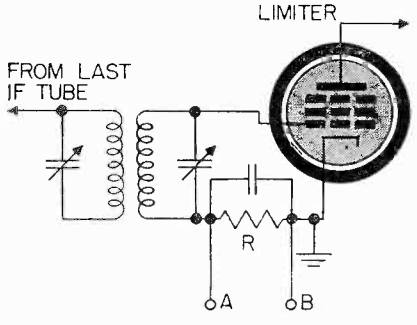


Fig. 1 Schematic of a typical limiter stage. The VTVM is connected to points A and B (across grid resistor R) during alignment.

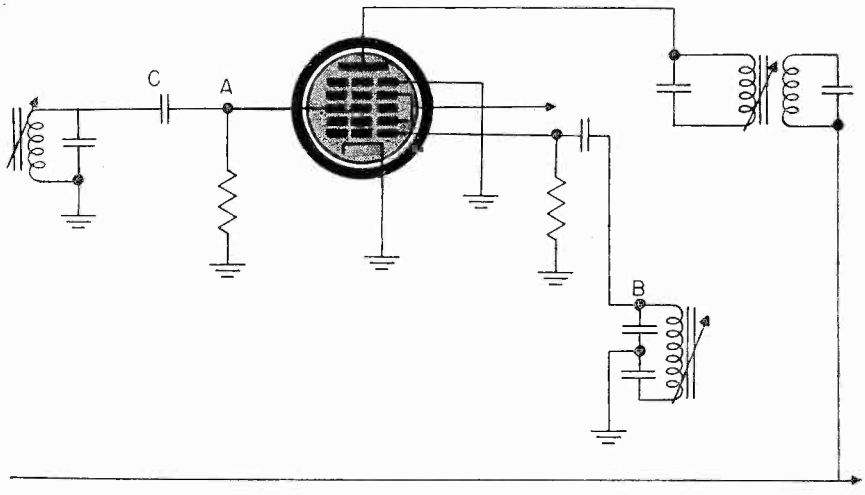


Fig. 2 Diagram of a converter circuit using 6SB7-Y tube. The signal generator is applied between point A and ground as described in the text. In this case condenser C prevents too much shunting through the coil. A short from point B to ground or across the coil disables the oscillator. It is also desirable to short the AVC lead to ground during alignment.

Restore the receiver oscillator to operation by removing the "short" across its tuning condenser section used for IF alignment, restore the mixer grid circuit to original connections, shift the signal generator output over to receiver antenna binding posts. Adjust RF, mixer and oscillator trimmers in accordance with the manufacturer's test instructions to yield about 10 volts on the VTVM at specified radio frequencies by returning signal generator to same. Reduce signal generator output as the RF circuits are aligned. Keep limiter output at about 10 volts.

Receiver sensitivity may now be determined as the unmodulated signal generator output in microvolts required to bring the output meter reading just up to a value which does not appreciably increase with increase in signal generator output. This is the number of microvolts of signal required for full limiting, and should substantially agree with the set manufacturer's specification thereof.

Had the receiver being aligned employed a ratio detector and no limiter, then the VTVM would have been connected across the single ratio detector load resistor if one were used (between ground and the ungrounded ratio detector diode cathode). It would usually be necessary to disconnect temporarily the large-capacity condenser (if of more than a few thousand mmfd.) from across the ratio detector load

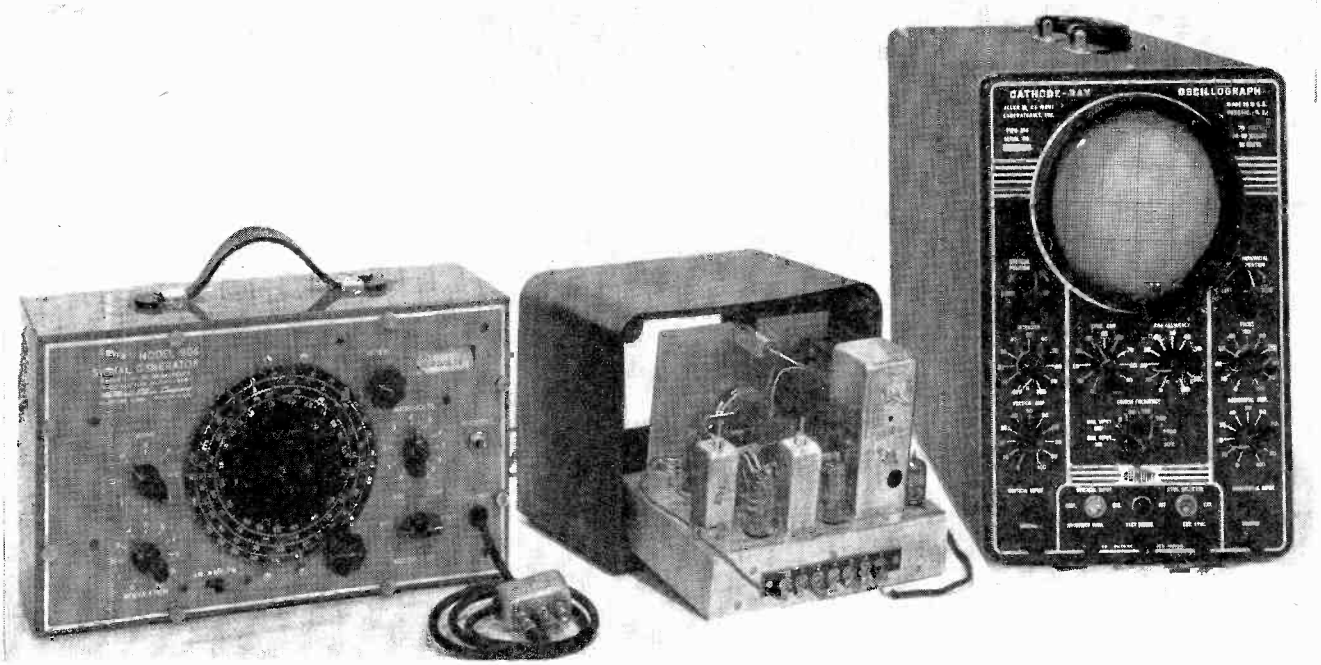


Fig. 4 A typical FM alignment setup. The Silver 906 generator and a Dumont oscilloscope are shown prepared to align a "Pilotuner."

resistor. In RF alignment of the ratio detector, sensitivity of the receiver would be determined by microvolts input required to yield one or two volts of rectified signal voltage on the VTVM shunting the ratio detector load resistor. Alignment would have involved adjustment of the ratio detector primary trimmer as well as of the IF transformer trimmers—but *not* of detector transformer secondary trimmer.

Visual Alignment of IF

If the VTVM now be disconnected from the limiter grid resistor, and the oscilloscope vertical amplifier be connected thereto instead (by a shielded cable), ground to ground, oscilloscope "high" to the joint of the limiter grid resistor and last IF transformer secondary (or scope across ratio detector load resistor, as above), visual alignment may be effected. For IF alignment, reconnect the signal generator between the mixer grid circuit (temporarily opened in receiver, as above) and B—. Set generator to FM output, and set dial to frequency which, beat against the known frequency (40 mc for the Silver 906) of the generator's fixed-frequency oscillator, yields the desired output frequency. Set generator "sweep" or modulation control to yield about 500 kc sweep. Set the oscilloscope frequency controls to one third of the power line frequency, and very slightly adjust signal generator dial about the desired output frequency setting until three selectivity curves (as in Fig. 5) appear on the oscilloscope screen. "Stop" the picture on the oscilloscope screen by adjustment of the "fine frequency" control, having first set the 'scope "coarse" frequency control to the range including the power frequency. Readjust signal generator frequency until the length of the two horizontal lines connecting the three "upside-down" selectivity curves of Fig. 5 are of equal length. *Don't change signal generator frequency from this setting until the IF and discriminator (or ratio detector secondary) alignment is completed.*

Now the IF trimmers may be adjusted for maximum depth (amplitude) of the curves and maximum symmetry thereof. It is better, however, to set the oscilloscope frequency control to double power line frequency, which will yield the picture of Fig. 6. Here two traces only of the selectivity curve are superimposed on each other, one reversed from the other. Adjust signal generator frequency to bring them as closely, one over the other, as possible. Then touch up IF trimmers (and the primary of the ratio detector transformer only, if present) for exact similarity of curve noses. Skirts may separate slightly as they ascend to the base line on the oscilloscope screen, but noses must be identical and symmetrical, side by side. "Pips," or extreme dissymetry in curve shapes can be caused by misalignment or by regeneration. Short, shielded leads from generator and oscilloscope to receiver will minimize regeneration. If present, it must be "shot" by conventional means.

Detector Visual Alignment

Circuit-wise, the discriminator

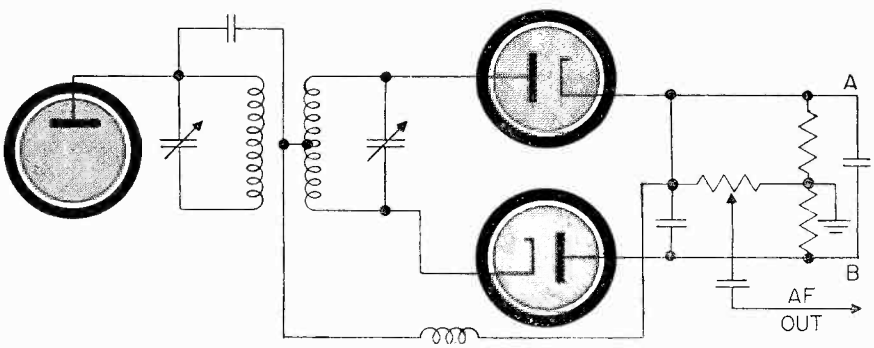


Fig. 3 Schematic diagram of a ratio detector. The VTVM is connected to points A and B.

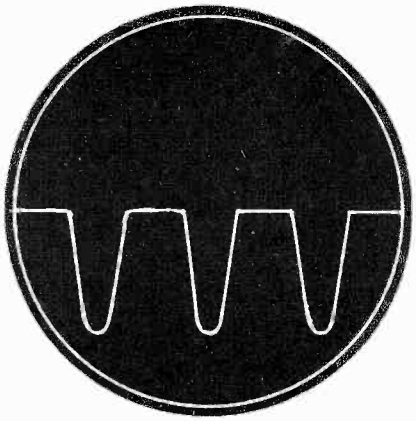
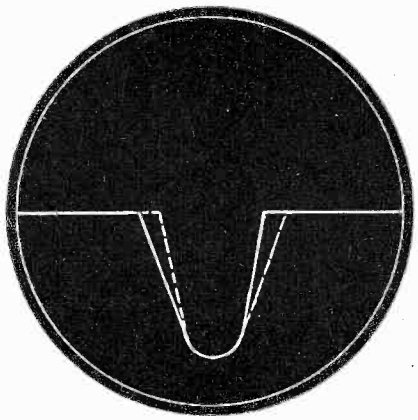


Fig. 5 Oscilloscope pattern obtained when the ratio of the oscilloscope sweep frequency to the sweep frefrequency of the generator is 2/3.



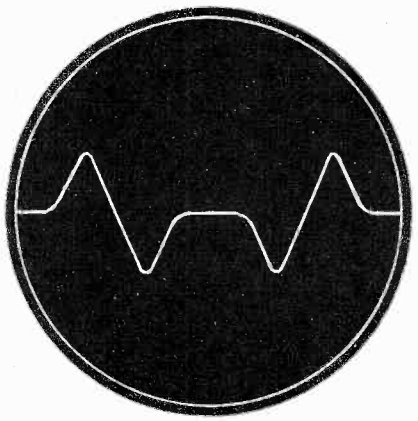


Fig. 6 Left: IF trace obtained by setting the oscilloscope to twice the power line frequency. Right: discriminator curves, 'scope at power frequency.

and the ratio detector look quite similar. The similarity ends here, however. Both operate to convert changes in frequency caused by transmitter modulation back to amplitude variations in voltage. The discriminator does only this, while the ratio detector also simultaneously erases any amplitude modulation such as noise accompanying the signal. Thus in one dual diode the ratio detector does the job of a pentode limiter tube and a dual diode discriminator.

Alignment of either type of FM detector for proper symmetry is almost impossible in practical servicing except via the visual route.

With signal generator and oscilloscope connected as we left them above while performing the visual IF alignment check and touch-up, the oscilloscope only has its connecnections shifted from across the limiter grid resistor to across the discriminator load resistors. Without touching the signal generator frequency setting, set the oscilloscope fine frequency control to power line frequency to "stop" the two S-curves of Fig. 6 (right) upon the screen. After looking at what two traces, reversed one from the other, of a discriminator S-curve look like, shift oscilloscope fine frequency control to twice power line frequency to stop the same two curves, but now laid one over the other upon the screen as in Fig. 7. Adjust the discriminator primary trimmer for maximum height and depth of the total of four curve peaks above and below the horizontal base-line. Adjust the discriminator secondary trimmer so that the cross-over of the two diagonal lines at the center of the curve is exactly on line with the horizontal base-line at each side of it. (Adjust secondary trimmer for maximum symmetry of the picture of Fig. 7, in other words.)

To establish correct S-curve and symmetry thereof for a ratio detector involves adjustment of the ratio detector secondary trimmer only—since we adjusted its primary trimmer in IF alignment. Two types of ratio detector circuits are in use. In one type a single diode load resistor is found having one end grounded. In the second type there are two diode load resistors connected in series, with their center-tap grounded. For either receiver connect oscilloscope vertical amplifier from ground to "audio take-off point" (to joint of "low" terminal of ratio detector transformer tertiary winding where it is by-passed to ground). If a VTVM is used with a single resistor circuit, temporarily bridge this load resistor with two equal fixed resistors whose sum is five to ten times the resistance of the receiver load resistor.

Before doing this, however, and with signal generator set for center-frequency unmodulated output, note upon the VTVM connected across the ratio detector load resistor the exact rectified signal voltage measured there. Adjust signal generator output to make this about 1½ volts. Having done so, connect a 1½ volt dry battery across the ratio detector load resistor (minus to ground or diode plate, plus to ungrounded diode cathode) to stabilize the rectified signal voltage during S-curve adjustment. Now set up signal generator and oscilloscope as instructed for discriminator alignment and simply adjust ratio detector transformer secondary trimmer for a symmetrical, "mirror-image" superimposed S-curve as in Fig. 7.

It has been found with certain ratio detectors that visual IF alignment may be effected with the os-

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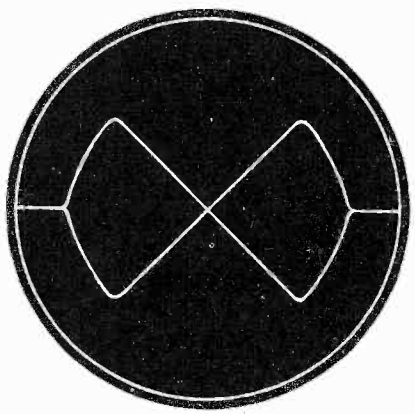


Fig. 7 When the oscilloscope fine frequency control is set for twice the power line frequency the pattern contains two discriminator curves with one laid over the other as shown

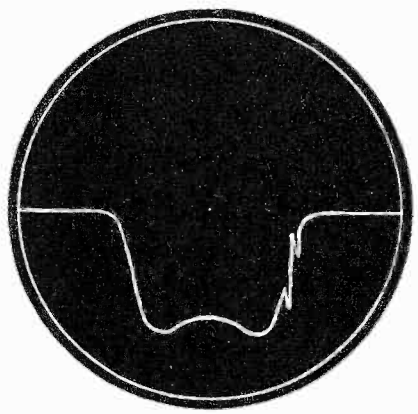
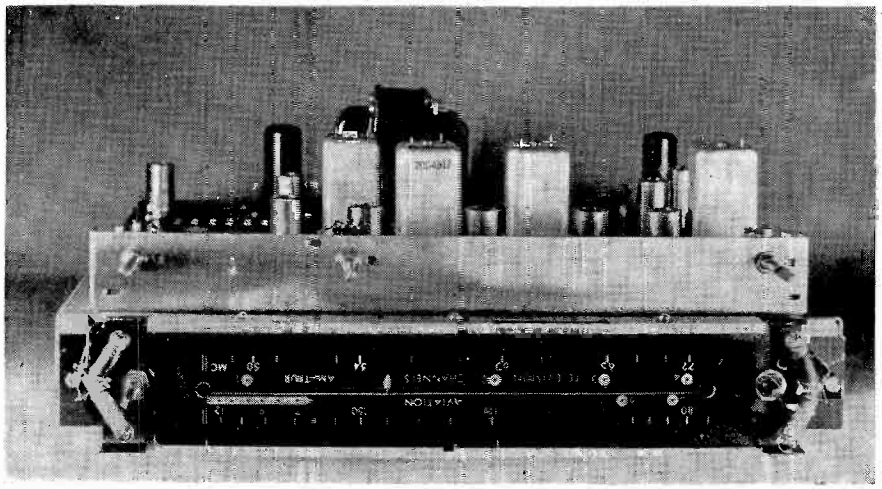
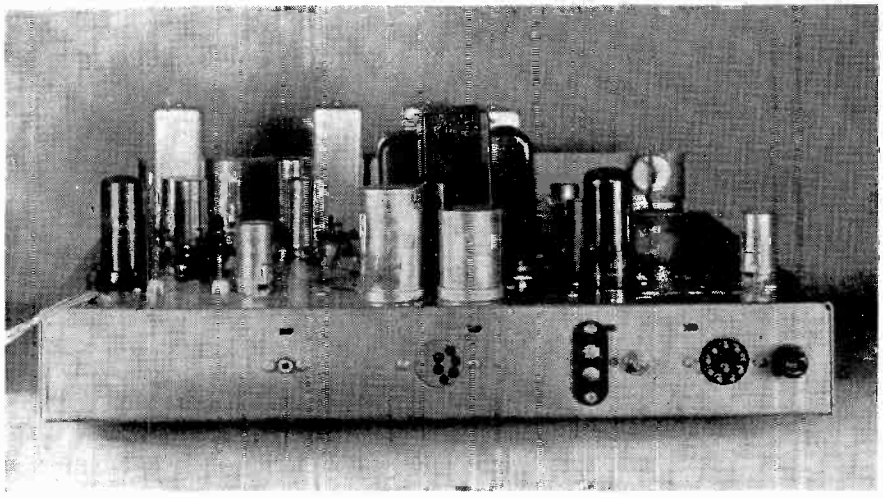


Fig. 8 How a marker shows up as a "pip" on the oscilloscope screen. The marker pip of a frequency 75 kc off the intermediate frequency should not appear further than half way up the side of the curve as shown here.



LOW-COST TELEVISION WITH THE INTERCARRIER SYSTEM

by Morton Scheraga
Allen B. Dumont Labs.



You may be seeing this system in many television receivers soon.

Television receiver manufacturers are constantly striving to make their equipment simpler and less expensive. As more and more people are able to buy television receivers, the importance of television to the serviceman increases. More sets mean more potential repair and maintenance jobs. An interesting development is now proposed which may bring television into many more homes in the future. Although it is not yet being used, it may point a way to greater production of less expensive television receivers. This method is known as the "inter-carrier" system. Fig. 1 compares the conventional and "intercarrier" systems. The conventional system splits the IF into sound and video sections right after the mixer circuit. The IF carriers are then detected and amplified separately.

The bottom diagram of Fig. 10 illustrates the intercarrier system. The actions in this system are as follows:

1. Incoming television signal is heterodyned as usual, producing sound and video IF carriers.

2. Combination of sound and video IF carriers is amplified as a unit in the IF amplifier.

3. Video signal is detected and amplified as usual. It is then fed to the CR tube.

4. The video IF carrier and the sound IF carrier *mix* at the second detector and produce a 4.5 mc beat carrier. This beat carrier has the 25 kc FM deviation of the sound signal.

5. This 4.5 mc FM beat is amplified in the video amplifier. It is

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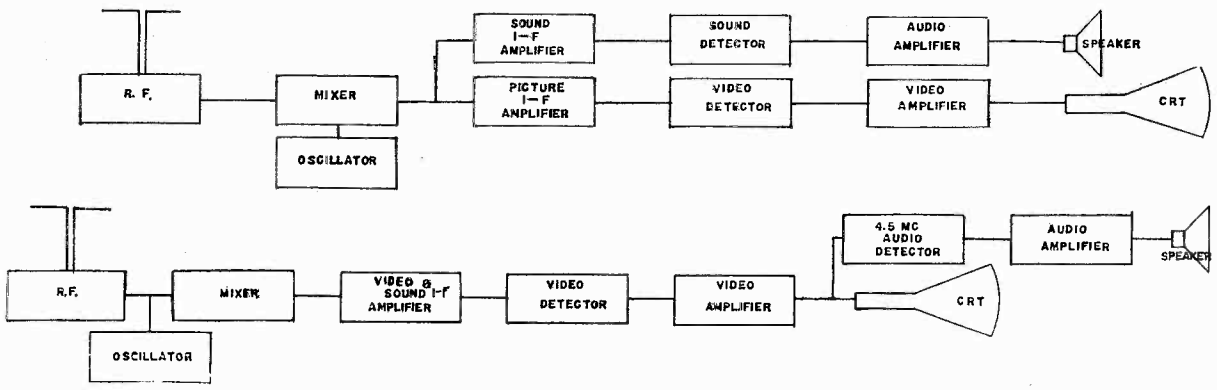

Fig. 1 Block diagrams showing difference between the conventional arrangement and the "intercarrier" system. Above: conventional television receiver. Below: intercarrier receiver.

AN FM SIGNAL SOURCE

by Stanley Curtis

If you have only one FM station in your area and its on only part of the day, this frequency modulation record player will prove helpful for test and demonstration purposes.

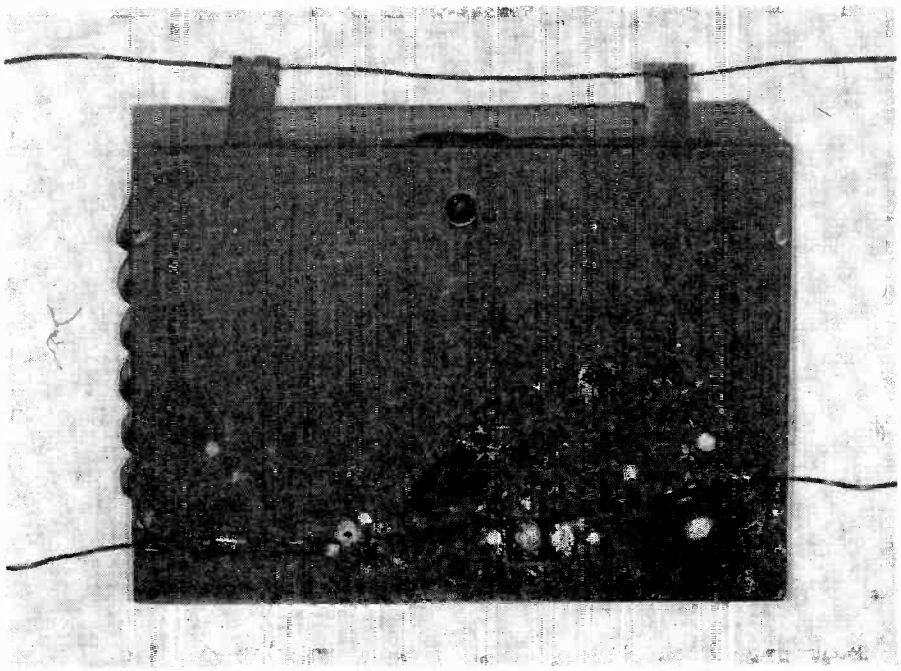

Fig. 1 External view of the frequency modulated record player. Part of the radiating loop is seen connected to the binding posts.

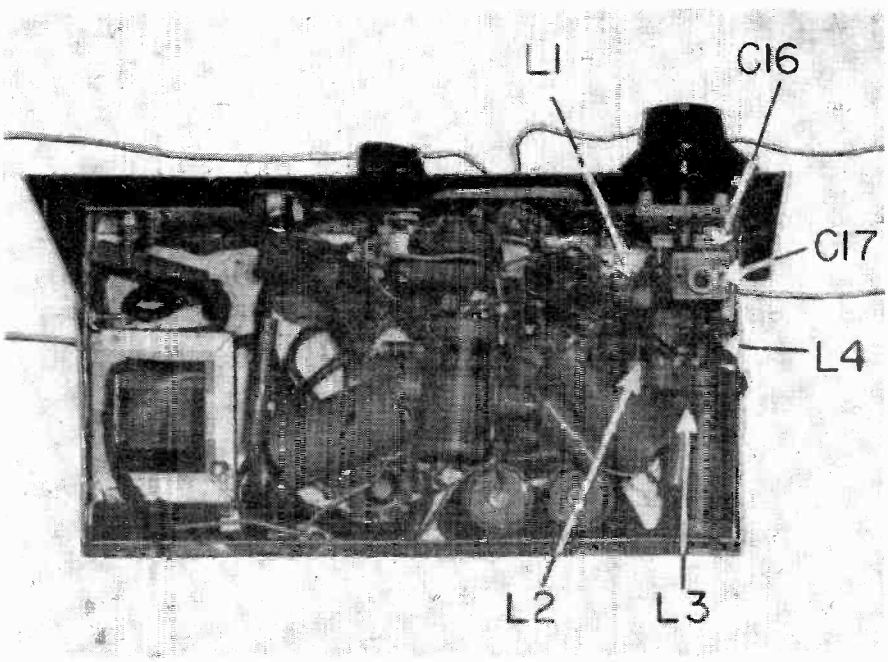

Fig. 2 Bottom view, showing the locations of the components.

WE'VE all had the same annoying experience. An FM receiver to be tested, a customer in the store wanting a demonstration of FM and the FM station not on the air.

Since FM stations have yet in most communities to prove themselves self supporting, they operate for the minimum time allowable to keep their FM licenses. This amounts to six hours a day. In the writer's home city of Utica, this happens to be from 3 P.M. to 9 P.M. daily.

When demonstrating repaired radios on the FM band or servicing FM receivers, the problem of what to do when there are no stations on the air is a serious one. Of course you can always tell the customer to come back later or wait for the hour when the FM station is on the air. It is unsatisfactory, to say the least.

An FM record player which covers the range of 88 to 108 megacycles with a fair deviation gives an adequate signal for test purposes and provides a source of FM signal for demonstrating the FM receivers.

Remember always that for demonstrating radios, the important point to be stressed to the customer is the noise reduction accomplished by the use of frequency modulation. The wide frequency range possible with FM is limited by the range of the crystal pickup used in conjunction with the FM record player and the limited range in which most recordings are made. The quality of signal possessed by the signal generator hereafter described is entirely acceptable and can be picked up by any FM receiver in your shop.

Tubes Used

A 6J5 was decided on as an oscillator because of its stability and self shielding. A 6SA7 is used as

→ To Page 14

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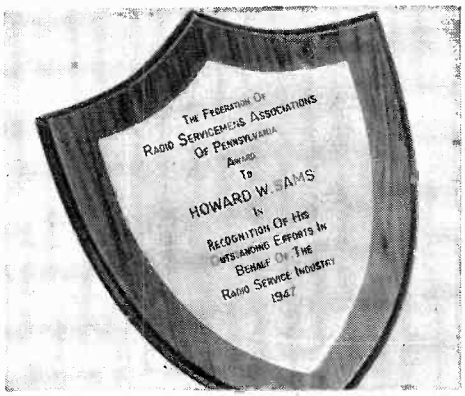

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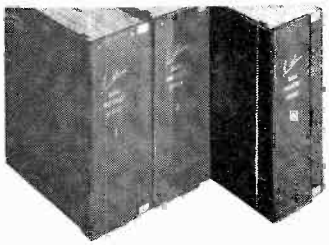

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→ From Page 12

a reactance modulator. A 6J5 is used as a straight audio amplifier to boost the output of the crystal and drive the reactance modulator. A 5Z4 is used as the rectifier. A Bud 903 metal cabinet is used to house the signal source. An AC-DC chassis provided our sub-panel. The overall dimensions then turned out to be 7 × 10 × 6 inches. Fig. 1 shows an external view.

Coils

The oscillator tank coil consists of 4 turns of No. 18 enamel wire wound with a ½ inch diameter spaced as to be ⅜ inches long. This is tapped approximately 1 turn from the bottom of the coil, or the side opposite from the antenna coil. The coil is self-supporting. It is indicated on the schematic of Fig. 3 as L4.

L5 is the antenna coil which consists of 2 turns of No. 18 enamel wire ½ inch diameter closely coupled to L4. This coil is also self-supporting.

L6 is the radiator, quarter wave, 58 inch loop, self-supporting of No. 14 enamel wire.

The three radio frequency chokes, L1, L2, and L3 are wound on ¼ inch dowels. They are respectively 22, 23 and 25 turns to avoid possible resonance or parasitic oscillation.

Other Components

C16 is a 15mmfd variable. This is your main oscillator turning condenser. C17 is a 3-30mmfd trimmer condenser. This is set only once to give the desired frequency range of 88-108mc.

The main thing to be careful of when assembling the unit is to be sure that all the filament wires are twisted to minimize hum and that all components to be grounded are grounded at the associated tube sockets. The under-chassis arrangement of parts is shown in Fig. 2.

The power supply presents no deviation from the conventional type. Adequate filtering is used in each plate and screen circuit. Don't try to eliminate any of the by-pass condensers. At the frequencies used, they are all vital.

A jeweled pilot light is incorporated to keep us from forgetting to turn the generator off. It is easy to forget when you're not testing an FM receiver.

In this unit we incorporated the switch on the deviation control for convenience. Turn on an FM receiver and slowly tune the band to determine where you hear the carrier "plop." If there is a "tuning

→ Turn to Page 28

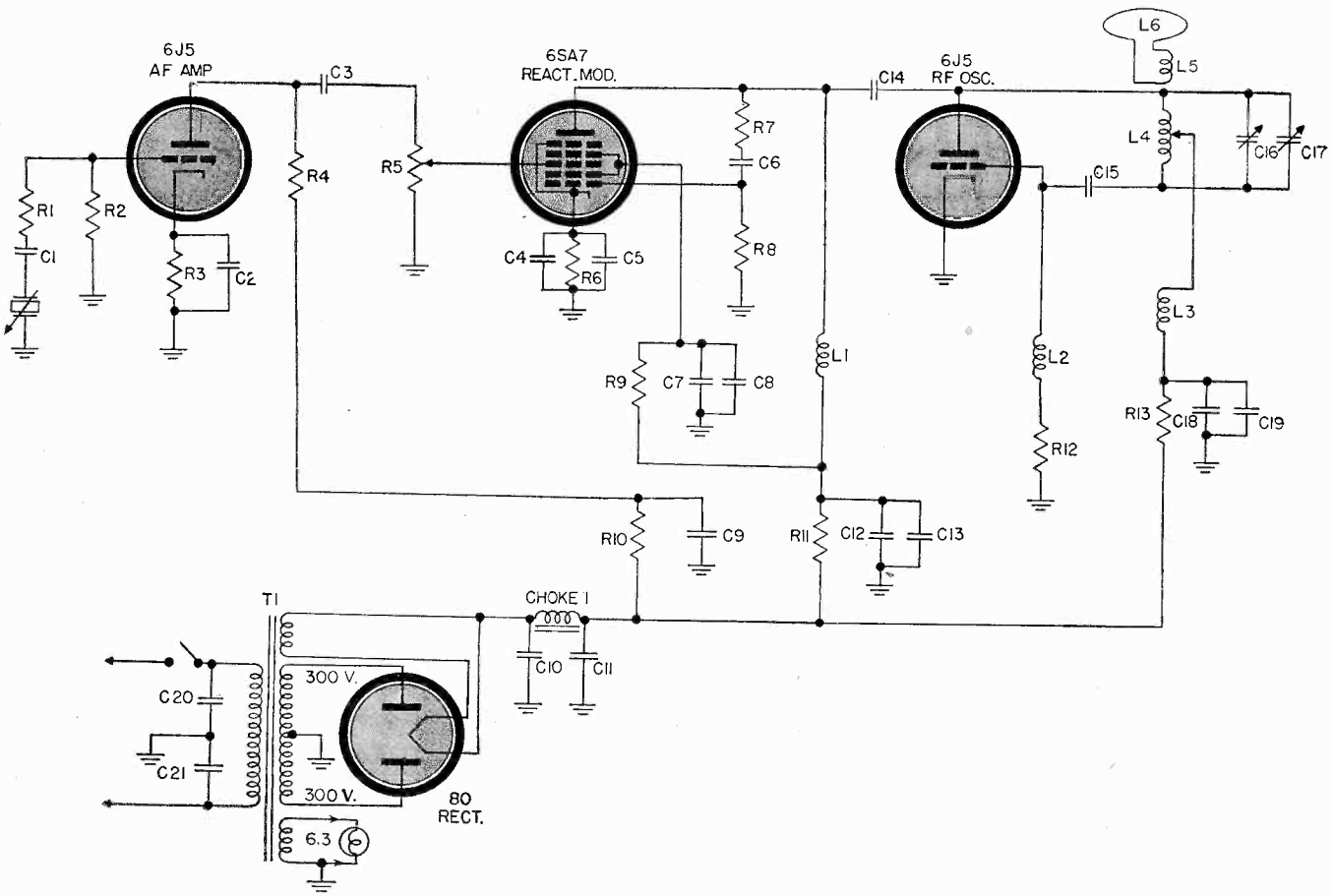
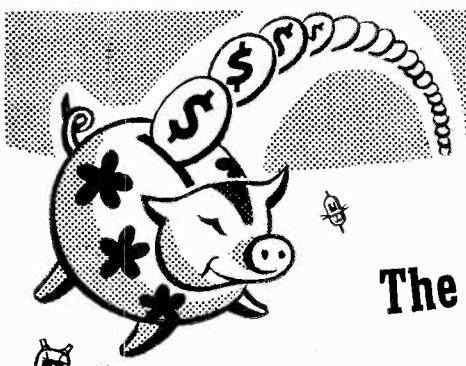


Fig. 3 Schematic diagram of the unit.

C1, C3, C20, C21—.05 mfd tubular 600 V. condenser.
C2, C4—20 mfd 25 V. electrolytic condenser.
C5, C13—.005 mfd tubular 600 V.
C6—.0002 mfd mica 600 V. condenser.
C7, C9, C10, C11, C12—12 mfd 450 V. electrolytic.
C8—.005 mfd tubular 600 V. condenser.
C14—.00025 mfd. mica 6000 V.
C15—.00005 mfd mica or ceramic condenser.
C16—15 mmfd variable.
C17—3-30 mmfd trimmer.
C18—8 mfd 450 V. electrolytic condenser.
C19—.01 mfd tubular 600 V. condenser.

L1—RFC 22 turns No. 22 en. ¼ inch dowel.
L2—RFC 23 turns No. 22 en. ¼ inch dowel.
L3—RFC 25 turns No. 22 en. ¼ inch dowel.
L4—Tank Coil. 4 turns No. 18 enamel, ½ inch spaced to ⅜ inch tapped approximately 1 turn from bottom of coil, opposite side from antenna coil.
L5—Antenna coil, 2 turns No. 18 en, ½ inch closely coupled to L4.
L6—Radiator ½ wave. 58 inch loop, self-supporting No. 14 enamel.
R1, R2—500,000 ohm ½ W.
R3—3000 ohm 1 W.

R4—100,000 ohm 1 W.
R5—500,000 ohm Potentiometer
R6—1000 ohm I W
R7, R10—50,000 ohm ½ W.
R8—250,000 ohm ½ WW.
R9, R12—5000 ohm 5 W.
R11—20,000 ohm 5 W.
o aR13—10,000 ohm 5 Wt.
V1—6J5 audio amplifier.
V2—6SA7 reactance modulator.
V3—6J5 oscillator.
T1—300-300 V. 50 MA 6.3V Trans.
Ch1—10 H. 30 MA choke.



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How to Eliminate Hum

→ From Page 7

with hum bucking. The bucking coil is wound next to one end of the field coil and connected in series with the voice coil circuit. A typical arrangement is shown in Fig. 6. The bucking coil introduces a counter hum voltage into the voice coil circuit which is out of phase with the hum voltage being introduced via the output transformer. Occasionally the hum bucking coil connections are reversed. In such a case the hum will be aided, rather than attenuated. It is not necessary to disconnect these leads to test for this condition. Just temporarily short circuit the bucking coil (this can usually be accomplished with a screw driver) and listen to the hum. If the connections are reversed, shorting will reduce the hum. On the other hand, if the coil is wired correctly, the hum will become louder when the coil connections are shorted.

Tunable Hum

In some cases an annoying hum appears when a receiver is tuned to a station carrier, then disappears when the dial is turned away from the carrier. Tunable hum may happen with either an AC-DC or a straight AC receiver. It is usually eliminated by connecting a condenser having a capacitance of from .01 to .05 mfds. across the A-C line entering the receiver power supply. It is advisable to connect one end of the condenser to the set side of the on-off switch so that the line voltage will not be applied to the condenser when the set is not in operation. A more reliable method is to use two condensers connected in series with

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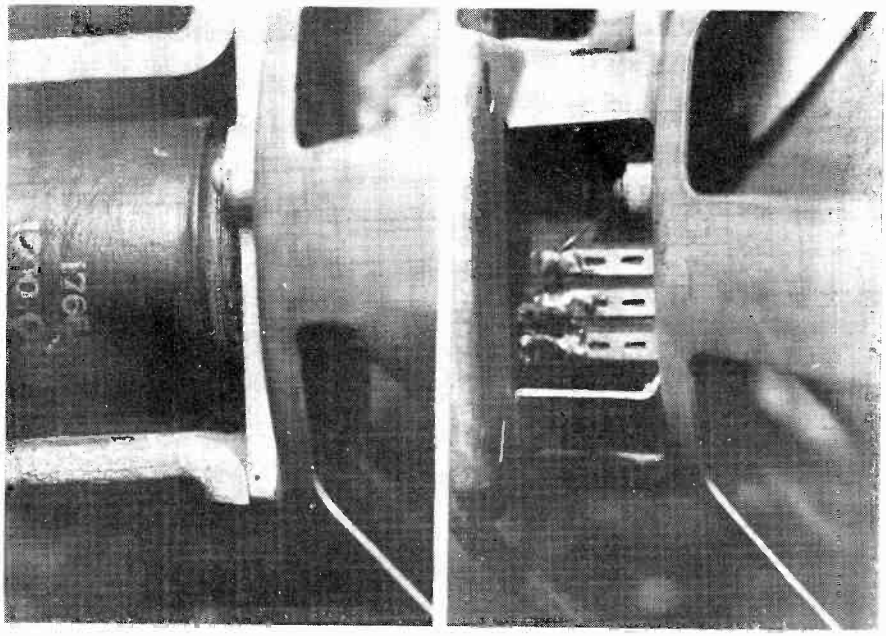

Fig. 6—Left, hum bucking coil winding on the field coil of a speaker. Right, terminals provided on the same speaker for voice coil and hum bucking coil connections. The wire on the top terminal comes from the hum bucking coil.

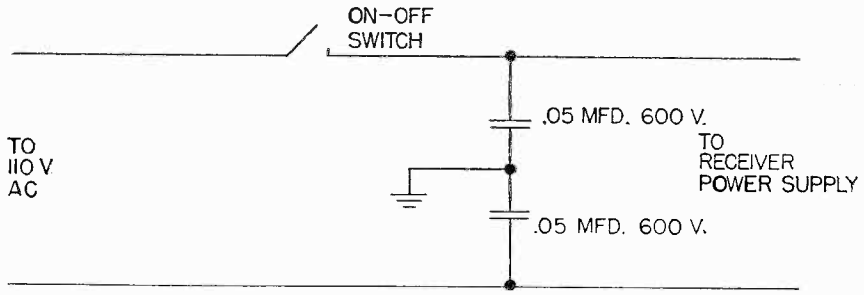

Fig. 7 How condensers may be connected across the line to reduce tunable hum.

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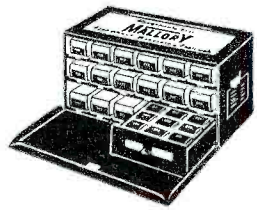

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→ From Page 16

each other, with the center connections grounded to the receiver chassis and the two outside ends connected across the line. See Fig. 7. Tunable hum can also be caused by a defective tube or a defective filter condenser.

Mutual Inductance

Once in a while a receiver using an interstage audio transformer will have hum due to stray mutual inductance between the audio transformer and the power transformer, with the chassis acting as a common core. A simple remedy is to remount the audio transformer, using brass screws and brass, or aluminum, bushings. (See Fig. 8) Where the two transformers are located extremely close together, it becomes necessary to reposition the audio transformer so as to change the relative angle between its core and that of the power transformer, or possibly to relocate it entirely. In a few cases it is found that an audio transformer is located extremely close to the speaker field coil, resulting in hum due to the mutual inductance of the two. In such a case it is better to relocate the transformer, if possible.

Miscellaneous Remedies

The filament leads should be inspected and dressed away from other leads; especially the grid leads of the audio stages. Very often a bad case of hum can be corrected in this way. Hum may also be caused by a shorted cathode by-pass condenser. In such a case, there is usually considerable distortion present, but this is not always readily detected. If there is any doubt about the condition of this condenser, one end should be disconnected so that it can be more accurately tested. A stubborn hum may sometimes be remedied by grounding the cathode condenser, the cathode resistor, and the grid resistor of each audio stage to a common point on the chassis. In many cases a leaky audio coupling condenser will be found to be the cause of excessive hum. In these cases the hum will be accompanied by distortion and loss of volume; but not always obvious enough to be readily detected by a serviceman not acquainted with the particular model in which the trouble occurs. Since

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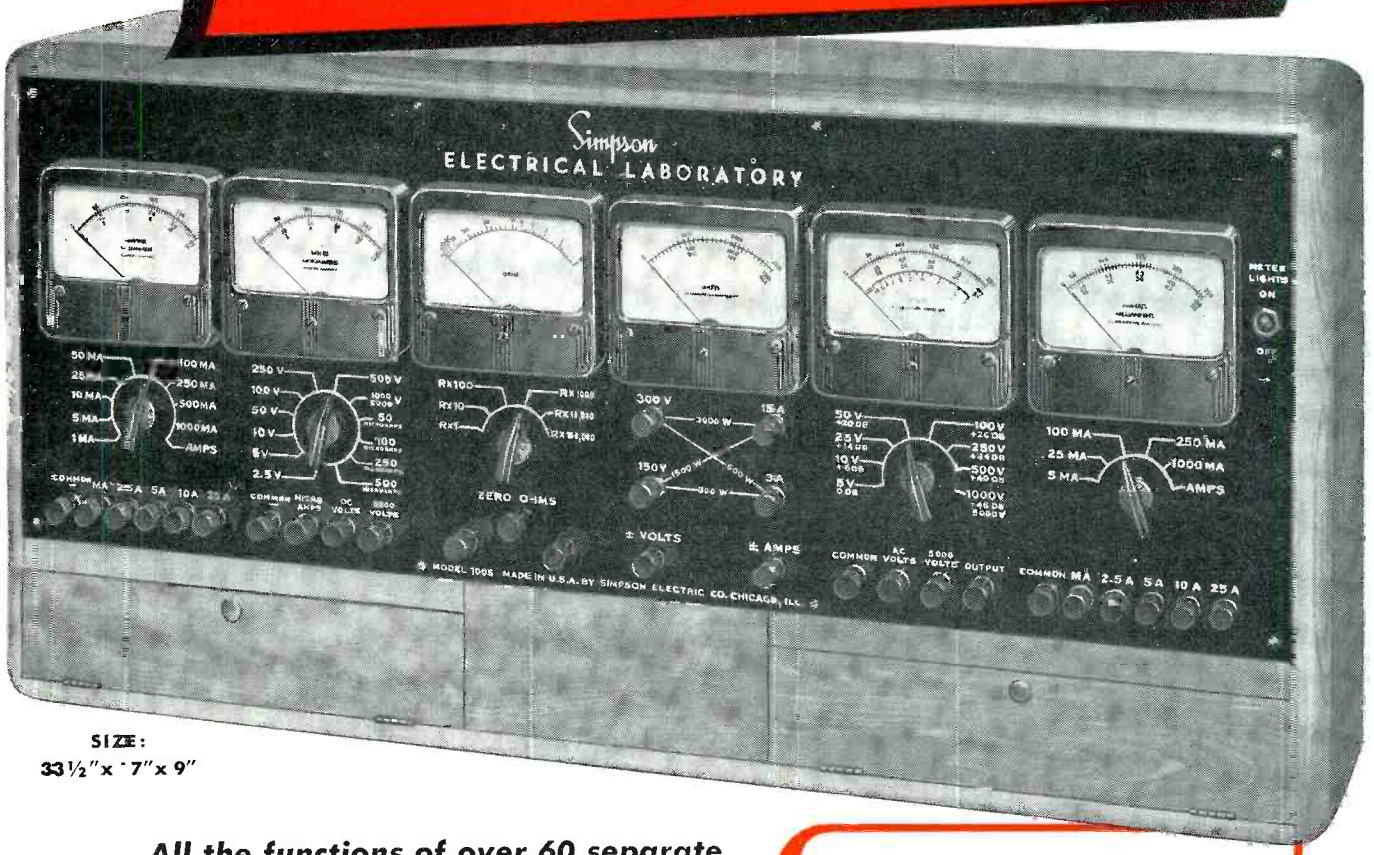

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0-500 MA. D.C.
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0-2.5 Amps. D.C.
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0-10 Amps. D.C.
0-25 Amps. D.C.

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0-5 Volts D.C.
0-10 Volts D.C.
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0-500 Volts D.C.
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0-5 Amps. A.C.
0-10 Amps. A.C.
0-25 Amps. A.C.

Simpson
INSTRUMENTS THAT STAY ACCURATE

by John T. Frye

PROBABLY all of you fellows have heard a recording of your voice, either on wax or wire. How did it sound to you? Unless yours is indeed an unusual case, the voice seemed like nothing you ever heard before; and, in spite of the insistence of your friends that "it sounds exactly like you," you could not bring yourself to admit that there was any resemblance between your own voice and that odd-sounding recording.

Since you do not recognize your own voice when you hear it, did you ever stop to wonder what kind of an impression your customers get of you when they call on the telephone? Undoubtedly a large percentage of your customer- relations are carried on by means of Mr. Bell's handy little invention. Many of your first contacts with your customers are established over the telephone. The first impression they get of you, your ability, and your business are based upon how you sound over the wire, and these first impressions are important—and lasting.

It is easy to overlook or to minimize the importance of this fact. There is something about talking over the telephone that gives a deceptive sense of anonymity, of not having to display the same courtesy and patience you would use as a matter of course in dealing with people face to face.

This is definitely a mistake. If anything, you should make an effort to be even more courteous and more patient over the telephone than you are in the presence of the customer. Then he can see you; a smile or a gesture can give an altogether different meaning to a spoken word; but when you talk to him over the telephone, he has nothing to go on except what you say and how you say it. I do not mean to imply that you are to take voice-culture lessons or attempt to be the "Voice of Charm." I simply mean that your telephone-technique should receive the same careful consideration that you give to any other facet of your business that can make either a good or bad impression on your customers.

One of the first considerations, of course, is to be understood. That is accomplished by speaking clearly and distinctly with the lips two or three inches from the mouthpiece. Do not turn your head away from the microphone while you peer out of the window or put an extra flourish on an artistic bit of doodling. Speak in an ordinary conversational tone. Neither yell nor whisper. The telephone has been carefully designed for the quiet, conversational voice, and it responds best to that manner of speaking. Do not interrupt the party on the other end of the line any more than you would if you were talking to him face to face. Listen carefully to what he says; try to grasp what he wants; and let your own conversation show that you have done both of these things.

Remember, too, that you can offend without the slightest intention of being discourteous. Quick speech often gives the impression of impatience. Monosyllabic responses sound short and discourteous to many people. I had this brought home to me when I asked some Mexicans who were teaching me Spanish why they never answered a question simply *"Si"* or *"No."* "It does not sound polite," they told me gently. "Yes" was always *"Si, cóko no?"* (Yes, why not?); and "No." with them, was softened into *"Creo que no"* (I believe not). Keeping this in mind I have tried to train myself to avoid giving single-syllable answers to questions. "I am very sorry I cannot," or, "I'm afraid that is impossible," will leave a much better impression than a flat "No," even

→ To Page 30

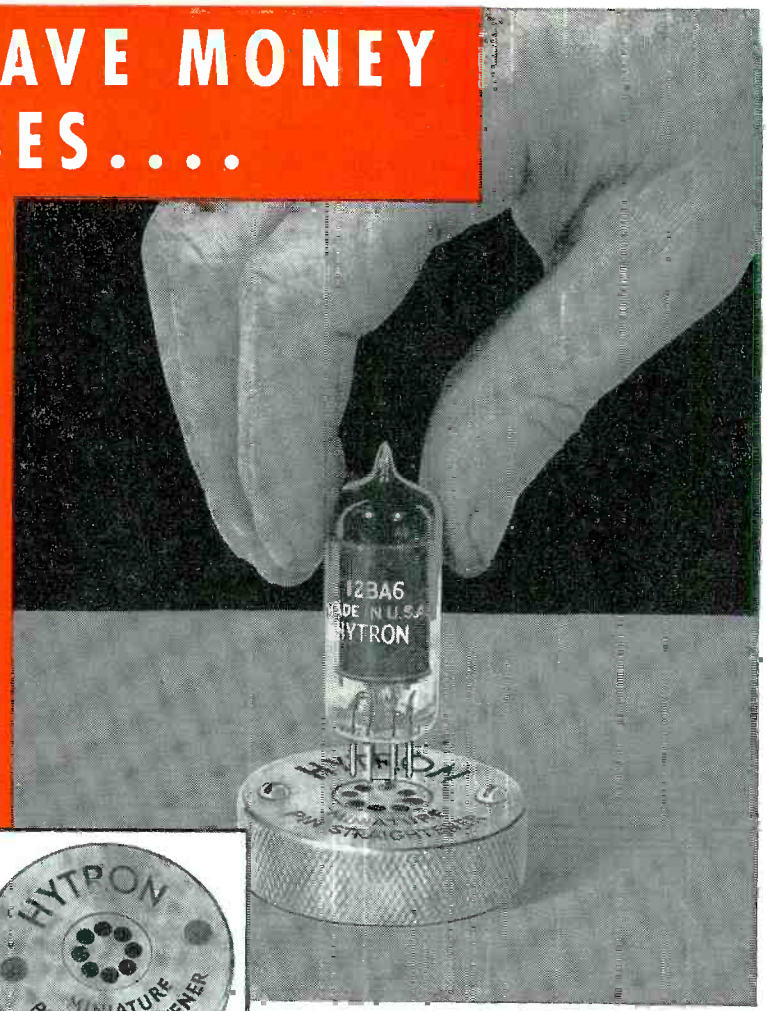
SAVE TIME — SAVE MONEY
SAVE TUBES....

With the New HYTRON Miniature Pin STRAIGHTENER

Ever cussed the pins of miniatures when they broke as you fussed to straighten them with your fingers or with long-nose pliers? Unfortunately, the pins have to be pliable to avoid cracked buttons. But you can make pin straightening easy and safe.

For only 49c — less than cost — a fraction of normal price, you can own a new Hytron Miniature Pin Straightener. You then merely press a 7-pin miniature gently into the Straightener until the button base seats squarely. Presto, the pins are straight again! Best of all, avoiding just one broken tube can pay for the Straightener twice over.

Features: precision die of wear and rust resistant steel for long life and close tolerances, production-tested, easy clean-out, adapted to hand or bench use. It's faster, cheaper, safer to use the Straightener *always* before plugging in miniatures. You need three Pin Straighteners — for bench — for field tool kit — for counter. *Available only from Hytron jobbers.* Order yours today.



ONLY 49c
AT YOUR HYTRON JOBBER'S

A PREVIEW

The Hytron Miniature Tube Pin Straightener and Handy Tube Tapper are just the beginning. Watch for more lower-than-cost Hytron tube tools designed especially for you. They will save you time — help you make more money. Follow the Hytron ads for announcements. Order the tools from your Hytron jobber.

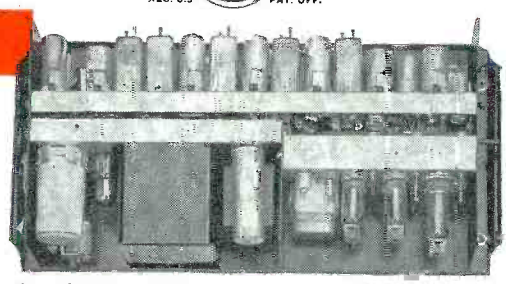
Hytron Handy Tube Tapper — novel and useful tool locates elusive intermittent "shorts" and "opens". Pencil, eraser, and tube tapper. Fits breast pocket. Compact and nonmetallic. Rugged and effective. Only 5c at your Hytron jobber's.

BENDIX RADIO
REG. U.S. PAT. OFF.

TUBES ARE KNOWN BY THE COMPANY THEY KEEP

Bendix MRT-3A, 152-162 mc f-m taxicab transmitter uses Hytron tubes generously.

Companies with top names like Bendix pick top quality components. You, too, choose the best when you ask for Hytron. Join the leaders. Specify Hytron tubes.



These service tools made available to you on a non-profit basis by both Hytron and its jobbers.

SPECIALISTS IN RADIO RECEIVING TUBES SINCE 1921

HYTRON
RADIO AND ELECTRONICS CORP.

MAIN OFFICE: SALEM, MASSACHUSETTS

How to Eliminate Hum

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this is usually a very high resistance leak, in the neighborhood of several megohms, the best way to be sure about the coupler is to disconnect one end of it and substitute in its place a condenser known to be OK. If everything else fails the hum can sometimes be effectively reduced by substituting condensers of considerably lower capacity in place of the original coupling condensers. This should be a last resort, however, since it will mean sacrificing the lower bass notes as well as some volume. The optimum value of capacitances to use will have to be determined by experiment in each case. A hum remedy is sometimes effected by installing RC isolating networks in the B plus line of one or more stages, where such networks are not always incorporated in the circuit.

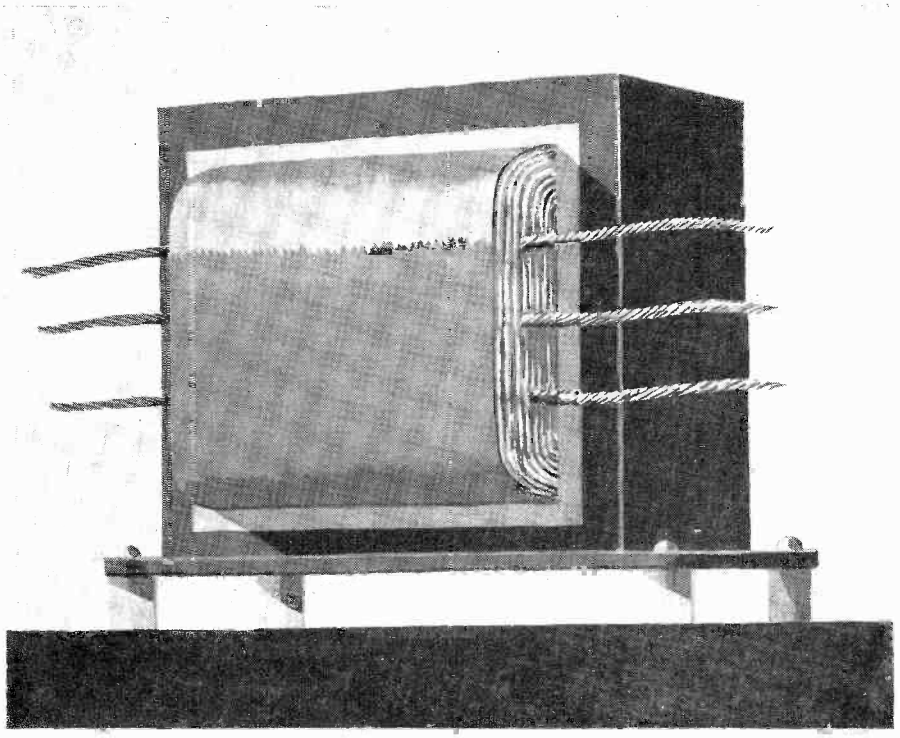


Fig. 8 Hum is sometimes caused by formation of a "common core" between audio and power transformers. This trouble can be remedied by mounting the audio transformer on brass standoffs.

Television Intercarrier System

→ From Page 11

then detected in a discriminator and passed through the AF amplifier to the speaker. These operations are illustrated in Fig. 2.

The intercarrier system thus eliminates the need for a sound IF channel. A simple circuit for separating the sound carrier from the video pass band is shown in Fig. 3. It will be remembered that the audio carrier is always fixed at 4.5 mc from the picture carrier. Thus a 4.5 mc trap, placed in the plate circuit of the video amplifier, allows separation of the sound signal from the picture signal.

The intercarrier sound receiver is less affected by oscillator drift since the sound frequencies will not normally move out of the wide video pass band. The system also makes possible lower cost television receivers at only a slight sacrifice of resolution and adjacent channel rejection. It may therefore eventually be adopted for all cheaper television sets. However, before this system can be fully employed commercially, it will be necessary to amend the standards for television transmission to insure that the video

→ To Page 36

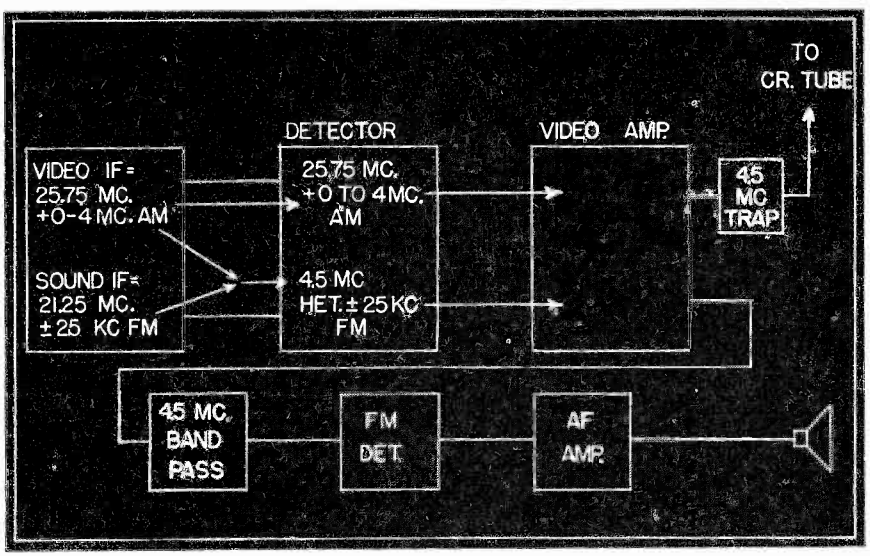


Fig. 2 Operation of the "intercarrier" television system. This system may soon allow production of low cost home receivers.

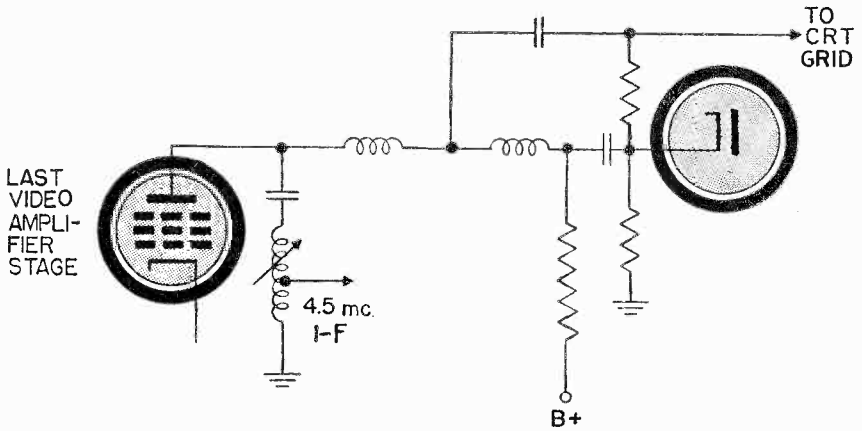
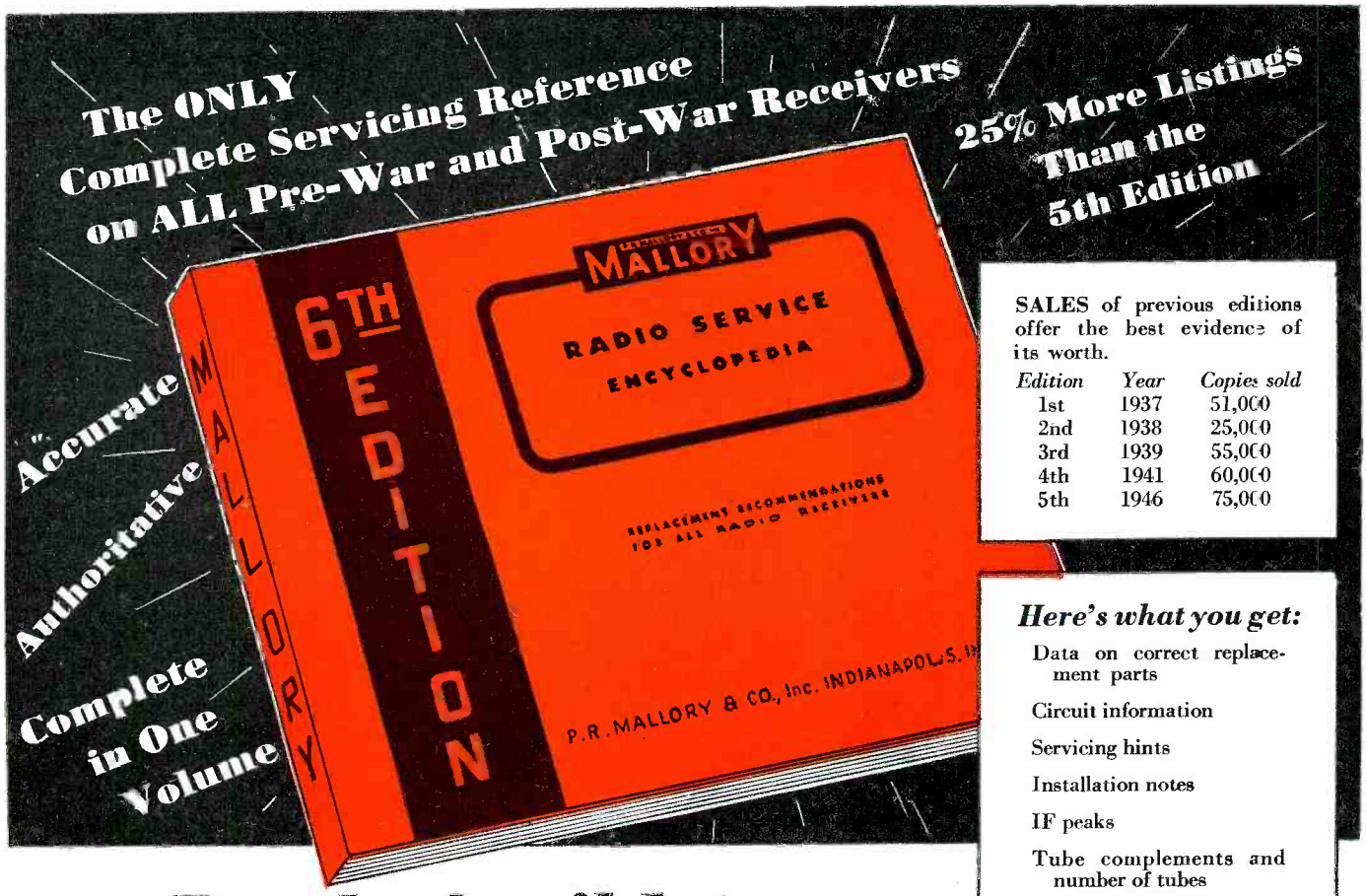


Fig. 3 Combination 4.5 mc trap and sound take-off point in intercarrier receiver.



SALES of previous editions offer the best evidence of its worth.

Edition	*Year*	*Copies sold*
1st	1937	51,000
2nd	1938	25,000
3rd	1939	55,000
4th	1941	60,000
5th	1946	75,000

Here's what you get:

- Data on correct replacement parts
- Circuit information
- Servicing hints
- Installation notes
- IF peaks
- Tube complements and number of tubes
- References to Rider, giving volume and page number

RESERVE YOUR COPY NOW

Ready April 1st—
The 6th Edition
Mallory Radio Service Encyclopedia

Here it is—up to date—the only accurate, authoritative radio service engineers guide, complete in one volume—the Mallory Radio Service Encyclopedia, 6th Edition.

Made up in the same easy-to-use form that proved so popular in the 5th Edition, it gives you the complete facts on servicing all pre-war and post-war sets . . . volume and tone controls, capacitors, and vibrators . . . circuit information, servicing hints, installation notes, IF peaks, tube complements and number of tubes . . . and in addition, cross-index to Rider by volume and page number for easy reference. NO OTHER BOOK GIVES YOU ALL THIS INFORMATION—that's why it's a MUST for every radio service engineer.

25% more listings than the 5th Edition. Our ability to supply these books is taxed to the limit. The only way of being sure that you will get *your* copy *quickly* is to order a copy today. Your Mallory Distributor will reserve one for you. The cost to you is $2.00 net. It's the buy of the year.

THE MALLORY RADIO SERVICE ENCYCLOPEDIA
Complete—Authoritative—All in One Volume

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MALLORY
CAPACITORS . . . CONTROLS . . . VIBRATORS . . .
SWITCHES . . . RESISTORS . . . RECTIFIERS . . .
VIBRAPACK* POWER SUPPLIES . . . FILTERS
*Reg. U. S. Pat. Off.
APPROVED PRECISION PRODUCTS
P. R. MALLORY & CO., Inc., INDIANAPOLIS 6, INDIANA

Sweep Generators for FM Alignment

→ From Page 10

cilloscope connected with the "audio take off" point to ground and the large bypass capacitor across the load resistor disconnected, IF coil secondary alignment for best S-curve performed immediately thereafter. A 1½ volt dry cell must be connected across the load resistor as described above.

There only needs to be added one point—the answer to the question "How do I know my curves are wide enough, but not too wide, now I've aligned circuits for symmetry?" Unless grossly improper IF and S-curves have been set up in alignment, proper pass band width may be presumed operative in any properly designed receiver. However band width can also be checked with an extra AM signal generator, of known accurate frequency calibration. Connect it in shunt with the FM generator, and adjust its output so as it is tuned a little "pip" traces across the curves seen on the oscilloscope screen. For dis-

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Are the New SPRAGUE TM's *REALLY BETTER?*

you be the judge—TRY THEM IN YOUR TOUGHEST JOBS

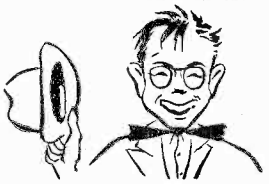
We think the new Sprague type TM *molded* paper tubular capacitors are so far ahead of any other capacitors that there just isn't any comparison.

Quite naturally, we should! Not only do we make them . . . we know *how* they are made and *why* they are better.

But don't take our word for it. If you haven't already seen and used these new units, by all means get at least a few today. Try them in your toughest jobs—auto radios that get hot and are subjected to severe mechanical shocks. Use them in portable sets and in some of those small ac-dc radios that operate at temperatures at which you normally fry eggs. Give them the kind of jobs to do that are tough on paper tubulars. Then check for performance and long life.

All we ask is that you *try* them. If you don't decide the new Sprague Molded TM's are better than any other paper tubular capacitor you have ever used, we don't want to try to convince you! We feel confident of the result because we know that *your reputation* and *your customers deserve the best!*

"PROOF POSITIVE!" by Prof. Squeegee



Professor Oswald Z. Squeegee, the man who first successfully smashed the Atom in Sprague advertising back in 1938, took time out from his secret studies to wire:

HAVE JUST COMPLETED SEVERE LABORATORY TEST OF NEW SPRAGUE TM. SOAKED IT ONE WEEK IN SALINE SOLUTION (FISH BOWL, TO BE SPECIFIC). MIXED CONTENTS INCLUDING FISH AND SPRAGUE TM WITH ONE CAN DOG FOOD. HEATED TO 85° C. FOR THREE HOURS. DOGS ATE EVERYTHING BUT MOLDED CAPACITOR, WHICH WAS TOO HARD FOR CANINE TEETH. HATS OFF TO SPRAGUE! MUST HURRY BACK TO HISTORY-SHAKING EXPERIMENTS.

PROF. SQUEEGEE

CAPACITORS

SPRAGUE

*KOOLOHM RESISTORS

*T.M. Reg. U.S. Pat. Off.

SPRAGUE PRODUCTS COMPANY, North Adams, Mass.

JOBBING DISTRIBUTING ORGANIZATION FOR PRODUCTS OF SPRAGUE ELECTRIC CO.

Sweep Generators

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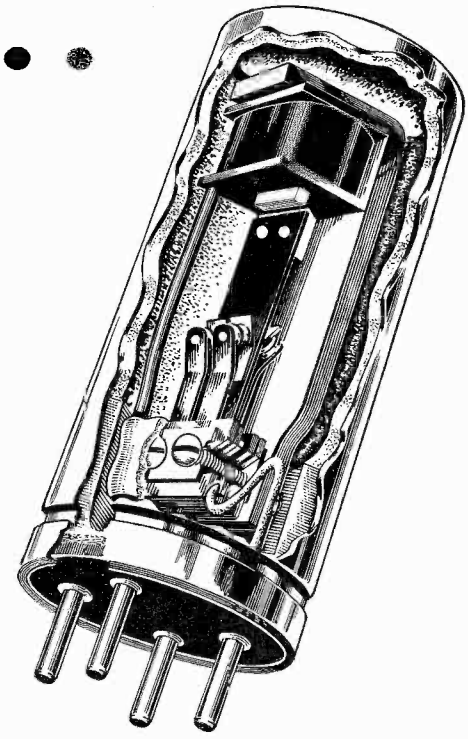
criminator with "pip" at horizontal cross-over point in Fig. 5 the signal generator shows the exact frequency of center of pass-band. The difference in signal generator frequency as it traces up to one curve peak, down to the other, shows the separation of these peaks from center frequency. This separation should be 150 to 200 kc between peaks—half this between either peak and center-frequency cross-over. If with a particular receiver, "pips" are not visible upon the discriminator S-curve, use a VTVM in place of the oscilloscope across discriminator and load resistors. Vary the unmodulated signal generator frequency and align discriminator transformer secondary to yield zero voltage at center-frequency, equal, maximum and opposite polarity voltage at points 150 to 200 kc above and below center-frequency. The same "pip" technique checks IF pass-band width. On the IF curve, points 75 kc off center-frequency should not be closer to the base-line than halfway down from curve peak. (See Fig. 8.)

It hardly seems necessary to add that with oscilloscope, and frequency-modulated signal generator connected to receiver input, it is possible to see the overall RF-IF selectivity curve of any FM receiver—to align visually RF, mixer and oscillator circuits just as one would the IF amplifier alone.

Always read and study test equipment manufacturer's instruction books. They're written to help you—*must be read and understood if satisfactory results are to be obtained.* ✓✓✓

Long Life . . . . .



As the sphinx and pyramid have withstood the ravages of time over the centuries gaining their reputation for longevity, the mighty Radiart VIBRATOR has proven itself to be long lasting even beyond its normal expected effectiveness. This quality of long life helps to make Radiart VIBRATORS outstanding and cuts to a minimum expensive duplicate installation costs. This is one of the factors that brings customers back to servicemen, satisfied and asking for Radiart by name and number. Dealers everywhere know when they sell Radiart, they sell quality. On this concept, your success and ours is assured.

STANDARD OF COMPARISON

RADIART

The Radiart Corp.

CLEVELAND 2, OHIO

FM Sig Source

→ From Page 14

eye" on the receiver, it will close when in tune with your FM carrier. If no carrier is heard, adjust C17, the 3-30mmfd trimmer paralleled with the main tuning condenser. This will bring the tuning into the band. It is then only necessary to make a finer adjustment on this trimmer to put the tuning range into the 88-108mc band.

Should any difficulty be encountered in getting the oscillator functioning, it may be necessary to shift the setting of the plate tap on L4 slightly. When we say slightly, take it literally.

Operation

Now, plug any record player of high impedance to the input jack and you will modulate the carrier with frequency modulation. R-5 is your deviation control, the 500,000 ohm potentiometer. Keep the deviation as low as possible to obtain an adequate signal.

You'll find this a useful tool to take along to a customer's house when there is a complaint of no FM reception. It can then be easily determined whether the fault lies in the antenna system. It frequently happens that folded dipoles incorporated in consoles give too weak a signal. The signal generator anywhere in the house will give adequate pickup to show if the receiver is functioning. If so, it will show the necessity of an outdoor dipole installation to bring the signal up to proper strength.

PHOTOGRAPH CREDITS

Page 11 (2)
Allen B. Dumont Labs.

FIRST *in Quality,* FIRST *in Performance*

You be the Judge! See why Centralab's Ceramic BC "Hi-Kap" Capacitors are your best buy!

"HI-KAP" FEATURES	DESCRIPTION	ADVANTAGES
1. Impervious to moisture	Ceramic-X is non-hygroscopic. Moisture absorption is .007% or less.	No deterioration, no shorting. Longer life even under the most adverse conditions.
2. Low mass weight 3. Small size 4. High capacity	Av. Wt. / Dimensions / Values .029 oz. — L—.540" D—.315" — .00005—.00025 mfd. .044 oz. — L—.830" D—.315" — .0005 mfd. .050 oz. — L—1" D—.340" — .000750—.005 mfd. .082 oz. — L—1.305" D—.400" — .01 mfd. Rating: 600 WVDC — 1000 VDC flash test.	For unit size and weight, Centralab BC "Hi-Kaps", made with Ceramic-X, are the only capacitors on the market which provide these voltage ratings.
5. Special insulation	Wax impregnated, lacquered, dipped in special phenolic resin, cured and wax impregnated.	Prevents any possibility of shorting to adjacent leads, chassis or components.
6. Convenient side leads	Heavy #22 gauge tinned copper.	Permit rapid, close-coupled connections. No tricky bending or fitting required.
7. Low power factor	Initial — .6%. After 100 hours, 95% humidity test — 3.0%.	More efficient circuit operation, fewer failures.
8. High leakage resistance	Initial — 5000 megohms. After humidity — 500 megohms.	Long life, more efficient performance.
9. Maximum dependability	One-piece construction. Leads soldered directly to electrodes.	Will not short or become intermittent.
10. Factory tested	For your protection, all units 100% factory tested before packaging and shipping.	Your guarantee to your customers of reliable service and performance.

PART NUMBER	VALUE (MFD).	LIST PRICE*
D6-500	.000050	$1.25*
D6-101	.000100	1.25*
D6-151	.000150	1.25*
D6-251	.000250	1.25*
D6-501	.000500	1.25*
D6-751	.000750	1.25*
D6-102	.001000	1.25*
D6-202	.002000	1.25*
D6-502	.005000	1.50*
D6-103	.010000	1.50*

*PER ENVELOPE OF 5

Rating: 600 WVDC — 1000 V. flash tested. Individually color coded, inspected and insulated.

All Capacitors Are Not Alike!

THAT'S why more and more Radio Service Dealers are turning to Centralab's *ceramic* by-pass and coupling capacitors for new dependability, permanence and convenient size. Compare the amazing low price at which Centralab is offering these *ceramic* capacitors, and you'll agree now's the time to give yourself and your service customers the newest and finest in capacitor components!

Note the wide range of *Hi-Kap* values available at left, and order a supply of these top quality capacitors from your Centralab Distributor today. For complete information, see your Centralab Distributor or write to *Centralab, Division of Globe-Union, Milwaukee, Wis.*

LOOK TO **Centralab** IN 1948!

First in component research that means lower costs for the electronic industry.

Over the Bench

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though the meaning is exactly the same.

You will notice that there is a great difference in the telephone techniques of different customers. Some will come directly to the point of the call with almost startling abruptness; others will beat all around the bush before stating what they want. You must be able to adapt your own way of speaking, to a degree, to that of the person with whom you are talking. With the to-the-point man, you should be able to be brisk and business-like without seeming short or discourteous. With the beater-around-the-bush, you should gently but firmly steer the conversation into the reason for the call without leaving the impression that your mind is on your soldering-iron.

Make sure that you get all necessary information before hanging up.

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LET'S REVIEW THE FACTS

on Plastic Molded Tubular Paper Capacitors

Pioneered by Sangamo

The first tubular paper capacitor to be molded in a thermo-setting plastic was introduced by Sangamo in 1946. It offered many of the same advantages available in molded mica capacitors which were also pioneered by Sangamo twenty-five years ago: better characteristics, longer life, and more dependable performance.

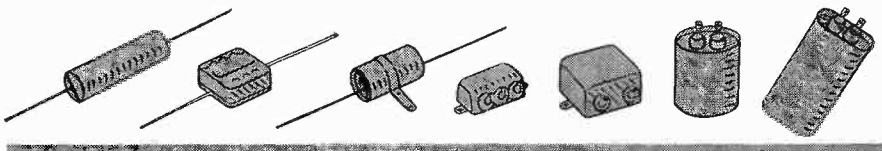
Universal Acceptance

The many advantages of Sangamo Type 30 Capacitors assure that molded tubular paper capacitors will soon be universally used in place of ordinary wax-filled paper capacitors: capacity values are permanently sealed in; no wax ends to melt out at high temperatures; and their mechanical stability has been improved so that it does away with the necessity for delicate handling. They can be used wherever ordinary paper capacitors are now used. Heat from a soldering iron will not cause wax to run . . . nothing can burn! This means greater ease of installation—fewer damaged assemblies—and more jobs finished in less time. The new Sangamo Type 30 Capacitor is definitely superior.

Send for Catalog

Write for the Sangamo Capacitor Catalog Number 23B. It gives you technical capacitor information and covers the complete range of Sangamo Mica, Paper, and Silver Button Capacitors.

SANGAMO



SANGAMO
ELECTRIC COMPANY
SPRINGFIELD • ILLINOIS

SC 482

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A call-back is like a P.S. on a letter: it shows poor organization. Incidentally, hanging up has a right and a wrong way. Do not toss the hand-set back on the cradle. That causes an ear-splitting thump at the other end of the line. Develop the habit of striking the disconnecting plunger with your thumb so that the line is disconnected before the hand-set is dropped into the cradle.

I must admit that it is not easy always to be polite over the telephone. There are times when that little black box seems possessed of a devil. For example, it will ring right when you are at the most critical point of hooking the spring on a yard-long dial cable. When you think sourly about having to restring all of those pulleys, it is pretty hard to pick up the receiver and sound as pleasant as a date-minded teen-ager answering the 'phone.

Just remember, though, that you would be a lot unhappier if that telephone did not ring at all, and that will help you to inject just the right note of interest into your voice. Never forget that the customer's ra-

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the Organizations

Reports from all over United States and Canada are making it clear that the Radio Service Technician is finding membership in an organization of great benefit. Radio Maintenance has kept you informed by starting this column many months ago, and we have watched group activity grow. If you are an organization member, let's hear from you about your group activities.

New York City breaks into the Organizations department with the following interesting information. At a meeting on December 2, the Radio Servicemen's Association of New York announced the election of officers and the establishment of committees for the organization's activities. This organization was formed immediately following the proposals of City Councilman Isaacs for the licensing of Radio Service Technicians in New York City. Its purpose is to establish the professional standing of radio service technicians through an ethical organization and mutual co-operation between the members. The members of the organization have agreed to a code of ethics which will correct many of the alleged abuses that have been attributed to the radio servicemen.

The program includes establishment of an investigation committee which will look into complaints of customers and evaluate them on a fair basis. Educational activities planned will provide training in new radio maintenance techniques to keep members of the organization up to date in the field. Emblems are being issued to member servicemen which they will display prominently in the windows of their shops.

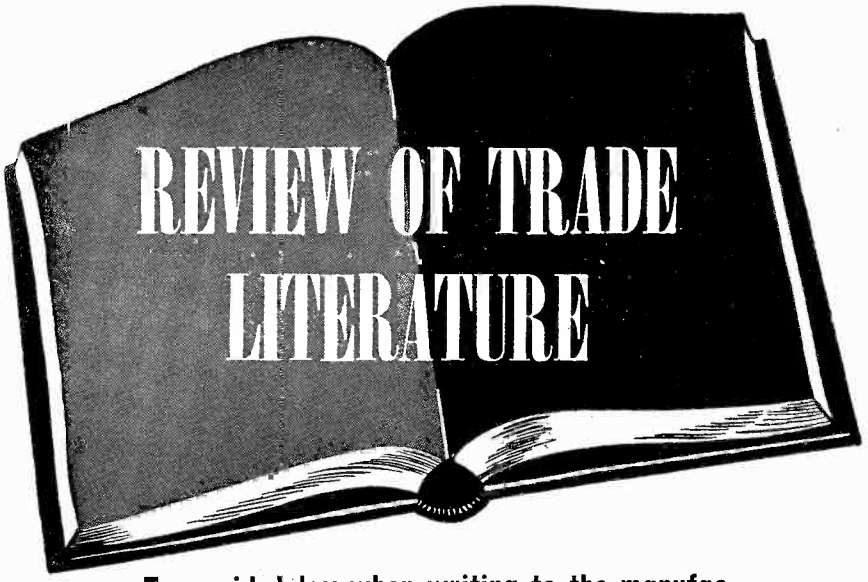
The officers are Max Leibowitz, President (Mecca Radio and Electric Shop); Norman Jacobson, Vice-President (Mid-City Radio and Phonograph Co., Ink.); Jack Edel, Treasurer and Recording Secretary (Modern Radio Service); Harry Anis, Corres, Secretary (Harry's Radio ervice). A drive is under way to enlist every radio service technician in the metropolitan area.

We believe that the following letter shows some of the advantages of the exchange of ideas among organizations: "The Dallas Radio Sales & Service Association has made a very satisfactory rate of progress in the past year, and is continuing to grow. Our greatest achievement was the accomplishment of a similar operating agreement with Radio Stations WFAA, WFAA-FM, as enjoyed by the Philadelphia Radio Service Man's Association. We feel greatly indebted to Mr. David Krantz of that splendid group for his great interest and personal aid to us. It is needless to say that the constant barrage of radio commercials has enhanced the prestige of our membership insignia.

In addition to the above our organization holds regular monthly educational meetings at which both sales and service techniques are presented. For the past several months we have been engaged in an exhaustive study of FM. Also we are promoting a program of FM education for the public.

I trust that the above will give you some idea of our activities, and I can assure you that we are looking forward to another successful year.

T. P. Robinson
Sec't-Treasurer



To avoid delay when writing to the manufacturer give issue and page number.

The Hamilton Kent Manufacturing Company has made available a bulletin on Rexon Vibration Mounts. This 8-page bulletin describes shock mounts and their characteristics and should be helpful to the serviceman in planning his shop and equipment and for custom installations. For a free copy, write to Hamilton Kent Manufacturing Company, Kent, Ohio.

A complete new 1948 catalog showing popular types of capacitors and radio noise filters used in servicing radios and industrial electronic equipment, is now available from authorized Solar distributors, or directly from Solar Capacitor Sales Corp. Among the new items in Catalog SC-2 are a complete line of Superex paper capacitors, midget hearing-aid capacitors, molded paper capacitors, speedflash capacitors, plastic-protected dry electrolytics, and greatly enlarged listings of "Twist-Prong" electrolytic capacitors.

To obtain this catalog, write to Solar Capacitor Sales Corp., 1445 Hudson Blvd., North Bergen, N. J.

Rogan Brothers, compression molders of plastics, have announced their new illustrated catalog which lists specifications on their complete line of stock molded plastic knobs, control handles, instrument knobs, etc. It also contains useful information on how tool cost savings can be achieved, plus data on the Rogan "deep relief" branding process. Copies may be obtained by writing: Rogan Brothers, 2500 W. Irving Park Blvd., Chicago 18, Illinois.

The 1948 edition of the RCA Tube Reference Book, a vest-pocket booklet containing technical data for radio servicemen, engineers, and technicians, has been published and is now available from RCA, Cunningham and RCA Victor tube distributors. A combination technical reference, memo book, diary, and radio directory, the RCA Tube Reference Book contains up-to-date data on RCA receiving tubes, condensed data on over 260 RCA non-receiving tubes, RMA color codes on mica and ceramic capacitors and resistors. It has in addition, a world atlas with maps in full color, including an 8-page section of the United States.

The volume has been expanded this year to include several valuable new features. These include a "replacement directory" covering tubes for industry, communications, and special uses, and a listing of directly interchangeable RCA tube types as well as a listing of similar RCA types. Additional features are a battery interchangeability chart, a glossary of television terms, charts for calculating series resistance and parallel capacitances, and a table of metric equivalents.

"Television Receiver Construction" is the name of a new booklet

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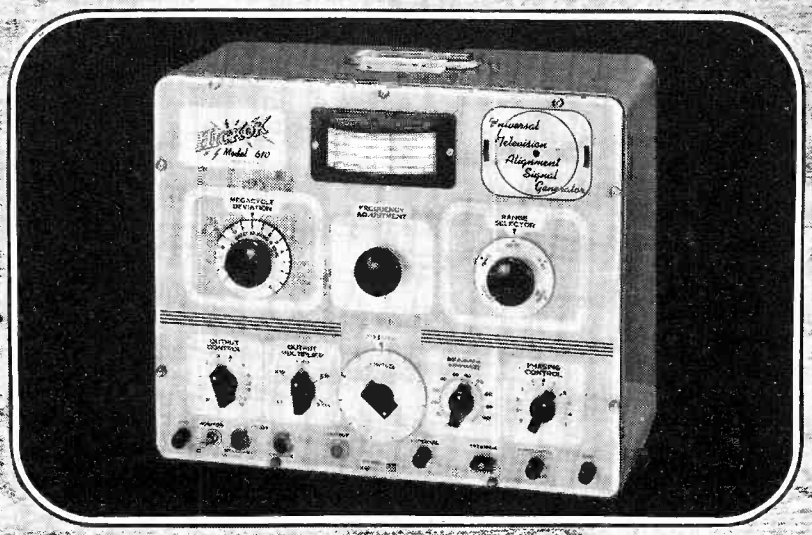
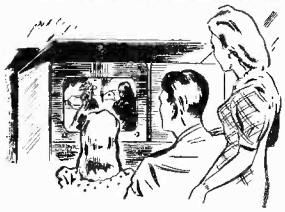
As great an achievement as Television itself!

HICKOK MODEL 610

TELEVISION ALIGNMENT GENERATOR





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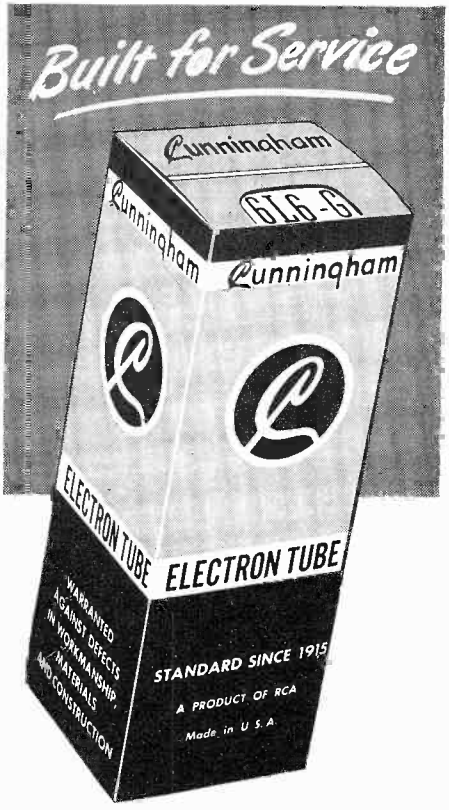

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Over the Bench

→ From Page 32

dio and its symptoms are of major interest to him or to her, and he likes to hear you sound as though you are interested too. When he is talking to you on the telephone, he is not wasting your time; instead, he is giving you a golden opportunity to do a job of selling—selling yourself and your service. So the next time you hear that bell, come out smiling! ✓ ✓ ✓

Trade Literature

→ From Page 34

describing how to build a complete television receiver. This television receiver uses 18 tubes and is designed to operate on any of the video bands from 44-88 mc. The booklet is arranged to help students and experimenters in building this instruction receiver. A 3″ viewing tube is used, and the receiver is light and compact. Arthur Liebscher, the author of the booklet, is a lecturer on television at the technical school of Temple University. The chapters include such features as "How Television Works," "Precautions," "Antenna Construction" and "Notes on Soldering" as well as actual construction procedures. The booklet is available at $1.50 a copy.

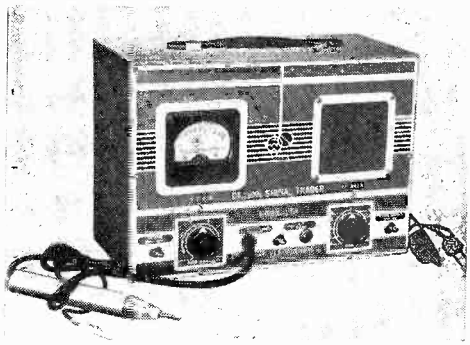
Television

→ From Page 22

carrier does not fall below a minimum value during transmission. Otherwise the sound which depends upon the video signal being detected will not be obtained.

The intercarrier system is just one of the many developments which will bring the prices of television receivers into the popular market. ✓ ✓ ✓

THE INDUSTRY PRESENTS



SIGNAL TRACER

The Precision Model 250 Signal Tracer features a four stage, high gain (over 80 db) amplifier and a shielded probe, which has a series capacity of only 3 uuf. The frequency response is linear from 30 to 15000 cps. The instrument is also a vacuum tube voltmeter useful for measuring high impedance voltages and stage gains. A 5-inch PM speaker is built into the caginet, which is metal and measures 6¼" x 12¼" x 9". For further information write to Precision Electronics, Inc., 641-643 Milwaukee Ave., Chicago 22, Ill.

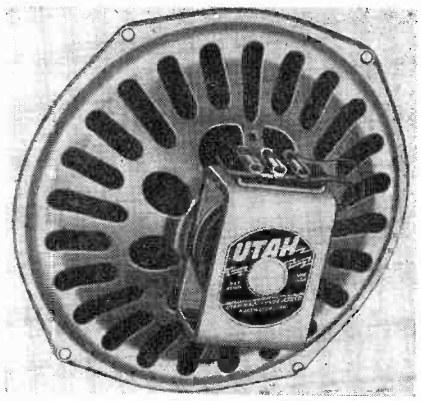
HIGH-SENSITIVITY KILOVOLTMETERS

A new series of high sensitivity kilovoltmeters specifically adapted for measurement in television and similar electronic circuits has been announced by the Shallcross Manufacturing Company. All portable, a feature of their design is the fact that little current is drawn from the circuits in making high-voltage measurements. The eight kilovoltmeters in the line provide both DC types, as well as AC-DC types in practically any required voltage combination. They are accurate to 2% for DC and 5% for AC measurements.

Further information will be sent upon request to the Shallcross Manufacturing Company, Collingdale, Pa.

PORTABLE AMPLIFIER

The "Bingo" amplifier, produced by Audar Inc., Argos, Indiana, is a complete portable PA system. It has sufficient power for audience coverage up to 300 or more persons. Speaker and amplifier are contained in a two-toned leatherette carrying case, equipped with 6 foot line cord for use on 115 volts 60 cycles. Total weight is 7 lb. 14 oz., and size of the case is 11¾ in. by 6 in. by 10 in.



AUTO SPEAKERS

Utah announces three new auto radio replacement speakers. Known as Models SE5S6, SE6S6 and SE7Y6, these Electro-Dynamic speakers are available in sizes of five, six and seven inches. Model SE7Y6 is shown. Including a 3 ohm voice coil and 4 ohm field coil, the speaker mountings are square type. For more information, write to Utah Radio Products, Huntington, Indiana.

STEPPED-UP CAPACITOR VOLTAGES

The voltage ratings of several Aerovox standard paper and oil-filled capacitor types have been extended to meet the elevated voltages encountered in television receivers, as well as in cathode-ray oscillographs. Series "84" (tubular paper capacitors) are now made in ratings up to 10,000 volts D.C.W. The midget-can Series "89" and the round-can Series "12" and "14" are available in extended voltage ratings from 3500 to 7500. Series "14" is available in the double-ended design or with pillar terminals at either end and with two adjustable ring mountings.

CRYSTAL CARTRIDGE

The Astatic Type "LT" crystal phono cartridge has an output of 1.00 volt, avg. at 1,000 cps; minimum needle pressure, ¼ oz.; cutoff frequency, 4,000 cps; and replaceable Type "T" needle with a precious metal playing tip. Low surface noise and low needle talk are features of the new cartridge. Further information is available from The Astatic Corporation, Conneaut, Ohio.

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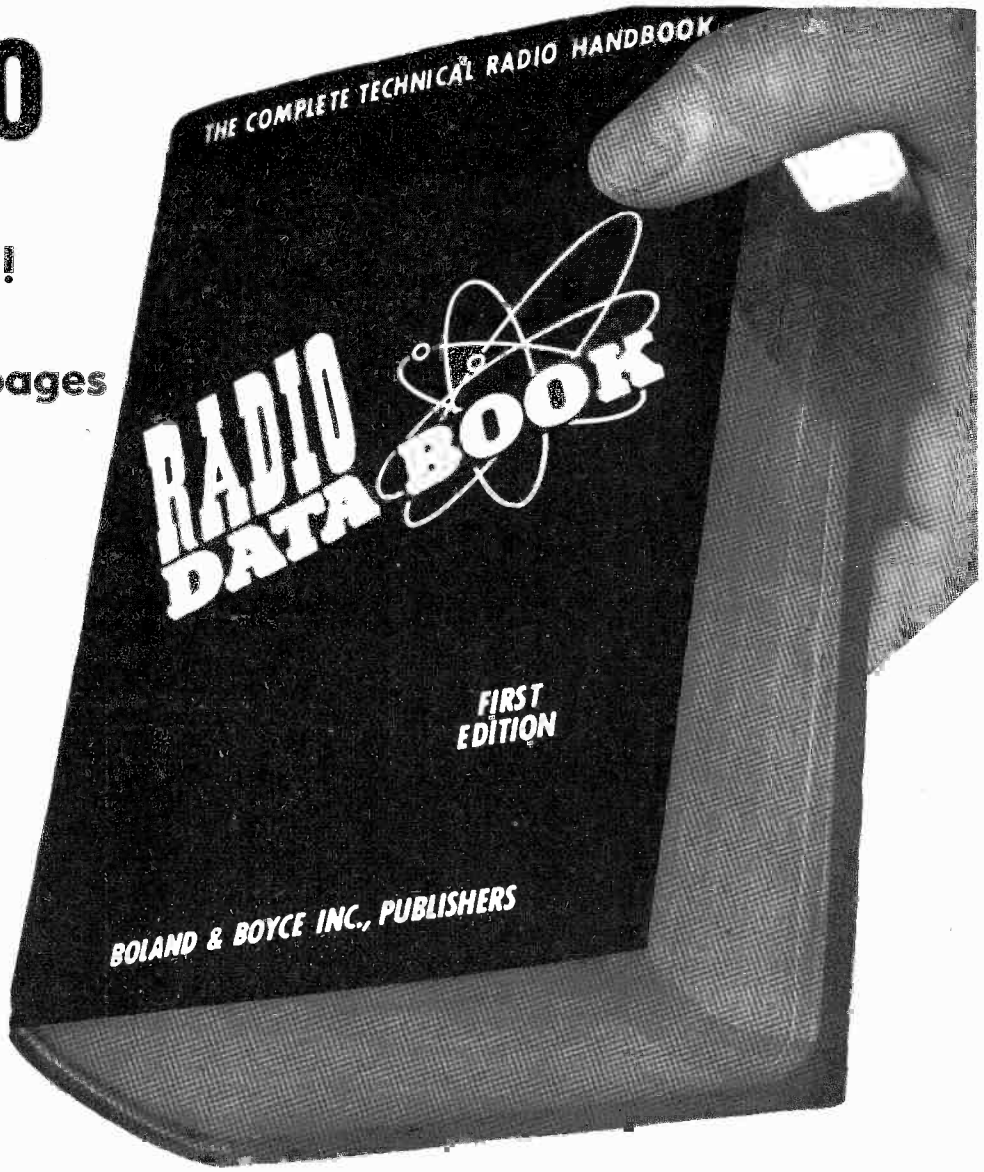

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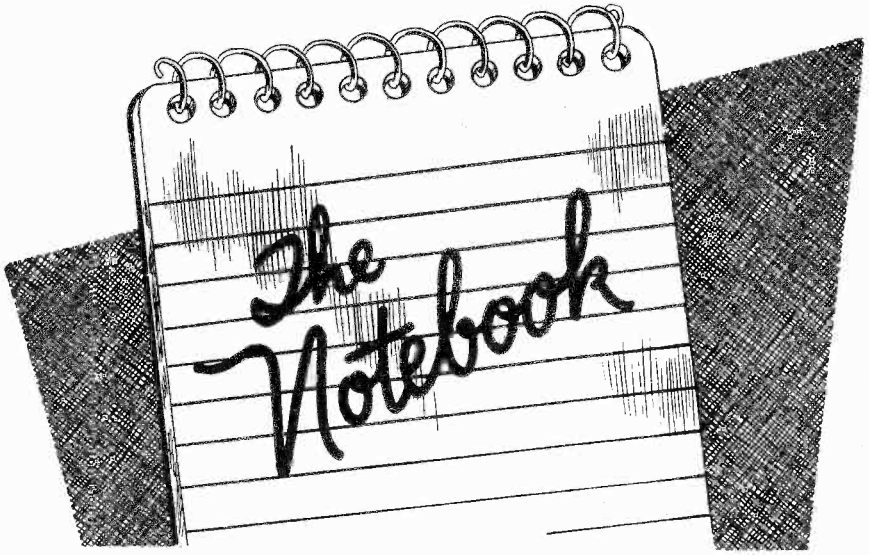


Each month the reader sending in the best suggestion receives a crisp ten dollar bill. For all others published, RADIO MAINTENANCE will pay five dollars. Let's hear from you. All entries become the property of Radio Maintenance.

Coding Socket Wrenches

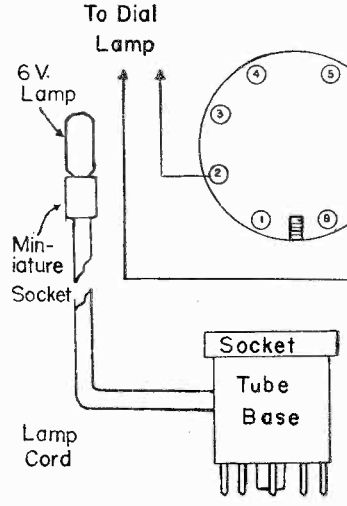
A GOOD way to save time in handling socket wrenches is to color code them. Paint them either completely (on the handle) or with a dot using the RMA color code. For instance, the smallest would be brown, the next larger would be red, the next orange, etc. In this way, if a wrench is too big or too small for a job, you can immediately spot the proper one.

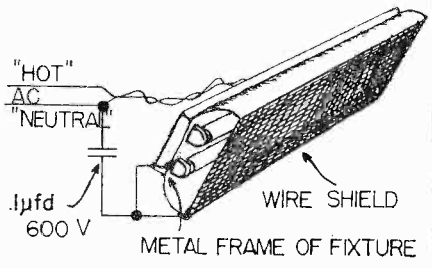
B. A. Bolten
Stamford, Conn.

Trouble Light

A handy trouble light for examining receivers being repaired can be rigged up as shown in the illustration. An adapter is made and leads from the filament prongs brought out through the side and through a flexible cord to a flashlight bulb. The adapter is the ordinary kind made from an old tube base and socket. The adapter is plugged into a socket in the receiver and the proper tube plugged into the top of the adapter. The tube is then connected properly, and the trouble light will operate.

San Antonio, Texas
Ed. G. Roquet





Noise Eliminator

If you have trouble with noise from the fluorescent light over your bench, here's a way to get rid of it. Some coarse mesh wire shielding material is spread over the front of the light as shown. Then you ground the mesh to the AC neutral lead through a .1 ufd 600 V. condenser. You'll probably get a little less light but a lot less noise.

Vic Kecknagel
Vic's Radio Shop
Burlington, Wis.

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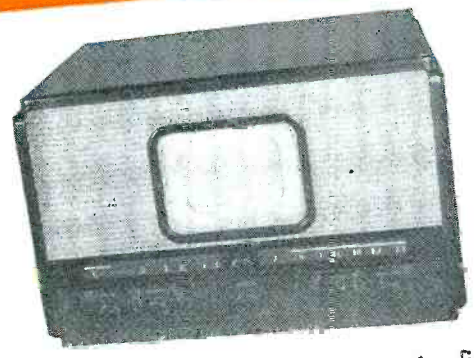
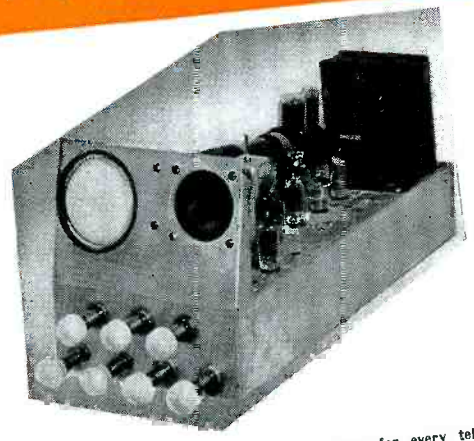
THIS MONTH'S BEST BUYS IN RADIO!

Here's what servicemen have been waiting for—a frequency modulated FM and TV sweep signal generator. With this new McMurdo-Silver 909 and your oscilloscope, you can visually align FM and TV sets—quickly and easily. Your cost at Almo $48.50.



Here's a fine receiver in the low price field. Distinguished Balmont features electrostatically deflected seven inch tube, with reception on all 13 television channels. List price is $250.00.

Telesweep oscillator gives you quick accurate measurements for television circuits. Frequency range of 5-100 mc and 170-216 mc, sweep width 500kc — 10mc. Maximum output volt. RF probe for point-to-point check. Your cost, $68.50.



Espey's basic television kit is the receiver for every television beginner to learn the fundamentals of TV. It's easy to assemble: no previous knowledge of television required. There's a pictorial instruction book included to show every step of the way. Your cost is $69.50, less tubes. Write or stop in for further details on this unusual kit.

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