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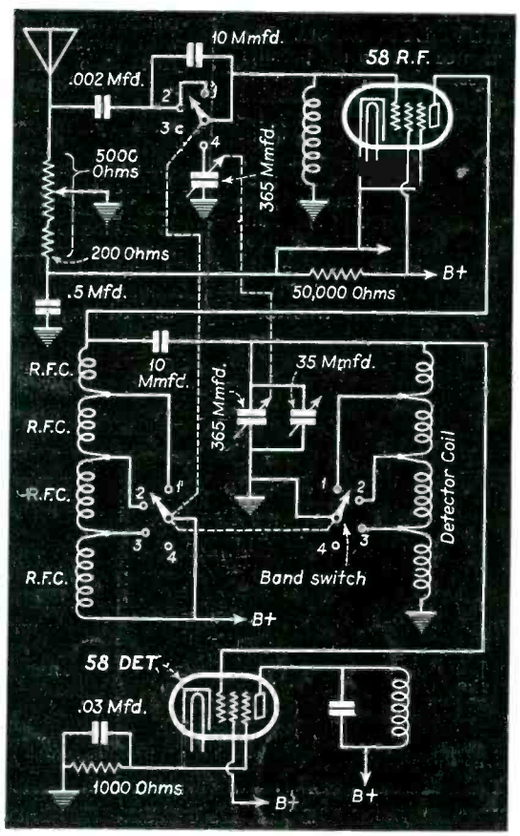

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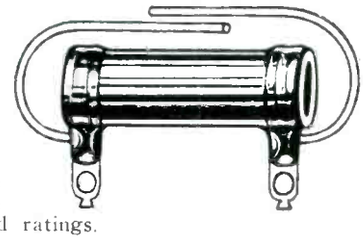

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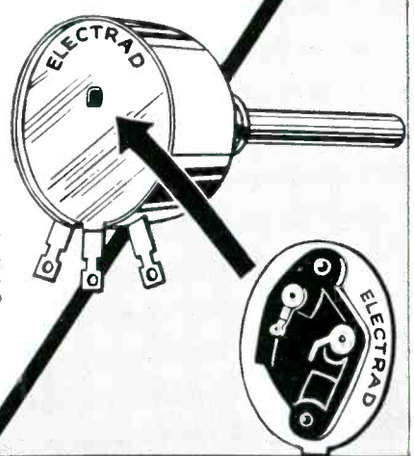

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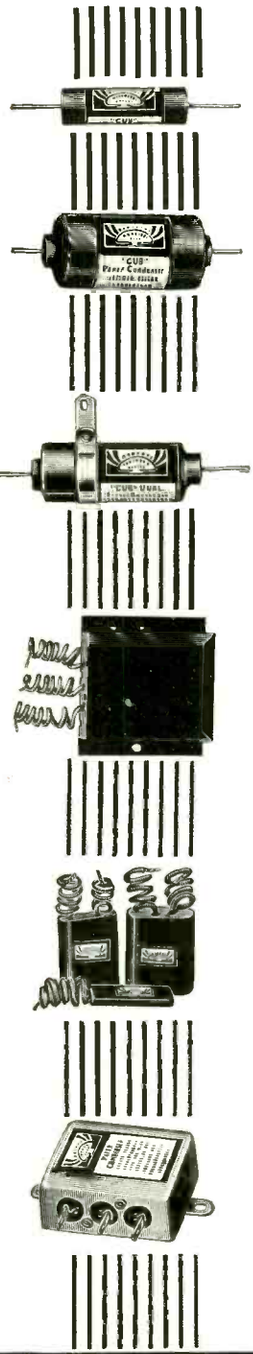

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SERVICE

A Monthly Digest of Radio and Allied Maintenance

MARCH, 1934
Vol. 3, No. 3

EDITOR
John F. Rider

MANAGING EDITOR
M. L. Muhleman

ASSOCIATE EDITOR
Ray D. Rettenmeyer

EDITORIAL CONTENTS

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Servicing 477 RECEIVERS
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CLAROSTAT AD-A-SWITCH line comprises the maximum utility with minimum stock investment. Series W (Wire Wound) obtainable from 50 to 50,000 ohms. Series C (new composition element) obtainable from 1,000 to 5,000,000 ohms. Both lines obtainable in all tapers—insulated shaft 1½" long. Wide use is indicated as follows: W-28 will service 128 sets; C-28, 106 sets; W-29, 77 sets; C-59, 66 sets, etc., etc.

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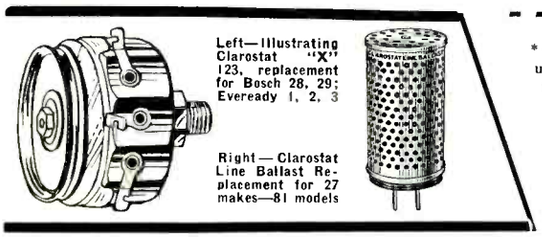
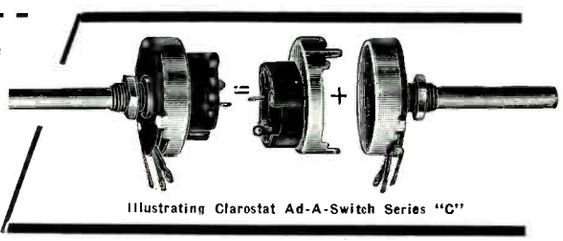


Left—Illustrating Clarostat "X" 123, replacement for Bosch 28, 29; Eveready 1, 2, 3

Right—Clarostat Line Ballast Replacement for 27 makes—81 models

* Clarostat is the trade name used by the Clarostat Manufacturing Company, Inc., to identify its products. Products which bear this trade name are manufactured and guaranteed by the Clarostat Manufacturing Company, Inc.



Illustrating Clarostat Ad-A-Switch Series "C"

CLAROSTAT

MANUFACTURING CO., INC.

287 NORTH SIXTH ST., BROOKLYN, N. Y.

THE ANTENNA...

ON "PRICE" BUYING

ONE of the complaints voiced by Service Men during the past few years was that relating to prices. They stated that many customers have been greatly influenced by the prices quoted them by service men—that it was difficult to build up a dependable clientele because of the wide range of charges asked by different Service Men for similar kinds of service operation. Also that customers seem to have developed a special liking for bargaining.

Is the above native only to the customer? . . . Or is it equally rampant among the service trade itself with respect to its suppliers? It is quite true that when the Service Man acts as the intermediary between the supplier and the ultimate consumer, the set owner, he is entitled to a discount, but some Service Men have been prone to select items, be they tubes, parts, speakers, etc., purely upon a discount basis. They buy where the discount is greatest, be this discount variation as low as one percent. Bargaining is quite prevalent when the man can make a personal call upon the supplier.

The evils voiced as being present in the service industry are also evident among the suppliers. Suppliers, like Service Men, are interested in building a solid foundation for their business, yet they cannot place even the normal amount of reliance upon their customer mailing lists because they have learned that the roster of names as shown upon their mailing list and the names upon the orders is ever changing.

Is it really worthwhile changing sources of supply because of a difference of perhaps two or three cents on an item, particularly when the original source of supply has been rendering service beyond reproach? It is true that there are exceptional instances, when one establishment has made a "buy" and can offer a unit at a ridiculously low price, at which time, it is quite in order to switch from one supplier to the other. But under normal circumstances, such changing is not worthwhile in the long run. There is much more to the association between a customer and a supplier than purely price considerations. Each and every Service Man knows this to be true with respect to his own customers—and it is equally true when the Service Man is the customer.

Do not for one moment feel that we are advocating the unnecessary expediture of money. You should at all times be interested in securing your merchandise at the lowest possible price, but, and it is quite an important but, bear in mind that the dollar and cents amount involved in a purchase is only one part of the transaction. The speed of delivery is worth an inestimable amount. Many a Service Man, attracted by price alone regretted changing his source of supply, even once, because the material ordered did not arrive on time to complete the service call by the day promised.

It is customary among all suppliers to say that all customers, old or new, are treated with equal promptness and exactitude. Still, you will find that there is a distinct advantage to be gained by being known to the supplier, because of continued patronage. That little something which cannot be interpreted in dollars and cents and is not for sale, is given to those men who are known to have traded with the house for a long time—to the steady customer. Maybe it is nothing more than a more detailed answer to a problem, or a closer decision when the supplier is asked to choose between two items which are suitable for a job and the Service Man customer cannot come to a satisfactory conclusion. Whatever this something may be, it is of value to the customer.

Suppliers are as a general rule proud of their customers who cannot be lured away from them just because the competitor offers something slightly cheaper. An organization which can depend upon its customers, which can gauge its repeat business, can actually offer much more in service than one which must depend upon "price bait" to lure its trade. If you have had dealings with established and reputable suppliers, if you like the reputation of these houses, if they have given you satisfaction, do not judge the merits of their products purely upon a price basis. Do not switch your patronage from one to the other, a third or a fourth just because another house is a few cents cheaper than your regular supplier. If you can get what you require from your own supplier and his price is sufficiently low to give you your profit, trade with him. Give him the opportunity to earn his justified profit. Enable him to build upon your good will, just as he is enabling you to build up good will among your own customers by selling you good merchandise at the right price and making deliveries on time.

• • •

WE believe that we are right when we say that many auto-radio manufacturers are patiently watching the success of the auto ignition man in the auto-radio field. If this group as now being corraled by one large receiver manufacturer, should prove worthwhile, there is every likelihood that much income will be removed from the radio servicing field, because other auto-radio receiver manufacturers will pay closer attention to the auto battery and auto ignition man. From what we hear, 1934 is expected to be a boom auto-radio year, shattering all previous auto-radio sales records. Such being the case, now is the time to place your nose to the grindstone and make your contacts.

Many established radio Service Men have consistently refused to handle auto-radio service. They claim there is not enough service to be had. That may be true today, but what about the future—1934, 1935, etc. If auto-radio manufacturers complete successful arrangements with auto ignition organizations for good radio service during 1934, why should they change during ensuing years? There are some 20 odd million automobiles in the United States. This represents a lot of service and means many millions of dollars in years to come. Don't miss the chance.

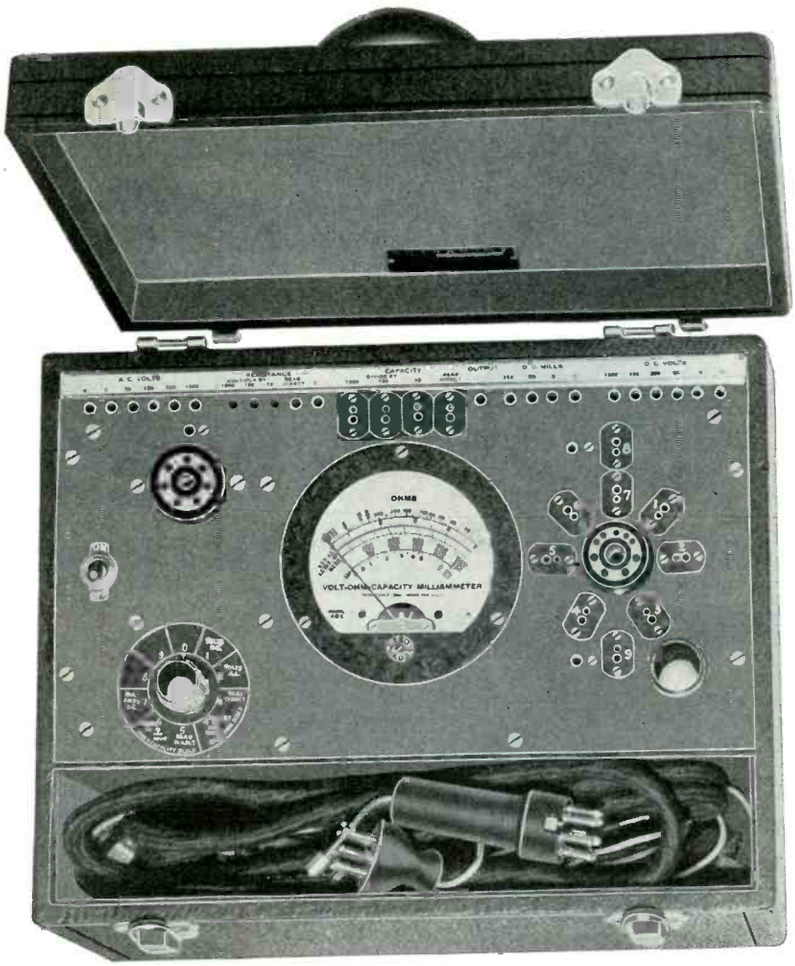
Don't gamble too much upon the inability of the auto ignition man in the radio field. It is our opinion that it is easier for the radio man to learn ignition principles than the reverse—but if given the chance, the battery station will be installing and repairing auto-radio receivers.

John F. Rider.

HICKOK

New 1934 Model S. G. 4800

ALL PURPOSE RADIO SET TESTER



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Combination Point to Point (Static) or Dynamic Method

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Lowest to Highest Values

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MILLIAMPERES
RESISTANCE
CAPACITY
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Readings Contained in Meter on 4800 Radio Set Tester

Five ranges of D.C. volts as follows:	0-5 0-50 0-250	0-500 0-1000
Five ranges of A.C. volts as follows:	0-5 0-50 0-250	0-500 0-1000
Four ranges of D.C. Milliamperes, as follows:	0-1 0-5	0-50 0-250

Four ranges of resistance reading from ½ ohm to 10 megohms, in four steps as follows:

½ ohm to 10,000 ohms
5 " " 100,000 "
50 " " 1 megohm
500 " " 10 "

Four capacity ranges, .0001 Microfarad to 20 Microfarads, as follows:

.1 –20 Microfarads .001 –.2 Microfarads
.01 – 2 " .0001–.02 "

New development in the construction of capacity meter, accuracy is unaffected by any A.C. line voltage between 100 and 125 volts.

New development in the Ohmeter accuracy is absolutely unaffected by change in battery voltage.

Temperature coefficient, all meters, all ranges, practically zero.

Output Meter contains complete range of output with sensitivity so that the least sensitivity of volume output can be read.

OUTPUT RANGES

0-5 Volts, Sensitivity 1 Milliampere
0-50 " " 1 "
0-250 " " 1 "

Instructions supplied to enable operator to connect output meter to receiver without disturbing internal connections. Connection is made through tube sockets of receiver.

DEALERS WRITE FOR BULLETIN S.G. 48

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This volume covers the period between 1919 and early 1931. The great majority of the old receivers are to be found in this volume.

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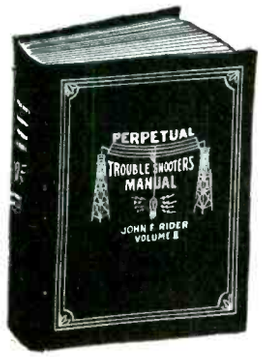
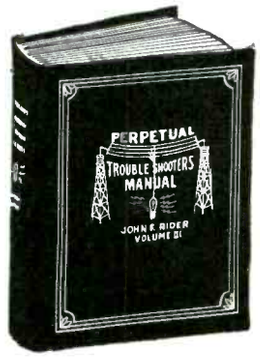
This volume covers the period between early 1931 and the middle of 1932. It also includes some older receivers, which were not available when Volume I was printed. Point-to-point data is to be found in this volume.



VOLUME III

1185 Pages, $7.50

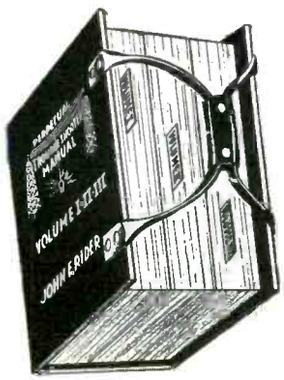
This volume covers the period between middle 1932 and about June of 1933. It also includes some old receivers which were secured subsequent to the publication of Volumes I and II. Volume III also contains some point-to-point data and the world's only set catalog identifying about 8,000 models.



All of these manuals contain schematic wiring diagrams, socket layouts, chassis diagrams, voltage data, photographic views, resistor data, condenser data, electrical values, alignment notes, i-f peaks, trimmer location, continuity test and point-to-point data, etc., etc. All manuals are loose leaf bound in "instant-removal" type binder and contain cumulative index.

COMBINATION MANUALS

Combination Manual with carrying handles. About 3000 pages, $25.00



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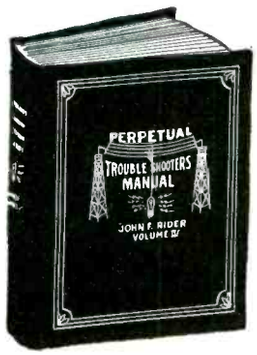

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SERVICE

A Monthly Digest of Radio and Allied Maintenance

FOR MARCH, 1934

A Multi-Range Ohm- and Output Meter

By JOHN H. POTTS

ALWAYS a convenience, the multi-range ohmmeter is fast becoming a necessity for the rapid servicing of modern radio receivers. The increasing use of high resistances in grid circuits, diode detection and automatic volume control circuits, have made voltage tests of these circuits of little value. Also, many defects in low-resistance circuits, which do not affect voltage or current readings, such as trimmer condenser shorts across r-f or i-f coils, may be readily located by resistance-continuity measurements. Service Men skilled in the use of the ohmmeter can usually locate causes of breakdown in short order without removing the chassis or unsoldering connections, regardless of the location of the trouble. For general experimental work, and in laboratories and factories where extreme precision is not required, the ohmmeter offers distinct advantages in low cost, speed and convenience of operation over the usual bridge methods.

The apparatus to be described combines the best features of modern commercial design plus greater range and adaptability, extending well into the megohm region, without using external batteries or apparatus. The high range is secured by a unique thermionic method which increases the sensitivity enormously without requiring a highly sensitive meter. The apparatus is simple and inexpensive to construct and will also serve as an output and capacity meter.

Design of Ohmmeter

The fundamental circuit of the usual type of ohmmeter is shown in Fig. 1. The total circuit resistance is composed of the calibrating resistor, Rc, the internal resistance of the meter, Rm, and the unknown resistor, Rx. Thus, we may write,

$$Rx + Rm + Rc = \frac{E}{I}.$$

$$\text{Or, } Rx = \frac{E}{I} - (Rm + Rc)$$

Rc is chosen to be of such value as will give full-scale deflection when the measuring terminals a-b (Fig. 1) are shorted. Provision must be made to compensate for falling battery voltage in order to assure full-scale deflection for calibration purposes. Two methods are in common use, as shown in Fig. 2. The first method, Fig. 2-A, is to put a variable resistor in series with Rc, decreasing its value as the battery voltage falls. In Fig. 2-B, the meter is shunted with a variable resistor to accomplish the same purpose. In the method of Fig. 2-A, it will be seen that a 20 per cent drop in voltage will necessitate a 20 percent decrease in the value of the calibration resistance necessary to maintain full-scale deflection. In the shunted meter method shown in Fig. 2-B, since the resistance of the meter is negligible compared with the resistance of the calibrating resistor, the change in total circuit resistance necessary to compensate for battery voltage changes is negligible. Since the accuracy of the calibration is directly dependent upon circuit resistance being maintained constant, it is apparent that the design of Fig. 2-B only should be used. For those who have constructed ohmmeters using the first described circuit, it is suggested that the change necessary to improve the design be made.

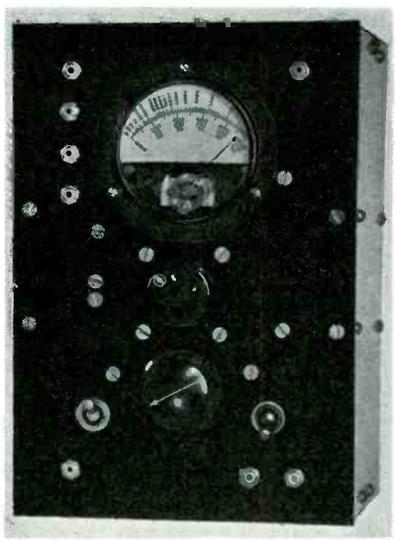
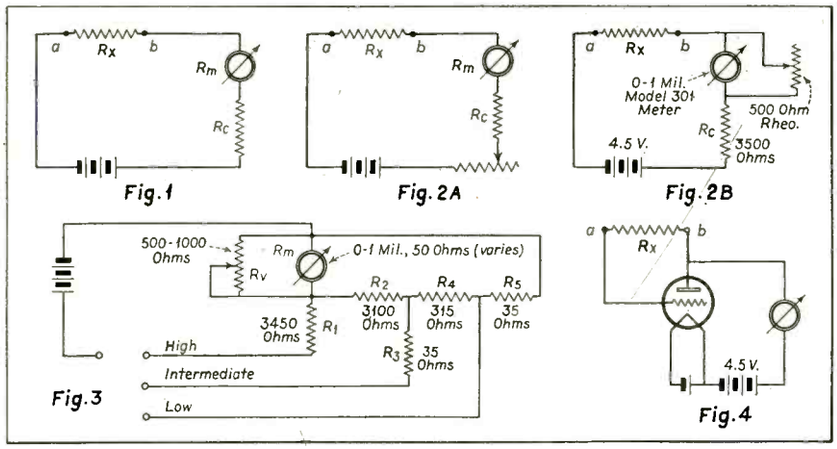


Fig. 6. Front panel view of the completed Multi-Range Ohm- and Output Meter.

Increasing the Range

Using the circuit and constants of Fig. 2-B, the range extends from about 1,000 to 100,000 ohms. Lower ranges may be secured by using the circuit of Fig. 3. For the intermediate range, extending to 10,000 ohms, two paths for the current are provided. The total effective circuit resistance for this range is 350 ohms. R-2 and the meter are in parallel with R-4 and R-5. The resistance of the path composed of R-3, R-4 and R-5 is one-ninth that of the path through the meter, R-3 and R-2. Thus only 10 percent of the total current in the circuit passes through the meter and, to secure the value of the resistance to be measured, we need merely to divide the original calibration by 10. For the low range, in like manner, one path for 99 percent of the current is through R-5, while but 1 percent of the current passes through R-2, R-4, and the meter.



The above circuits serve to explain the structure and operation of various type ohmmeters. Fig. 4 is the diagramatic arrangement of a vacuum-tube ohmmeter.

For this range, we accordingly divide our calibration by 100.

The Megohm Region

We have shown above how to lower the range. To increase our range upward, if this design is to be retained, we must use higher voltages. In this design a 4.5-volt test battery is used. Since the maximum resistance giving a readable deflection is 100,000 ohms, for one megohm we should require 45 volts, and for 10 megohms, 450 volts. Alternatively, we might use a correspondingly more sensitive meter. But neither is desirable. Resistors of values over one megohm, in radio sets, are of carbon and are not usually designed to be subjected to such high voltages. Carbon has a negative temperature coefficient and therefore the indicated resistance under abnormal voltages may be considerably less than the effective resistance as actually used in the set. And, of course, it would seriously limit the convenience of the ohmmeter to be obliged to carry a source of high voltage supply from place to place. More sensitive meters involve increased expense and far greater care in handling.

The Thermionic Ohmmeter

To overcome these objections, the simple thermionic method shown in Fig. 4 was devised. The principle involved is as follows: When the grid of a tube is free and the plate potential low, it assumes a negative potential, probably due to electrons, which, leaving the filament with insufficient velocity to reach the plate, accumulate on the grid. Under these conditions, if a resistor is connected between plate and grid, the positive potential of the plate is transferred to the grid, and plate current flows. If the grid were completely free, the grid potential under these conditions would be the same as the plate potential, regardless of the value of the resistor. In every tube, however, there is a certain amount of leakage, so that the effective resistance of the grid is of the order of 50 to 100 megohms. For this reason, its actual potential is governed by the value of the resistor and accordingly a curve for various resistance values may be made. This method is extremely sensitive. Readable deflections are obtained for 10 megohms with only 4½ volts on the plate and 3 volts on the filament of a type 199 tube. Much higher values may be read with slightly higher voltages. A 230 tube may also be used to advantage. Having greater mutual conductance than the 199, it affords increased sensitivity.

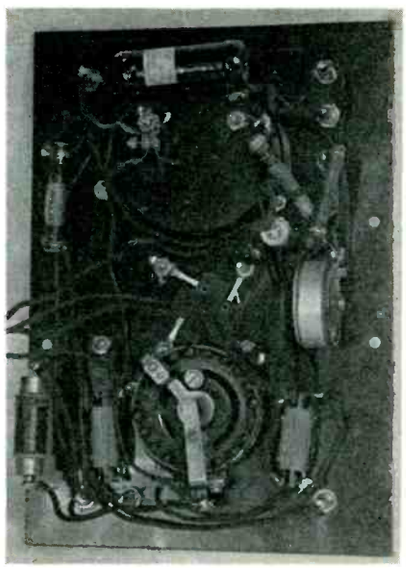


Fig. 7. Rear panel view of the completed unit, showing the arrangement of parts.

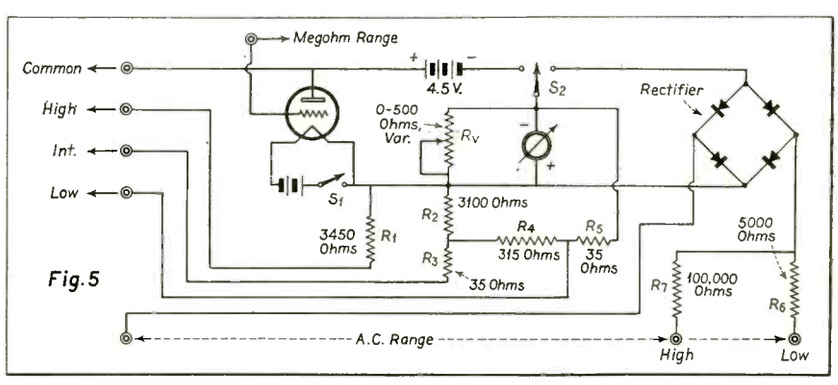
The Completed Design

In Fig. 5, the complete schematic design is shown. For the megohm range, the thermionic method is used, while for the lower ranges the tube is not required, thus conserving the filament battery. All ranges are brought out to pin jacks. The three pin jacks shown in the lower portion of the drawing are for a-c voltages. It is frequently desirable to have a low range for lining up sets, etc., and a high range for checking capacity. These a-c ranges are obtained by using the resistors R-6 and R-7 in series with a miniature copper-oxide rectifier. This type of rectifier is sensitive and efficient and has advantages over a tube voltmeter for these purposes in that no battery is required. Of course, when used for voltage measurement it forms a load on the circuit being measured but in most cases this is negligible. Where no-load measurements are required, as in r-f circuits, the 199 tube may be used, but higher battery voltages will be required. As shown, with the meter shunt resistance at maximum setting, the range is 0-6 volts on the low scale and 0-120 volts for the high scale. Using the usual a-c line supply, condensers may be tested by connecting the line supply to the "high" a-c range, with the condenser to be tested in series with one side of the line. By comparing the meter reading with a previously secured calibration, the value of capacity may be determined.

Construction of the Apparatus

The apparatus is mounted on a small bakelite panel, the batteries being contained in the cabinet. In the unit shown in Figs. 6 and 7, the cabinet was made of aluminum with the edges joined by strips of angle brass, drilled and tapped for 6/32 screws. The meter recom-

(*Continued on page 94*)



The complete circuit of the Ohm- and Output Meter.

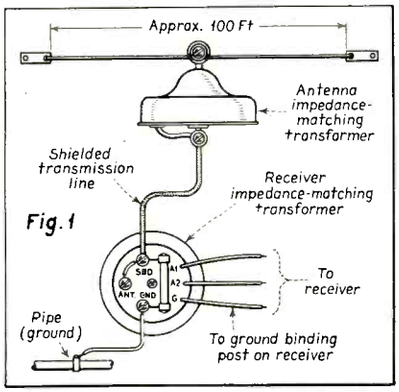
Noise-Reducing Aerials to the Fore

By G. S. GRANGER

NOW is the time for all good Service Men to come to the aid of their customers. We have no figures, but we venture to say that about one percent of the Service Men have tackled the noise-reducing antenna business and made a good thing of it, while the other 99 percent have either let the matter ride or long ago come to the conclusion that these special aerial systems weren't much good anyhow.

Man's Static

We suggest, therefore, that the 99 percent fiddle a bit with a nice, long wire for an aerial. The idea is to connect this wire to the antenna post of a



This type of noise-reducing antenna system will take the burrs out of any radio. It's easy to install.

receiver located, say, on the fourth floor of an apartment building, and use it like a fish line.

Start in by turning up the receiver volume control and then letting out the aerial from the nearest window. Due to the fact that this wire will be a pretty punk aerial until it is completely unfolded, the experiment isn't perfect. But if the whole formality is handled with proper respect, the experimenter will no doubt learn that a whale of a lot of man-made static hugs the ground.

Thus, lesson number one says, the higher the aerial from the ground the less noise of the man-made variety. The first supplement to this lesson is, the higher the aerial, the better the signal.

The conclusion hits you in the eye . . . use a high aerial to get a better signal and less man-made noise. Then another little supplement hits you on the button . . . use a high aerial to get a good signal so that it will over-ride the noise which *does* reach the aerial.

Signal-Favoring Aerials

"Noise-Reducing Antennas" is a good name for the systems employed, but it doesn't tell the whole story. Some Service Men can't figure why these systems should be used when a good, high aerial erected in a clear space will provide a good signal. They have only learned lesson number one.

Let's take a look at lesson number two. It says, the impedance of the average aerial used for reception purposes does not favor the input impedance of the receiver; consequently, there is signal loss due to impedance mismatch. On the other hand, a well-designed noise-reducing antenna system, using transformers, permits a match of impedance between the aerial and the input of the receiver and without the impedance of the lead-in materially affecting either, consequently there is no loss of signal in the respect that there is in a common antenna system, and therefore it may be said that, aside from reducing noise, these aerial systems *also favor the signal.*

Comparison of Aerials

Having these two lessons well in mind, it becomes obvious that no matter how high a common aerial may be strung, and no matter how well isolated it may be from sources of man-made noises, it is going to feed noise to the receiver just the same. Why? Because you can't pick the signal off the flat top by radio . . . you need a lead-in. And the lead-in, which is also a very, very fine aerial in its own name, will pick up noise like our fish line some paragraphs back. The perfect answer to this problem is to sit up on the aerial mast with the receiver. Then there won't be any lead-in to get its feet wet in noise lower down. But most people like their radio via the arm chair and can't be persuaded to do flag-pole sitting merely in the interest of science.

But, figuratively speaking, you can place the listener and his receiver on top of the aerial mast by shielding the lead-in. This is like a man wearing rubbers so he won't get his feet wet . . . the lead-in is protected by the shield against any local noise.

Such a lead-in introduces heavy losses because of the high capacity existing between lead and shielding. Likewise because its impedance is not matched to that of the antenna or the receiver.

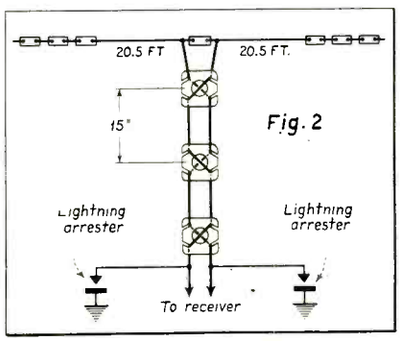
So what? Well, we can't decrease the actual capacity, so we do the next best thing . . . we reduce the signal voltage to such a low value that the lead-to-shielding capacity is negligible so far as the signal is concerned. This is done by interjecting a step-down transformer between the flat-top of the aerial and the lead-in. The large winding of the transformer has an impedance equal to the average impedance of the aerial at broadcast frequencies. The impedance of the small winding matches that of the lead-in. The transformer at the receiver end reverses the process with the result that the voltage is stepped up for the receiver input and without a mismatch of impedance values. The arrangement is shown in Fig. 1.

It can be seen that the average type of aerial can't possibly compare with a noise-reducing outfit, *even in areas where there is no noise.* The latter will always provide the better signal and therefore provide practical distance reception with comparatively low background noise.

All-Wave Receivers

There has been a big spurt in the manufacture and sale of all-wave receivers. New tubes and circuit refinements have made possible the manufacture of receivers of this type which will provide remarkably good reception of short-wave stations. Thousands of these receivers are already installed in homes and loads of people are listening to London, Rome, Italy, etc., through the worst sort of man-made interference.

Man-made interference is greatly intensified at short wavelengths, and new forms of noise, such as ignition systems in autos, dial phones, etc., come marching in. The fish line experiment is a revelation at these wavelengths. When the wire gets near the ground "the autos come in like a local."



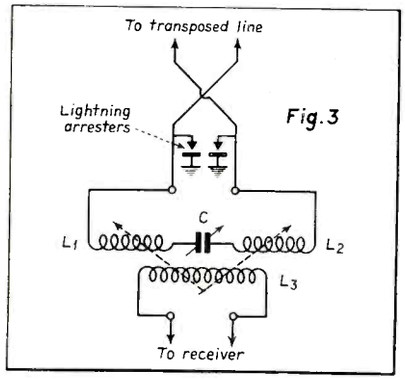
Details of a doublet with transposed feeder line or lead-in. This is for use with All-Wave receivers. Be sure to follow the aerial measurements.

It is here more than any place else that noise-reducing aerials are needed, and if ever there was a job a Service Man should handle, this is it.

Don't assume that people don't want such aerial systems just because they may not ask for them. The same people

are asking for knee action on their autos today, but they had to be told about knee action first before they knew what it was they wanted.

If you read the Saturday Evening Post, and other national magazines, you will find that a number of radio manufacturers are telling the public about noise-reducing aerials in their adver-



The doublet aerial system shown in Fig. 2 can be tuned. Here is the circuit arrangement.

tisements. People will soon know that to achieve the remarkable results possible with all-wave receivers, they will have to use a "special aerial system" with their sets. If you are in a position to obtain the names and addresses of people in your locality with short-wave or all-wave receivers, the problem of getting this installation business should be easy. And if done right, improved results are practically assured.

All-Wave Aerial Systems

The noise-reducing aerial system shown in Fig. 1 is not the best arrangement for short-wave reception. It is satisfactory down to about 200 meters, but below this point signal loss increases rapidly due to the increase of the capacity effect of the lead-in shielding at high radio frequencies and also because of a marked change in the impedance of the flat top at these low wavelengths.

Considering all factors, a doublet, with transposed feeders, such as shown in Fig. 2, is superior on the whole short-wave band from around 15 to 50 meters or so. Since the doubtlet has directional effects, it is best strung in a north-west, south-east direction. Moreover, since it effectively resonates at specific frequencies, it is well to make each of the halves 20.5 feet long. The antenna system will then be tuned to about 19 meters and will also be efficient around 25, 30 and 50 meters. Thus, a single aerial is good for reception on the three most common short-wave broadcast bands, where most people wish to listen. Its efficiency drops off at other wavelengths, but it is still a good aerial for the police and aircraft bands, and the lack of efficiency in the aerial is more than made up by the increased efficiency of the receiver as we go up in wavelength.

Referring to Fig. 2, it will be seen that a doublet is made up of a single wire cut in the middle. To the two equal halves thus formed are connected the leads or feed wires and these are transposed every 15 inches or so by the use of transposition blocks made of good insulating material. If care is taken in installation, the dimensions of the transpositions will be equal. In this case, then, any voltage induced in these two leads by man-made noise will be canceled out because the voltage in any one section of one lead will be out of phase with the voltage in the other section. Therefore, the arrangement eliminates noise by cancelation, but does not contribute much to signal loss because the capacity between the spaced feed wires is very low.

The transposed lead-in may be most any length desired. Both sections of the lead should be protected by lightning arresters, and should preferably terminate in a coupling coil connected between the leads and the receiver.

When the customer is desirous of obtaining the best results possible from his all-wave receiver, a tuned coupling system should be used, as shown in Fig. 3. With a coupler of this sort it is possible to tune the aerial system for each waveband by means of the variable condenser C and also increase or decrease the selectivity by altering the coupling between the coils L-1 and L-2, L-3. Couplers of this sort are on the market.

We have indicated the necessity for two aerials in conjunction with the all-wave receiver. Actually, two are necessary only in such cases where the very best results are demanded, or in cases of noise interference on both the broadcast and short-wave bands.

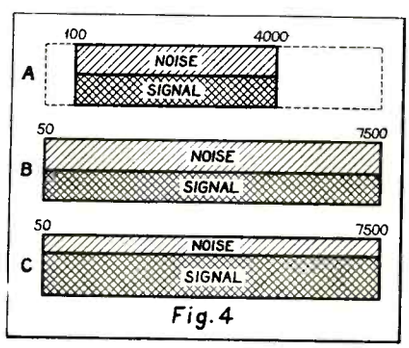
High-Fidelity Reception

The coming thing in the radio field appears to be high-fidelity reception. This means that many of the receivers soon to be produced may have a spread of as much as 40 or 50 to 7,500 cycles, which is an audio-frequency range much greater than the range of present receivers. (There are already a few up around 5,000 or 6,000 cycles.)

Of what significance is all this in relation to noise? Let's see: It may be said that the amount or degree of noise is pretty nearly equal throughout the audio-frequency spectrum. In other words, if a 1,000-cycle slice were taken out and the noise content measured, it would be found that it was about equal to the noise in any other 1,000-cycle slice.

Now let's look at A in Fig. 4. This represents the audio-frequency coverage of a good present-day receiver. For the sake of the example, we have shown the noise and signal levels to be equal through the spectrum indicated. Now look at B of Fig. 4. This represents the possible coverage of a high fidelity receiver and it is seen that by increasing the band width in order to reproduce higher and lower frequencies, we have also added a lot more noise. And there has been added a devil of a lot more than might at first be expected. In relation to A, the receiver represented by B has had its low range extended down only a few paltry cycles, and the added noise is almost negligible—but the high-frequency range has been increased by 3,500 cycles, which means that nearly twice as much noise has been added! Now we can see that by chopping off 3,000 cycles or more, as represented by the dotted lines in A, relieves a pretty bad situation if the receiver happens to be located in a noisy area.

This clearly means that receivers whose response runs up to as high as 6,000 to 8,000 cycles will require the services of a well-designed noise-reducing antenna system. Since most noise is purely a local matter and is not a part of the signal carrier it can be reduced or eliminated—and the reduction effected by the use of the type of antenna system shown in Fig. 1 will be *equal over the whole audio-frequency spectrum.* The result, then, will be a reduction of noise in the first place and a favoring of the signal in the second place, with the sum total result, as represented in C of Fig. 4, of a signal-to-noise ratio comparing very favorably with the conditions indicated in A. In other words, high fidelity is achieved, but with only the same amount of noise



Increase the audio acceptance band of a receiver and you also increase the noise about two-fold. Take a look! A noise-reducing antenna system is the solution.

content as if the receiver cut-off were at 4,000 cycles instead of 7,500 cycles!

We believe that the Service Man will find there are a number of receivers already in use whose acceptance bands are comparatively wide. The installation of noise-reducing antenna systems should measurably increase the pleasure the owners can obtain from these receivers.

General Data . . .

Atwater Kent 711

This all-wave receiver has a number of knobby features. Take a look at the diagram and you will notice that, for example, a parallel resonant circuit is used in the output of the 55 triode. Plate voltage is applied through the resistor R-20, and no current flows through the primary of the first a-f transformer. This prevents saturation of the transformer core and in consequence provides a primary of high inductance. In testing, don't anticipate a voltage reading at this point.

Also note that the tone control—of the step-by-step variety—is in the input circuit of the parallel push-pull stage using the 56's. This obviates breakdown of the tone control and yet provides a good range of control with only slight loss of grid voltage.

Detector-AVC Biasing

Now take a look at the 55 second detector tube. This is connected in the standard A-K way so that one diode is employed for detection rectification only and the other diode as the AVC rectifier. Voltage is applied to each diode through the condensers C-23 and C-24. The AVC circuit is easy to follow as it is up above the diagram. The first tube put on the control is seen to be the 58 first i-f amplifier. The control line then continues to the input circuits of the r-f tube, and if this line is traced, it will be found that the r-f tube is in the AVC circuit only on two wavebands, or positions B-1 and B-4 of the switch B. It is presumed that these are the broadcast band and the lowest short-wave band.

Now go back to the 55 tube again. Note that the cathode of the tube is connected to a point on the voltage divider, R-15, R-16, R-17, which is 10 volts positive—or 10 volts above ground. Since the triode grid of the 55 is grounded through the grid resistor R-18, its voltage is negative with respect to the cathode. The grid therefore has a fixed bias which does not alter with signal voltage, as is generally true with self-bias when the signal voltage is high. It should also be noted that the AVC diode is grounded through resistor R-13. Therefore, this diode is negative in respect to the cathode. On the other hand, the detector diode is not biased, as it will be seen that it is common in voltage to the cathode.

This negative bias on the AVC diode provides the delayed action of the automatic volume control system. Until the signal voltage is of sufficient value to overcome the bias, the AVC does not function. This also provides silent tuning between stations.

The manual adjustment for silencing action is in the cathode circuit of the second i-f tube. Note that switch G, which is a part of the band selector switch, shorts this silencing adjustor on the two lowest short-wave bands where it is desirable to have the maximum amount of sensitivity.

Semi-fixed Bias

Type 2A3 tubes are used in push-pull in the output stage. The bias is semi-fixed and is obtained from the drop across the speaker field in the negative leg of the power supply.

A sketch of a condenser unit is shown directly below the 2A3 tubes. The values given for the condensers are correct. In a previous Atwater Kent supplement, the .001- and .008-mfd condensers are interchanged. The supplement should be corrected to agree with the connections shown here.

The i-f transformers in this receiver are peaked at 472.5 kc.

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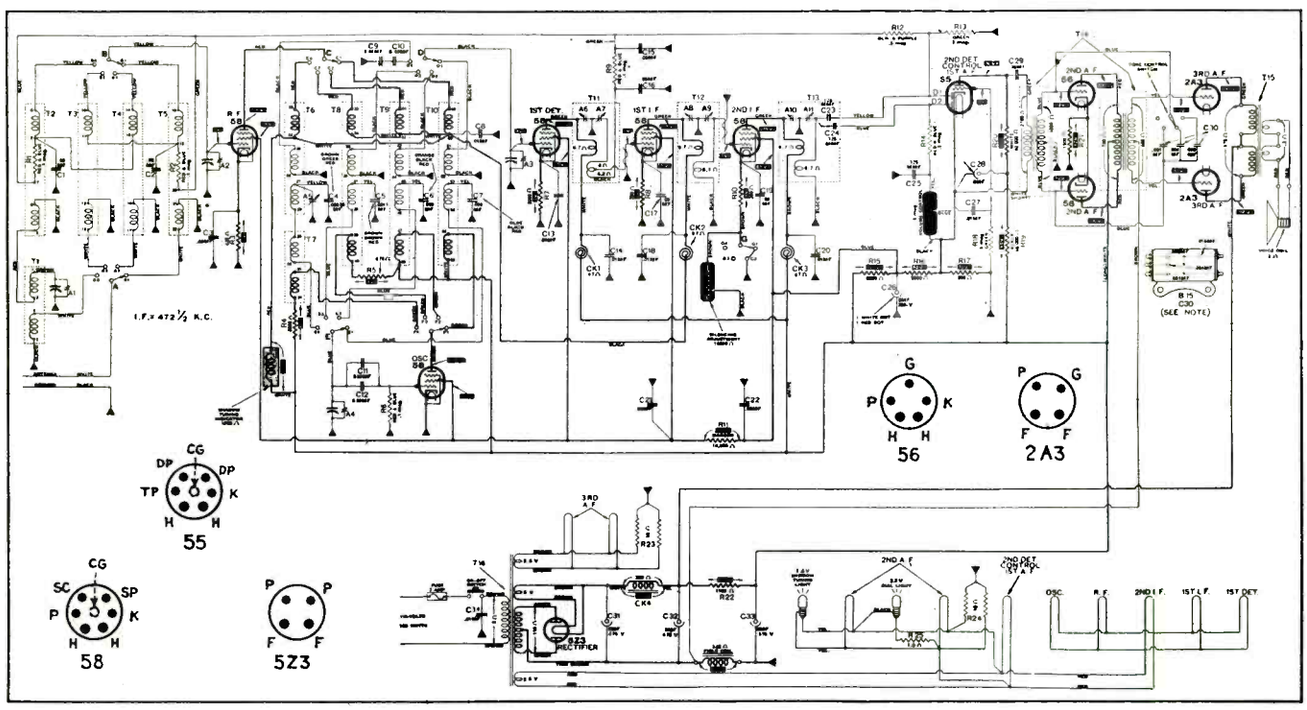
Emerson Models and Peaks

The Emerson Universal Compact, Model 375-LW and Model 375-M receiver uses chassis W-6-L. The i-f transformers are peaked at 125 kc.

The Model 77 receiver uses chassis Model M-AC-7. It will be found that these chasses with serial numbers below L-129,240 employ a type 55 tube as second detector. These sets are peaked at 175 kc. Chasses with serial numbers above L-129,240 use a type 2A6 as second detector. These sets are peaked at 172.5 kc.

Receiver Models 415 and 416 use the Universal Compact chassis Model V4-LA. This is a tuned r-f job.



Circuit of Atwater-Kent 711 All-Wave Receiver

Emerson D-AC-5

This is a 5-tube broadcast and short-wave chassis and is used in the Model 26 receiver. The bands covered are 100 to 200 meters and 200 to 550 meters.

A glance at the accompanying diagram will show that the now much-used system of paralleling coils is used in the wavechanging arrangement. That is, when the switches are closed, two coils in the secondary circuit of the antenna transformer and two coils in the tuned oscillator circuit are connected in parallel. This decreases the inductance in each case and thereby reduces the range of the tuning system. When the switches are open, the additional coils are left floating.

The circuit is seen to consist of a type 58 mixer-oscillator fed by the antenna through a band-pass filter. The bias on this tube is not controlled.

The 456-kc output of the mixer is fed into a second 58 tube in the i-f circuit. The cathode of this tube is in series with the volume control which both alters the bias on the i-f tube and the impedance of the antenna circuit. The range of the bias control is increased by employing the arm of the volume-control potentiometer as the return circuit for the power supply—that is, some current is bled through the 100,000-ohm and 15,000-ohm resistors between the filament of the 80 rectifier and the volume control. This increases the voltage drop.

A type 57 tube is used as a biased detector. This is resistance coupled to a type 47 pentode the grid bias for which is obtained from the drop in voltage across the resistor network paralleling the speaker field. The field, you will note, is in the negative leg of the power supply.

The voltage readings given are based on a line voltage of 117, and were taken with a 1000-ohms-per-volt meter. Take readings with volume control full on and antenna wire grounded to chassis. The voltage across the speaker is 90 volts.

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OHM- AND OUTPUT METER

(*Continued from page* 90)

mended is an 0-1 mil although the one actually used was a discarded 0-115 mil thermo-galvanometer from which the thermo-couple had been removed. It has a full-scale deflection for about 800 micro-amps and low internal resistance. For the resistors, it is suggested that one-watt, wire-wound, precision type, be used. If these are not obtainable, they may be made by winding resistance wire on prepared forms. In the apparatus shown, R-2 was made by using the rear section of a 3800-ohm Victor volume control, the resistance being adjusted to the correct value (3100 ohms) by means of the contact arm. R-4 was secured from a Radiola 28 volume control, a few turns being removed to bring the value to the required 315 ohms. R-3 and R-5 were wound by hand with resistance wire taken from another discarded volume control, carbon resistors providing convenient mounting forms. The miniature rectifier will have to be purchased. S-1 is a single-throw toggle switch to control the filament of the 199 tube. S-2 is a double-throw toggle switch, which, in one position, connects the test battery in the plate circuit for all resistance measurements and in the other position, disconnects the plate battery and cuts in the rectifier, adapting the meter for a-c.

Operation of Apparatus

For resistance measurements, connect one test lead to the upper left hand pin jack and put S-2 in proper setting. Connect the other test lead to the next pin jack on the left. This adapts the meter for resistance measurement on the 100,000-ohm range. Short the two test leads and adjust the meter for full-scale deflection. The leads may now be connected to the unknown resistor and the deflection noted. If no perceptible deflection occurs, try the electronic range, transferring one test lead from the 100,000-ohm range to the megohm range, switching on the filament of the 199 tube and adjusting for full-scale deflection as above. If there is still no reading the resistor to be measured is open. Lower ranges are used in the same manner. On the low range, it may be necessary to readjust the meter rheostat R-2 due to the increased drain on the battery. This range should be used sparingly as the battery drain is 100 mils for full-scale deflection.

For a-c measurements, throw S-2 to the proper setting and connect the test leads to the pin jacks corresponding to the range desired.

General Notes

To those who may wish to experiment with other types of tubes, it might be well to point out that screen-grid tubes undergo a severe drop in mutual conductance if allowed to operate without any control-grid voltage, so this type of tube should not be used. In using other tubes of higher mutual conductance, a resistor for calibration purposes may be inserted in series with the grid. This will allow the measurement of extremely high resistances.

Calibrated dials for the lower resistance ranges may be secured from many radio stores. A reading of 3500, or some multiple thereof, should appear at half scale.

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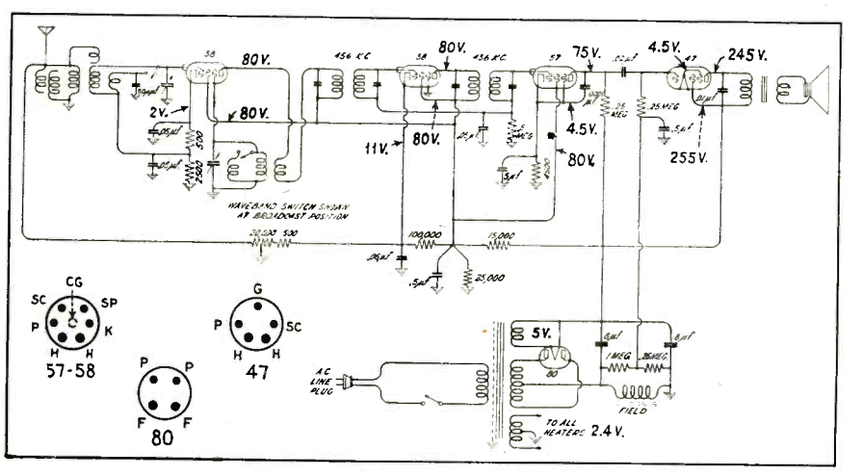
Testing 6A7's

A continuity test between some grids and the cathode of a 6A7 (or 2A7) tube checks out properly when the test is made cold. The same test with the tube warm—that is, with the heater energized, will give a substantial reading.

What happens is that the tube is functioning as a diode and the battery voltage of the continuity tester is sufficient to act as a "plate voltage." Thus, the d-c resistance is being measured between the cathode and one or another grid, and this is rather high for tubes of the 6A7 type because of the small space between elements.

The moral is—tubes such as the 6A7 and 6F7 should be tested cold for shorts between elements.

(*Short Wave Radio, pp* 45, *April,* 1934.)



The Emerson D-AC-5. Note that a type 58 tube is used as mixer-oscillator. Bias for the power tube is taken from the resistance network across the speaker field.

OSCILLATOR PERFORMANCE WITH PENTAGRID CONVERTERS

By ROGER M. WISE
Chief Tube Engineer,
Hygrade-Sylvania Corporation

THE oscillator circuit in receivers employing electron-coupled Pentagrid Converters, such as the 2A7, 6A7, and 1A6, requires very careful design if entirely satisfactory performance is to be obtained. This is particularly true in connection with all-wave models.

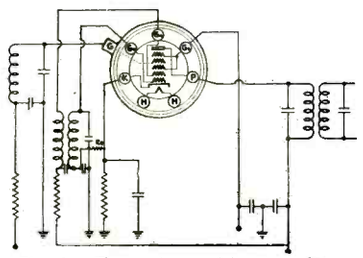


Fig. 1. The series padding condenser in the oscillator circuit provides uniform oscillation over the frequency band.

As is the case in any superheterodyne receiver, it is desirable to obtain as nearly as possible uniform oscillation strength over the whole frequency band. This is rather difficult in conventional types of circuits in which no compensation is incorporated, due to the fact that it is not easy to secure sufficient coupling at the low-frequency end of a given band without over-coupling at the high-frequency end. A very good means for checking the strength of oscillation over the frequency band is provided by a d-c microammeter inserted in the grid leak (Rg) circuit. The product of the current and the resistance will give a voltage proportional to the oscillator voltage.

Maintaining Uniform Oscillation

There are two methods commonly used for maintaining substantially uniform oscillation strength over the whole frequency band. These are shown in Figs. 1 and 2. The circuit shown in Fig. 1 incorporates a means for increasing the coupling at the low-frequency end of the band by utilizing the series padding condenser of the oscillator circuit for obtaining increased coupling at the low-frequency end of the band. This makes possible the use of an inductive feed-back at the high-frequency end, which is not sufficiently close to cause the generation of parasitic oscillations, while at the same time it allows sufficient feed-back at the low-frequency end to maintain a good degree of uniformity. This is particularly true for the domestic broadcast band where the series padding condenser used is of the correct value for maintaining proper alignment when intermediate frequencies in the range between 175 and 456 kilocycles are used.

It is not always thought desirable by the manufacturer to use a series padding condenser as shown in Fig. 1, and in those cases it is necessary to utilize some other method of maintaining uniformity of oscillation. This is particularly true when specially shaped condenser plates are used in the oscillator section as is quite often done.

Using Suppressor

The strength of oscillation at the low-frequency end is considerably weaker than at the high-frequency end of the band. If adequate coupling is used to bring the low-frequency oscillation strength up to a sufficient value, parasitic oscillations are quite apt to occur at the high-frequency end due to over-coupling. An interesting circuit (Fig. 2) shows a very satisfactory means of overcoming this condition by inserting a suppressor resistor Rs of 500 to 1000 ohms in series with the oscillator grid. This will reduce the strength of oscillation at the high-frequency end due to the fact that the capacity reactance of the input circuit decreases as the frequency increases. This limits the oscillator amplitude at the higher frequencies to a greater extent than at the low-frequency end of the band.

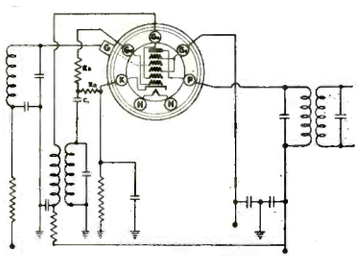


Fig. 2. In this circuit uniform oscillation over the frequency band is obtained by the use of the suppressor resistor Rs.

Low Plate Voltage

An additional point of interest in connection with the tube performance is revealed by the fact that greater ease in starting oscillations may often be secured by returning the grid leak to ground instead of to the cathode. With changes similar to those indicated above, type 6A7 tubes, which required at least 150 volts on the oscillator anode under the old conditions, require an anode voltage of only 25 volts to give satisfactory performance in the circuit of Fig. 2.

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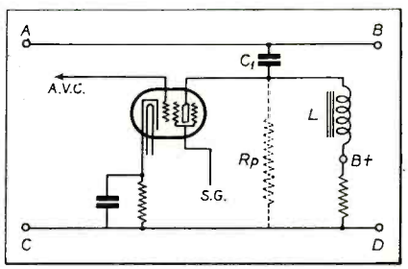
New Automatic Tone Control

The circuit of an automatic tone control and noise suppressor was shown on the front cover of the January issue of Service. This arrangement is based on a variation in capacity.

Another arrangement, based on a change in resistance, is shown in the accompanying diagram. It is known that the plate resistance of a tube can be altered through rather wide ranges with a change in grid voltage. In the accompanying diagram the resistance of the tube is indicated as Rp. The lines



Another automatic tone control circuit. The signal varies the plate resistance of the tube and thereby governs the by-passing effects of condenser C-1.

A-B and C-D represent the audio-frequency circuit. C-1 is a bypass condenser and L a choke with a very high value of inductance.

It can be seen that the condenser C-1 cannot bypass any audio frequency through the choke L since its value is too high. Nor can this condenser bypass through Rp, the plate resistance of the tube, if this value is also high. However, if the value of Rp is reduced, condenser C-1 will become effective, and the greater the reduction of Rp the more audio frequency will be bypassed.

Now it so happens that if a high value of negative bias is placed on the grid of the tube, the plate resistance will be high. Therefore, if the grid of this "ATC" tube is connected to the negative end of the diode load resistor in the receiver, the plate resistance of the "ATC" tube will be high when the signal voltage is high. Under these conditions the condenser C-1 cannot bypass. However, when the signal voltage is weak the negative voltage on the grid of the "ATC" tube will be less and therefore the plate resistance will be less. Condenser C-1 can then bypass a-f through Rp.

The result is that when the signal is strong the audio-frequency is not attenuated—but much of the high audio frequencies is bypassed or cut off when the signal is weak. Under conditions of no signal, the bypassing of condenser C-1 will be maximum and this means that the major part of the background noise is eliminated when tuning between stations.

(*Receiver Design Trends, Radio Engineering, pp 9, February*, 1934.)

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General Electric K-126

This receiver uses tapped coils and covers the broadcast band, and from 1,400 to 2,800 kc in the high-frequency band. With the wave-selector switch contacts closed, a part of each tuned coil is shorted.

The Circuit

The input circuit is designed to be used with or without a shielded antenna system, an extra post being provided for this purpose. The 58 r-f amplifier feeds the type 56 first detector which has a pickup coil connected in its cathode circuit, this coil being coupled to the circuit of the type 56 oscillator tube.

The i-f output of the first detector is 175 kc. This signal is divided between two type 58 tubes, one of which is the i-f amplifier and the other the AVC amplifier. The AVC i-f signal is fed to the type 56 AVC tube through a broadly tuned i-f transformer and the rectified voltage fed back to the r-f tube, first detector, and i-f amplifier tube, the bias voltages being correctly apportioned by the resistors R-11, R-12 and R-13.

Silent Tuning

Silent tuning is provided automatically in the amplified AVC circuit by the action of the 58 AVC i-f tube and the AVC tube. Note that the grid of the 56 AVC tube is connected to the ground and the cathode connected to the voltage divider 12 volts above ground. This makes the control grid —12 volts in respect to the cathode. A high negative bias is placed on the grids of the r-f, first detector and i-f tubes under conditions of signal, but this bias is not effective until a signal is tuned in at which time the 58 AVC i-f tube is able to develop sufficient voltage to overcome the negative bias on the 56 AVC control grid.

The type 58 i-f amplifier tube feeds the type 55 second detector employed as a straight diode. The output of the diode feeds the control grid of the triode of the 55. The control grid is diode biased, the bias therefore depending on the signal voltage.

Compensated Volume Control

Between the output of the 55 triode and the two 56 drivers in push-pull is located the compensated volume control which is made up of a potentiometer, two condensers and the reactor L-14. Following this is the treble tone control, and in the grid circuit of the driver stage is the bass tone control.

The 56 drivers are coupled to two push-pull type 59 tubes operated Class B, the undistorted output being ten watts.

R-F and I-F Adjustments

The sketch of Fig. 2 shows the locations of the various adjustable condensers. Four condensers are provided for aligning the r-f circuits and adjusting the oscillator frequency so that the oscillator will maintain a constant frequency (175 kc) difference from that of the incoming signal. Poor quality, insensitivity, poor AVC action and possible inoperation may be caused by improper adjustment.

When adjusting the r-f and oscillator circuits, a dummy 56 tube should be substituted for the type 56 AVC tube. This should be a tube normal in all re spects but with one heater prong removed.

The output meter should be an 0-10 milliammeter and should be connected in series with the plate supply for the second detector. In all adjustments, work towards a *minimum* deflection on the meter, rather than maximum.

Set Range Switch counter-clockwise and adjust the gang condenser trimmers with oscillator and set tuned to 1,400 kc. The high-frequency band is adjusted at 2,400 kc. This is done in a similar manner to the r-f adjustments except that the oscillator is set at 2,400 kc, the dial at 1,200 and the Range Switch in clockwise position. The line-up condensers on the Range Switch are also adjusted at this frequency.

Then set oscillator and receiver at 600 kc and adjust the 600-kc series conden-

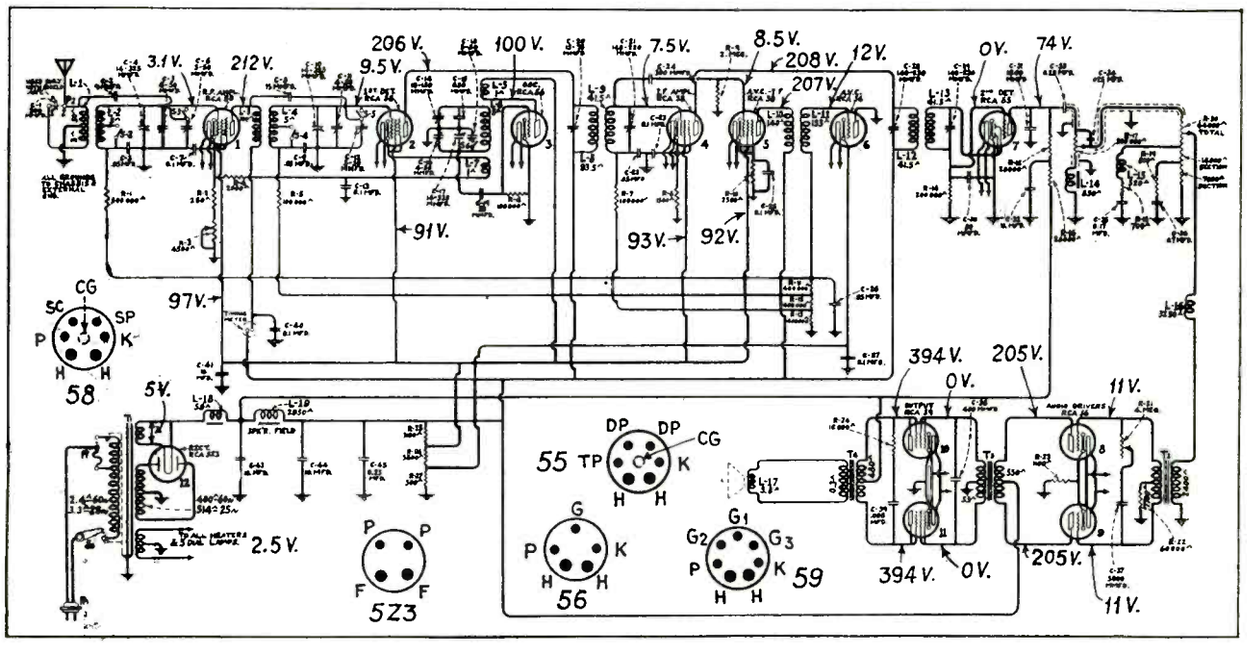


Fig. 1. Circuit of the General Electric K-126 receiver, with Class B output.

ser, rocking the gang condenser back and forth through the signal. Then readjust at 1,400 kc as previously outlined.

In adjusting the i-f transformers to 175 kc, use the dummy 56 in the AVC socket, and remove the oscillator tube. Also make a good ground connection to the receiver chassis. Adjust secondary and primary of second i-f transformer first. When all i-f adjustments have been made, go through them a second time.

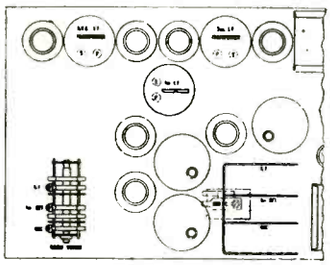


Fig. 2. Chassis view of the G.E. K-126, showing location of trimmers.

The voltages given in the diagram are based on a line voltage of 120. Take all readings with volume and sensitivity controls at maximum and no signal being received.

•

RCA Victor I-F Peaks

In the table below are given the intermediate frequencies used in the new RCA Victor receivers.

Model	*I-F Peak*
AVR2	175
102	TRF
221	370
301	460
320	370
340	445
340-E	445
380	175

The AVR2 is an Aircraft Beacon Receiver.

•

Sentinel I-F Peaks

The intermediate frequencies used in the new Sentinel receivers are as follows:

Model	*I-F. Peak*
501	465
502	465
599	262
602	265
623	465
624	465
634	465
635	465
660	465
5,100	465
1,046	465

The Model 602 is an auto-radio receiver.

ALL-WAVE TUNING SYSTEM

(See Front Cover)

The new Emerson Model S-755 All-Wave Receiver employs a very interesting arrangement of tuning on the various wavebands. The circuit of this portion of the receiver is shown on the front cover.

First take a look at the antenna circuit. It will be seen that there is but one position of the wave-change switch where the variable condenser shunts the tuning coil. That is position 4, which is the broadcast band. This is a normal condition. However, when the switch is thrown to position 3, the variable tuning condenser is entirely out of the circuit! But, the other circuits are now adjusted for a shorter waveband, and at these shorter waves or higher frequencies, the impedance of the tuning coil is much greater. Therefore, with the switch in position 3 the tuning coil functions as an untuned impedance. The circuit, in other words, is aperiodic.

Capacity Coupling

Now, with the switch at point 3, the short-wave signals are fed to the grid of the r-f tube through *two* fixed condensers, connected in series. The first condenser has a value of .002 mfd and the second one a value of 10 mmfd. With the two in series, the value of the larger of the two is considerably reduced to meet the frequency requirements.

When the wave-change switch is thrown to either position 2 or position 1, the 10-mmfd condenser is out of circuit, and the variable tuning condenser, too. The tuning coil still functions as a high-impedance choke. The series capacity between antenna and grid of the r-f tube is now .002 mfd. This provides the increased capacity coupling desirable on the shorter wavelengths.

Now let's take a look at the coupling system between the r-f tube and first detector. Note that the coils in the plate circuit of the r-f tube are not tuned. *These are r-f chokes,* which present a high impedance in the plate circuit and therefore increase the gain of the tube.

Choke Impedance

An r-f choke has two very important values—inductance and distributed capacity. The more inductance, the greater the impedance the choke presents to a signal of given frequency. However, to get high inductance we need more wire, and the more wire we add, the greater becomes the distributed capacity. At low radio frequencies—550 to 1500 kc—this distributed capacity is negligible and therefore does not bypass much signal, or, to put it another way, it does not decrease the impedance of the choke to the signal to any marked degree. But, when we get up to the high frequencies this very same value of distributed capacity makes the r-f choke like a sieve, with the result that all the beautiful impedance built up by adding more wire is of no value.

So what? If we decrease the number of turns in order to decrease the distributed capacity, we also considerably reduce the inductance or impedance. But, the impedance of a given inductance is greater at high frequencies than it is at low frequencies. So there is no worry, after all.

Emerson therefore uses a tapped r-f choke, so proportioned that the impedance offered to signals in each waveband is approximately equal. When the wave-change switch is at point 4—the broadcast band—all four r-f chokes are in circuit. When the switch is moved to point 3, the lower choke is shorted out, and so on to point 1, where only the top choke is in circuit and the others are shorted.

Tuned Grid Circuit

Now let your eye wander over to the tuned grid circuit. This is more like home, as things are quite natural. Since the rotor of the variable condenser is grounded, the whole tapped coil is in circuit when the switch is at point 4. When the switch is at point 3, the lowest part of the tapped coil is shorted, for its low end also connects to ground, as does the switch arm. And so on, up to point 1, where only the very top part of the coil is tuned by the variable condenser, all other sections being shorted.

A similar arrangement is used in the oscillator circuit. Since all switch arms are connected in tandem, the whole business of wave changing is accomplished by one knob.

•

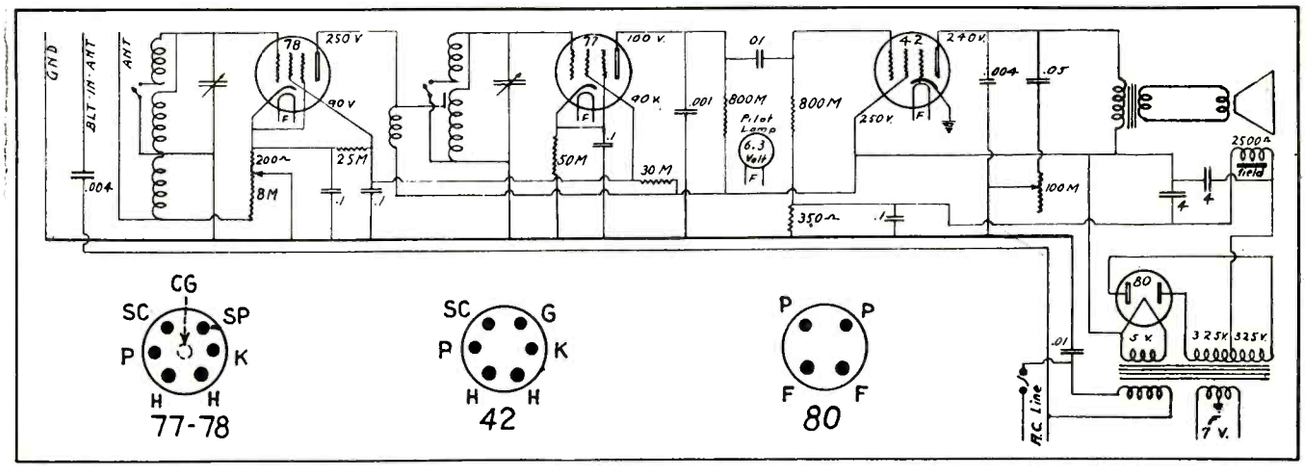
Crosley 120 Inoperation

Very unsatisfactory operation of Crosley Model 120, and later inoperation over section of dial between 800 kc and 550 kc. The dynatron oscillator not working.

Traced trouble to an oxidized flat-headed screw and stationary plate of the padding system for the low-frequency end of the oscillator. Poor contact effected by temperature.

Cleaned all contacts and placed a washer under the flat-headed screw to put tension on the contact after screw was tightened down. Trouble cured.

Robert G. Gedye,
Oglesby, Ill.



Circuit diagram of the Knight (Allied Radio) Model R Receiver.

Knight Model R.

The Model R Knight receiver (Allied Radio) uses chassis F9521. The accompanying diagram of this receiver is for chasses carrying serial numbers 32001 and up.

The receiver covers the broadcast and police bands. These bands are selected by a tandem switch, one part of the switch being in the secondary circuit of the antenna transformer and the other section being in the secondary circuit of the r-f transformer between the type 78 r-f tube and type 77 detector tube. When this switch is thrown to the left, the contact points of both sections are closed, thus placing the upper secondary coils in parallel with the lower secondary coils. This reduces the inductance of each transformer.

When the tandem switch is thrown to the right the contacts are open and the upper secondary coils are left floating. A further movement of this same switch controls the tone of the receiver. In other words, the tone control in the plate circuit of the type 42 power pentode is on the same shaft as the wave-change switch.

The receiver has a built-in antenna consisting of a connection to the a-c line through a .004-mfd fixed condenser. When it is desired to use this antenna, its lead is connected to the regular antenna lead.

Phonograph Installation

Should a customer desire to use the receiver for phonograph reproduction, use a single pole switch mounted as near as possible to the detector socket and connect it in series with the lead from the ground end of the grid coil of the detector tube. Then solder the phonograph pickup leads to the switch terminals. With this arrangement the pickup will be shorted when the switch is closed and in series with the grid coil lead to ground when the switch is open for phonograph reproduction.

To align, take chassis from cabinet, feed a 1400-kc signal from test oscillator into the antenna lead and adjust the trimmers on the gang condenser for loudest signal.

All condenser, resistor and voltage values are given on the diagram. Read voltages with the volume control in the cathode circuit of the 78 r-f tube full on.

•

Slide-Wire Resistors

Replacement resistors with adjustable taps save a lot of time and trouble when it is necessary to install a new voltage divider. However, the Service Man should not forget that heat causes oxidation and that sooner or later trouble will again develop in the voltage divider at the tap contacts unless they are soldered at the time of replacement.

After the correct positions for the taps have been determined, they may be soldered to the wire. Great care must be taken in doing this, else the resistance wire or the insulating base will be damaged. Also make sure that the solder is confined to the point of contact and does not flow over a number of turns of the wire, thereby reducing the resistance.

•

Galvin J-8 Lazy Boy

The Galvin Model J-8 Lazy Boy should not be operated without the pilot light as it is a part of the series filament circuit and will result in low filament voltage.

This receiver uses two 6D6 tubes as r-f and i-f amplifiers, a 6A7 as mixer-oscillator, and a 75 as diode detector, AVC and a-f amplifier. These tubes and the associated equipment are in a small table cabinet. The 25Z5 rectifier and 43 power pentode are mounted in a larger cabinet with the dynamic speaker.

Trouble Shooting

If the tubes fail to light, one of the following may be the cause: (1) Open filament in any tube in the set (filaments are in series). (2) Burned out dial light, as the dial light is also in this series circuit. It is necessary that it always be in operation to get the proper voltage of the tube filaments, as explained above.

Excessive hum may be due to a defective filter condenser or a defective tube. Low volume or distortion may be due to a defective speaker, defective 25Z5 tube, defective 43 tube or a partially shorted filter condenser. If there are no opens, low volume may be due to a defective r-f coil, shorted antenna, defective i-f coil, set out of alignment, or a weak 6D6 tube.

•

12A7 Characteristics

This is the tube used in the International "Kadette Jr." receivers. The socket connections will be found on page 433 of the December issue of Service.

It will be recalled that this tube is a combination half-wave rectifier and power pentode. The common heater operates at a voltage of 12.6 and draws 0.3 ampere. The plate voltage for the rectifier is 125 and the average output is 30 milliamperes.

The pentode operates with a plate and screen voltage of 135, grid bias of 13.5, and has an amplification factor of 100. The plate resistance of the pentode section is 102,000 ohms. Under normal operating conditions, plate and screen voltages for the pentode are lower than mentioned above.

Auto-Radio . . . .

Zenith Model 462

This receiver is for general use in any make car. A similar receiver, but using a type 6D6 tube as r-f amplifier, is especially designed for the Hudson and Terraplane cars. The receiver model numbers are 650-HD, 651-HE, 660-TD and 661-TE.

The Circuit

In the Model 462 a type 6C6 tube is used in the r-f stage, as shown in the accompanying diagram. This is coupled to a 6F7 mixer-oscillator which in turn feeds a 6D6 i-f tube. The i-f amplifier works into a 75 used as a half-wave diode. The diode circuit provides automatic volume control voltage for the grids of the r-f tube, mixer of the 6F7 and i-f tube. The triode portion of the 75 tube is biased by the drop in voltage across the cathode resistor. The volume control is in the grid circuit. The 75 triode is resistance coupled to a 42 pentode, the grid bias for which is provided by the drop across the filter choke in the negative leg of the power-supply circuit.

The power-supply unit uses a vibrator transformer and either a 6Z4 or an 84 tube as full-wave rectifier.

The sensitivity of the receiver is one microvolt. The power consumption is 40 watts at 6 volts. The power output is 2500 milliwatts.

Alignment

The receivers are balanced at the factory on accurate crystal-controlled oscillators, so don't try readjusting unless it is quite evident that the receiver needs it.

Before attempting to make any adjustments, the dial indicator must be set to 540 kc with the tuning condenser plates in full mesh. This is done as follows:

(1) Turn control toward the left until the stop is reached.

(2) Remove tuning knob.

(3) Loosen two set screws in tuning shaft bushing (under knob).

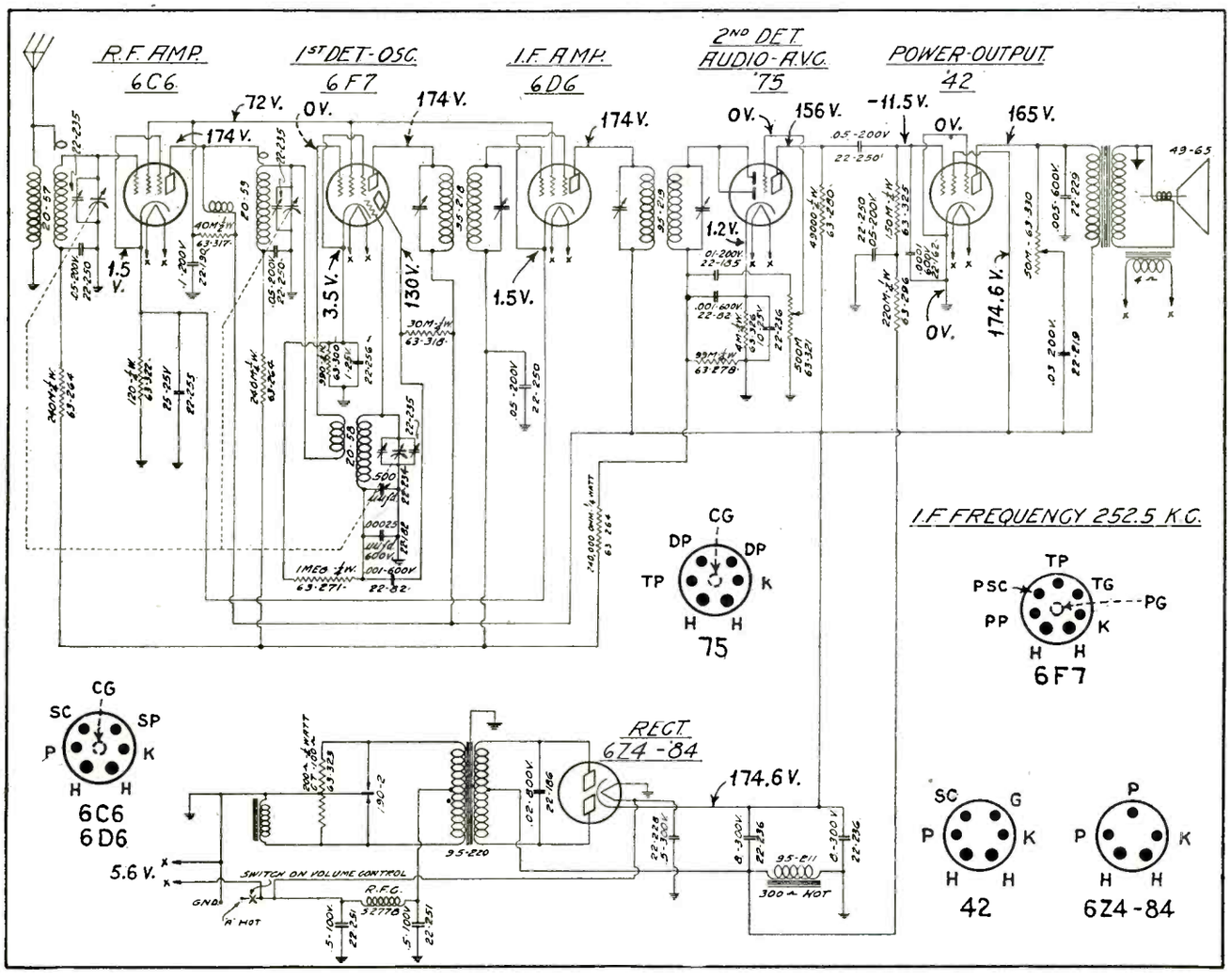
(4) Turn bushing until dial reads 540 kc.

(5) Tighten set screws and replace tuning knob.

To balance the i-f circuit, remove the grid lead from the 6F7 and connect the test oscillator (set to 252.5 kc) to the grid of the tube and to ground. Adjust the first i-f primary trimmer to maximum output from either the speaker or an output meter. Follow in the same manner with the secondary, and the primary and secondary of the second i-f transformer. This completes the i-f circuit. Place the grid lead back on the 6F7 tube.

Next attach the test oscillator to the antenna and ground leads and set it at 1500 kc. Turn the dial indicator to 1500 and adjust the oscillator, detector and r-f trimmers, on the condenser gang, for maximum output. Set the test oscillator to 600 kc and rock the pointer slowly over the same frequency on the

(*Continued on page* 102)



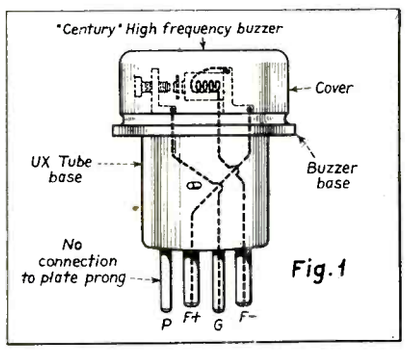
ON THE JOB . . .

Handy Test Buzzer

A very handy test unit, with a number of unique features, can be made from a good high-frequency buzzer. When used with a headphone, it will provide an audible indication in a continuity test and may even be used to test certain condenser values.

CONSTRUCTION

Referring to the sketch of Fig. 1, the buzzer is mounted on and connected to the filament and grid prongs of a UX tube base to be plugged into the '26



Details of Test Buzzer.

tube test socket of any type of tube tester, and is operated on the 1.5-volt a-c filament source of the tube tester power supply.

The external test connections are made either from the grid and the negative filament terminals of an adjacent tube testing socket or from extra pin jacks on the tester, according to the design of the tube tester being used. If desired, the unit can be made into a portable device having its own power plant, consisting of a 110-volt transformer with a 1.5-volt secondary.

OPERATION

The buzzer operates by virtue of the alternating-current flux through the coils, causing the vibrator to move at double the same frequency. Thus, the external test circuit is alternately opened and closed across the 1.5-volt drop through the buzzer coils by the action of the vibrator on its contact, the buzzer winding being in effect an auto-transformer of 1 to 1 ratio. No measurable current flows through the contacts and therefore no sparking occurs to pit them and spoil the adjustment.

For quick tests and tracing circuits, this unit is more convenient than a meter because one need not look up from the test probes as one does when the indication is visual.

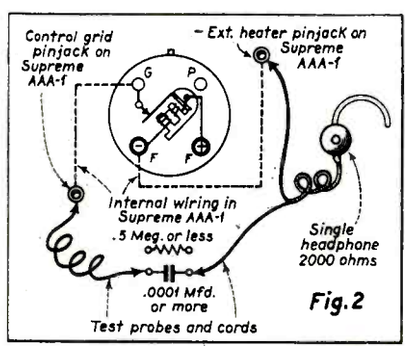
TESTING

The unit may be used to test through capacitance, inductance and resistance with equal facility, for it will give an audible indication through capacities smaller than .0001 mfd and through resistance as high as 500,000 ohms. In fact, the difference between, say, .0001 mfd and .000125 mfd can be discerned by listening through first one and then the other. The same, of course, is true with resistance, so that in either case it is possible to judge whether a value is low or high.

When properly adjusted and connected, the unit is absolutely silent until the circuit is completed through the test probes. Hence the operator can easily learn to spot intermittent opens or shorts in condensers and resistors.

Concealed wires within a wall or cable can be located by means of a search coil. This requires two headphones, one of which has the diaphragm removed. They are simply connected together in a closed circuit through both phones. The buzzer signal is applied directly through the wire which one wishes to locate. The same principle may also be used to locate the point of a short or cross in a multiconductor cable.

The writer uses one of these buzzer units in connection with a Supreme AAA-1 Diagnometer. In this case the upper limit of resistance through which the signal can be heard is greater than



Connections of Test Buzzer when used with Supreme AAA-1 Diagnometer.

5 megohms, but it is necessary to move the side of the headphone formerly connected to "Neg. Ext. Heater" pinjack to either the "Sp. Ch." pinjack or to the negative output pinjack, as shown in Fig. 2.

LIMITATIONS

This device naturally has limitations, and it is important that the operator know these in order to get maximum efficiency from its use. It will not distinguish between values of high capacity—above about 0.5 mfd, or values of resistance below about 5,000 ohms. Neither will it show a defective condenser shunted by an inductance or resistance—or vice versa, if the shunting condenser is greater than 0.25 mfd.

M. K. BARBER,
Third Signal Service Co.,
Fort Ethan Allen, Vt.

•

Replacing Majestic Drive Cable

The writer spent the best part of a day replacing his first Majestic Model 70 drive cable. He now does the same thing in twenty-five minutes, including removing from and replacing the chassis in cabinet.

Here's the routine: Plug in soldering iron. Remove knobs from front of set. Remove chassis bolts. Swing chassis around in cabinet so that heavy end stays in its compartment, and end where tuning condensers are extends outward from rear. Note here that cables to speaker and power pack are *not* removed.

Now remove three screws and lift off shield over tuning condensers. Take out the three hex screws holding bathtub to chassis.

Soldering iron is now hot. Unsolder four wires to condenser stators, and one ground wire. Unsolder dial light wires at dial light. Remove bathtub and cut off old cable. Start new cable on wheel at center. Put end eyelet over pin on rear drum and wind cable on front drum, being sure *not* to carry over idler pulley. Secure under screw. Cut off eyelet and then put cable over idler pulley. This takes up the slack.

Replace all parts in reverse order and the job is done before you know it.

P. W. HUTCHINS,
1902 *Tilden St.,*
Jacksonville, Fla.

•

6C6 in Supers

In servicing some supers using a type *77* as mixer-oscillator, I have found that this type of tube often fails to oscillate even when everything checks properly. Replacing the *77* with another may or may not rectify the situation. I have found, however, that replacing the *77* with a type 6C6 the set will invariably work properly again, as was also found true when the oscillator seemed dead only on certain parts of the band.

It has been noted that this procedure seems necessary only on those a-c and d-c supers that are cheaply constructed.

W. KARDA,
246 E. 77th St.,
New York, N. Y.

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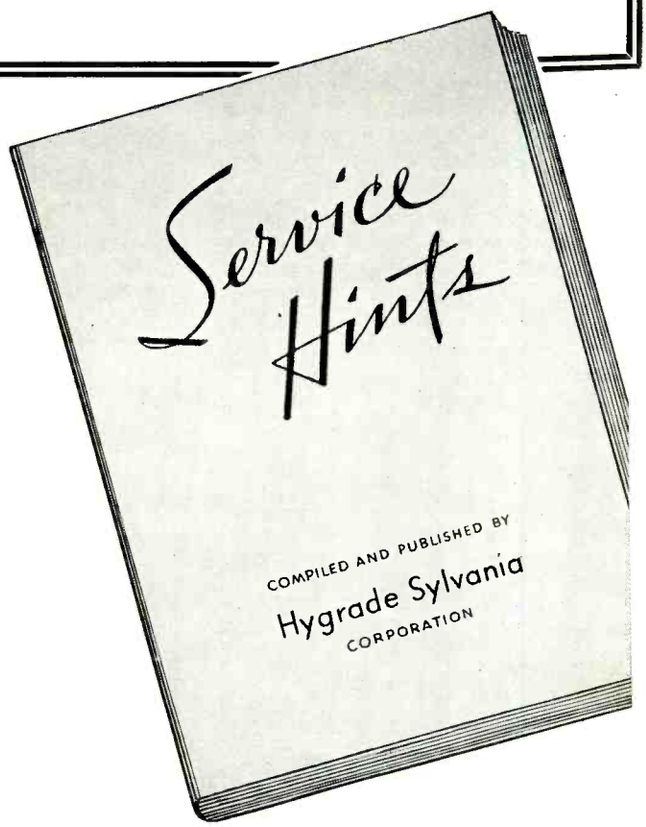

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TYPE 42'S AND 2A5'S AS "AB" AMPLIFIERS

Though the types 42 and 2A5 tubes are pentodes, and were originally designed to be used as pentode power amplifiers, they are perfectly swell when operated as triodes in a Class "AB" circuit, which is like Class A Prime. They are made to operate as triodes by connecting the screens to the plates.

The type 42 tube is the 6-volt version of the 2A5, so that both types may be treated as the same tube. The principal difference lies in the heater-supply voltage.

RCA Radiotron Co., and E. T. Cunningham have provided some real data on the above mentioned tubes in "AB" circuits. They state that the 42 or 2A5 when used as a triode in a push-pull amplifier will give good power output and low distortion. Examples of the use of the 42 used in this manner will be found in the circuit of the Stromberg-Carlson No. 64 on page 47 of the February issue of SERVICE, and the Philco Model 17, on page 314 of the September 1933 issue of SERVICE. Both these receivers are capable of delivering from 10 to 15 watts of power with low distortion.

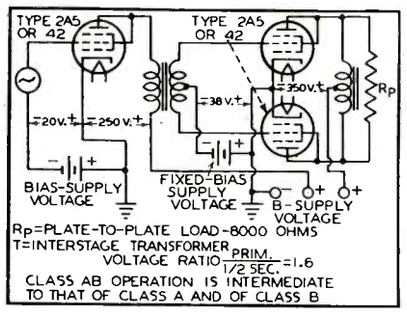

Fig. 1. Circuit of Class "AB" amplifier with a fixed bias supply. This arrangement will give the largest output.

TABLE I

Plate Voltage (max.)	250
Grid Voltage	—20
Plate Current (ma.)	31
Mutual Conductance (m-mhos)	2,300
Plate Resistance (ohms)	2,700
Load Resistance (ohms)	3,000
Power Output (m-w)	650

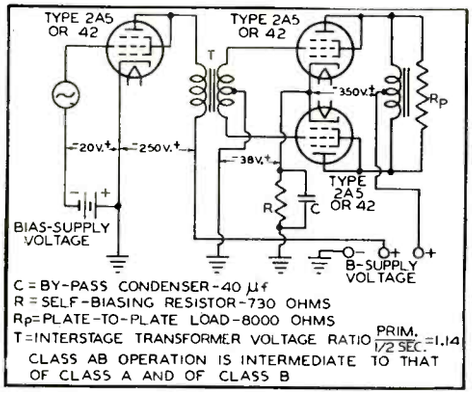

Fig. 2. In this Class "AB" amplifier circuit, self-bias is used. That is, a cathode bias resistor. This arrangement will not give as much output as the amplifier arrangement shown in Fig. 1, but is still very satisfactory.

BIAS SUPPLY

The amplifier shown in Fig. 1 has a fixed bias supply. The greatest power output is obtained with this arrangement. This represents the ideal case because the fixed bias from the low-resistance battery minimizes degenerative effect.

The amplifier shown in Fig. 2 employs self-bias—that is, bias is supplied by the drop in voltage in the cathode resistor, R. In this case sufficient capacity is used across the cathode resistor to reduce its impedance to a negligible value and thus reduce degenerative effects.

Ordinarily, the power output will be somewhat less with self-bias, because this arrangement generally has the poorest regulation. The maximum output will be about 14 watts whereas the total output with fixed bias will be about 18 watts.

When the grid-bias voltage is taken from the power-supply voltage divider (semi-fixed bias), or from a self-biasing resistor as shown in Fig. 2, the power output is reduced for two reasons. These are (1) that the bias voltage fluctuates due to changes in d-c plate current with signal and (2) that the bypassing of the a-c component around the biasing resistor may be inadequate. The semi-fixed bias will give results between the fixed- and the self-biased arrangements.

DESIGN DATA

It will be noted that in both Fig. 1 and Fig. 2 that either a type 42 or 2A5 is also used as a triode in the driver stage, with screen tied to plate. A driver is necessary, as Class AB operation is between Class A and Class B, and the amplifier operates in an over-biased condition. Power is therefore required to drive the push-pull tubes.

For either the circuit of Fig. 1 or Fig. 2, the driver tube should have a plate voltage of 250 and a grid voltage of —20. The power tubes should have a plate voltage of 350 and a grid voltage of —38.

For fixed bias, the driver plate load is 24,600 ohms, and for self-bias, 25,200 ohms. The plate-to-plate load for the power tubes should be 8,000 ohms in either case.

CLASS A TRIODE OPERATION

Many may wish to use the 42 or 2A5 as a Class A triode for specific purposes. The characteristics for this manner of operation are given in Table I.

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Correction

In the article, "Using 2A3 Tubes in Power Amplifiers" on page 20 of SERVICE for January, the circuit of Fig. 2 shows the plate supply for the type 56 tube connected to the left-hand (high voltage) side of the choke L-3. This is not correct and obviously places too high a voltage on the plate of the 56. The connection should go to the right-hand side of the choke L-3, at which point the voltage is approximately 200.

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ZENITH MODEL 462

(*Continued from page* 99)

dial and at the same time adjust the padder condenser for greatest signal strength. All adjustments should be gone over twice, or more, to insure greatest accuracy.

The first i-f transformer is between the 6D6 and 6F7 tubes at the back of the chassis base. The second i-f transformer is just in front of the power-supply casing. Both transformers have screw-and-nut adjustments, the nut being the secondary and the screw the primary, in each case.

The trimmers on the gang condenser are as follows, from the front to rear: r-f, detector, oscillator.

•

Correction

On page 368 of the October, 1933, issue of SERVICE it was stated that the G. E. Model B-40 is the same as the RCA-40. This is incorrect.

The G. E. B-40 is the same as the RCA-Victor M-34.

NOW LET'S TALK ABOUT SOUND AMPLIFICATION
and how you can make money selling it

YOU men who are servicing the Nation's radios . . . who have been in radio since before AC-all-electric, and those of you who have come along since—you're the men who should be getting into this Sound Amplification business with both feet.

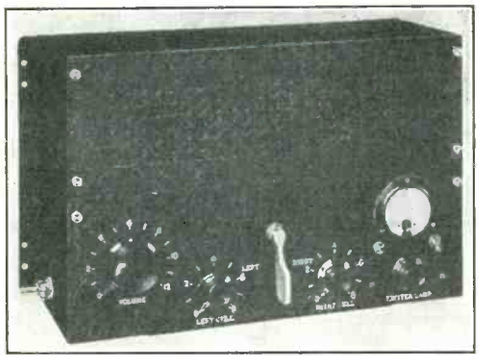
For, after all, Sound Amplification is a development of the radio industry of which you are such a large factor, just as talking pictures were a development of the radio business . . . and look where *it* is today.

Sound Amplification has hardly more than made its bow as an industry. The range of its selling possibilities has hardly been touched, but like many other things

WEBSTER, CHICAGO
AMPLICALL
For offices, industrials, Hotels and Institutions.

that are so close to us, we overlook them by their very nearness, there seems to be a big chance that the big sales . . . the big development in Sound Amplification selling will be accomplished by others than those who know the most about it now.

The Butcher, the Baker and the Candle-stick-maker, so to speak, are right now looking at this business to see what the possibilities are for them in getting into it. Arguments are being offered to a variety of businesses that there is a unit of sale they should



WEBSTER, CHICAGO
THEATER AMPLIFIER WR-85
For theaters seating less than 1000.

aggressively get behind. Editorial articles are being written to these various businesses along this line.

From where we sit, it might seem that we would be uninterested in who sold the units, or installed them or serviced them. We would probably sell the units anyway. But, we believe the service man is the most logical element of all for the building of this rapidly developing business.

You are better equipped with your knowledge and experience of the thing that made Sound Amplification possible—radio—to talk about it intelligently . . . to install it properly and to service it afterwards.

The WEBSTER COMPANY, CHICAGO has done business with you. The line of Sound Amplification units bearing our name has been developed to do for you what certain of the replacement parts have accomplished . . . provided you with units so complete, so absolutely free from the factors of uncertainty that you can confidently undertake to become the Sound Amplification merchandiser in your community if you choose.

Sound Amplification installing with WEBSTER, CHICAGO units presents you with the opportunity to develop your service business into a big thing. Not that servicing is not a job in itself. It's just that this is bigger. The unit of sale is larger and the profits are proportionate. Each installation is an advertisement for you in a big way.

Sound Amplification doesn't stop at Sound Truck or Car installation. It includes, with WEBSTER, CHICAGO equipment, every possible phase of reproducing sound in amplification from Industrial to Theater . . . in schools; in churches and assembly halls . . . outdoor and indoor; on main line current and off. And each unit has been designed and built to do the best job possible in its field without being extravagantly priced.

WEBSTER-CHICAGO selling helps, in the way of special bulletins for your assistance in further determining the exact unit for the prospective installation, are ready for you at the WEBSTER - CHICAGO authorized distributor, or from this office if you are not familiar with the distributor in your community.

THE WEBSTER COMPANY
3825 W. LAKE ST.
CHICAGO, ILL.

Send for complete catalog and name of your distributor now, while it is in your mind.

ASSOCIATION NEWS . . .

INSTITUTE of RADIO SERVICE MEN CONVENTION

The registration on the first day of the Second Annual Regional Convention of the Institute of Radio Service Men in Chicago last month was more than 800, which was very nearly equal to the total registration at the First Convention of the Institute held a little more than a year ago. Altogether, more than 1,200 radio Service Men, engineers, amateurs, distributors, dealers, broadcasters, manufacturers, manufacturers' representatives, and publishers visited the Second Convention and Exhibit, which was proclaimed unanimously the most outstanding meeting that has ever been known in the history of the radio service industry.

Well Represented

Representatives of every branch of the radio industry came from distances of 500 miles and more. There were two registrants whose homes are in Australia, and one whose home is in Paris, France. One engineer from Los Angeles arranged his return trip to be in Chicago at the time of the Convention. It was truly the cross-roads of the radio business for three days.

Technical Sessions

The afternoon technical sessions of the Convention were given over to the factory service managers or field engineers who made complete analyses of the circuits in current models of receivers. The evening sessions were devoted to technical discussions on topics of interest and value to Service Men and engineers.

Exhibitors Galore

Nearly sixty nationally known exhibitors displayed their products in the Exhibition Hall. Every leading instrument manufacturer was represented, as were most of the tube manufacturers. Set manufacturers, parts distributors, manufacturers of parts and accessories, and publications occupied the remaining display facilities.

The meeting of the Intersectional Committee on Standardization scheduled at first for Saturday morning was postponed until Sunday morning to enable delegates from outlying Sections and Chapters to make a tour of the studios of the National Broadcasting Company in the Merchandise Mart, and also to await the arrival of representatives from Sections and Chapters whose delegations had notified General Headquarters that they would be in Chicago on Sunday.

Intersectional Committee Meeting

The Intersectional Committee entered into a general discussion of the subject of Standardization and elected to include in the scope of the National Committee all matters that relate to technical information and design, matters that relate to the development of standard forms for keeping records of customers' devices, and matters that relate to interference.

It was voted that the actual organization of the National Committee should be held in abeyance for a period of two weeks in order that members at the meeting might have an opportunity to give more thought to the project and formulate ideas as to the best method of procedure. It seems at this time that the National Committee on Standardization will embrace Sub-committees on Technical Matters, Forms, and Interference, and that each Section and Chapter will have similar committees established in accordance with the National Committee.

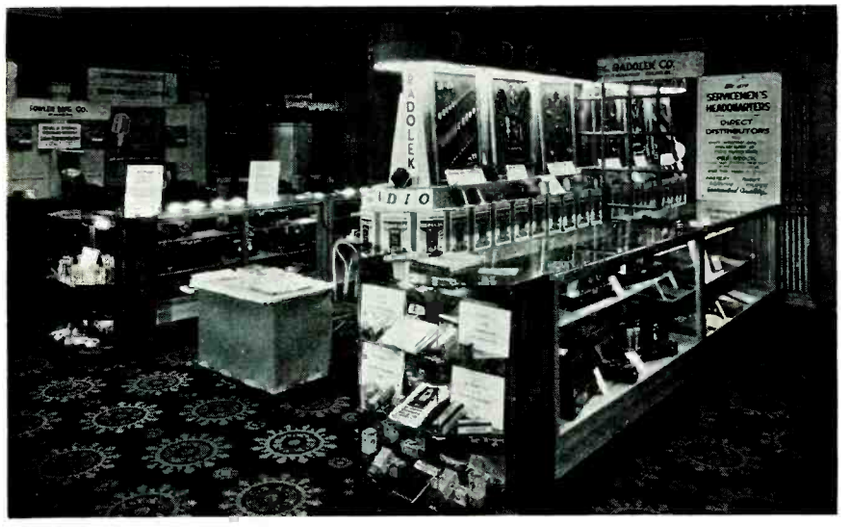
Interference Campaign

Publicity that had appeared in the Chicago papers relative to the points to be discussed by the Intersectional Committee, and which included a reference to the nation-wide activity on an interference campaign brought representatives of the interference department of the Commonwealth Edison Company and the Chicago Surface Lines to the Convention. Arrangements have been made for complete cooperation with the light company, and each of the delegates present at the meeting of the Committee was asked to get in touch with similar representatives of their local power companies to effectuate the work of the Sub-committee in every way possible.

Convention Great Success

Altogether, a great deal was accomplished at the Convention. It provided a meeting place for everyone and the ones who failed to avail themselves of the advantages afforded are most decidedly the losers. One of the most striking things about the whole show was the excellent display of cooperativeness. The utter absence of all things that create dissension and discord was the subject of comment from every side. The show was business-like in every respect. Everything ran with clock-like precision. Everyone enjoyed themselves; everyone who attended derived a lot of good in their own way.

Right at the close of the show, one of the leading tube manufacturers commented upon the fact that those who attended this Convention were here for business, and pointed out that as evidence thereof, there was not a piece of discarded literature upon the floor.



Here's what some of you fellows missed—view of a few of the booths at the recent I. R. S. M. Convention in Chicago. Note the windswept streamlining of the Radolek sign. It's all ready to take off.

I.R.S.M. Expands Offices

Visitors to the General Office of the Institute of Radio Service Men in Chicago will find that it has moved into enlarged quarters on the eleventh floor of the Boyce Building, at 510 N. Dearborn, in which building the office has been located for the last year and a half. The expansion of the organization and the increase in work necessitated by the various activities in which the Institute is engaged, necessitated the acquiring of the additional space.

I.R.S.M. "Region" Organization

The 20th Region of the Institute of Radio Service Men, embracing the greater part of the states of New York and Pennsylvania, is being organized, with the Rochester Section as the Key Section of the Region.

A Region in the Institute corresponds, in so far as possible, with the Federal Radio Inspection Districts, such changes being made as will enable the most effective supervision over the affairs of the radio service industry. An officer elected by the members in each Region will act as an officer of the General Organization, the entire lot of twenty such officers making up the Advisory Council. To make the organization more complete, two members elected from each Section within the Region will comprise a Sub-Advisory Council, headed by the officer in charge of the Region.

The establishment of the Regions will create a closer liaison between the Sections and Chapters in a personal way and will serve to advance the program of development of the service industry. It will also serve admirably in the control of fair practices that are in process of development under the code of fair competition for the radio service industry.

The Rochester Section is the first Section of the Institute to undertake the organization of a Region. It has made a remarkable, even an outstanding, record in the short time it has been in existence.

THESE ARE
Genuine
OHIOHM SUPPRESSORS

ACCEPT NO OTHER

Model WP (Plug)

Model Z (Universal)

Model WD (Distributor)

153,000 CAR MILES
Without a failure!

OHIOHM SUPRRESSORS

Have achieved such a record under conditions of 95% relative humidity, a temperature of 140° F., and connected in series to an ignition system operating at the equivalent of 60 M. P. H. for 2,550 consecutive hours.

Also Available in Complete Sets

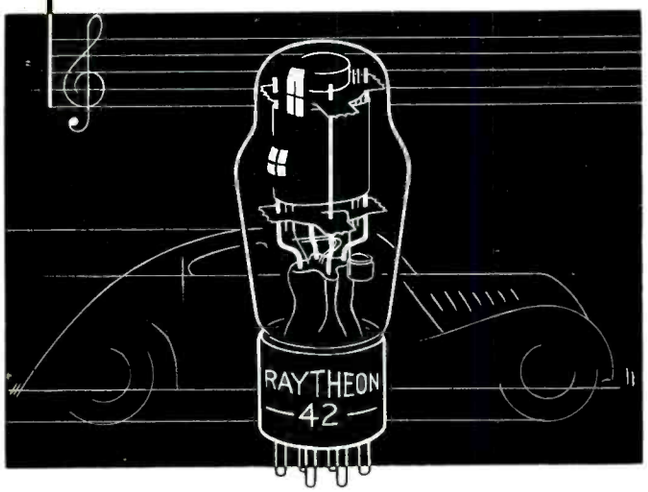
consisting of necessary suppressors and condenser to fit all makes of cars.

•

Get them from Your Jobber or directly from

THE OHIO CARBON CO.
12511 BEREA ROAD CLEVELAND, O.

ITS USE REFLECTS ITS CHARACTER



LIKE a human being, the character of a radio tube can be told by the company it keeps. If there is an integrity of purpose behind it, a superb skill in its manufacture, these will be reflected in its use in places where only the finest of precision instruments can be used.

Huge planes of the great continental transport companies, alert police cars on watch throughout the country, expeditions probing the farthest reaches of the earth, buy and use Raytheon 4-pillar Tubes because of their precision-construction, and because of the 4-pillar-support principle which guards this precision.

The automobile radio, now vastly increasing in use, demands a radio tube that can withstand the cruelest treatment. And it is not to be wondered at if automobile manufacturers, installing these radios as standard equipment in their cars, specify Raytheon 4-pillar Tubes.

When you sell new tubes to a set owner, you can recommend with confidence Raytheon 4-pillar Tubes — making not only a satisfied customer, but a sound profit for yourself. For a tube of such excellence is merchandised only on the very soundest principles of profit.

NRA WE DO OUR PART

RAYTHEON
4-PILLAR RADIO TUBES

RAYTHEON PRODUCTION CORPORATION

30 E. 42nd St.	55 Chapel St.	445 Lake Shore Drive	555 Howard St.
New York City	*Newton, Mass.*	*Chicago*	*San Francisco*

HIGHLIGHTS . . .

"High Fidelity" and the Service Man

The Service Man is going to have a new kind of responsibility when high-fidelity receivers get into the hands of the public. The whole radio industry—from broadcaster to set manufacturer—is going to rely on the Service Man to do a bang-up job on these receivers when they go fluey—which they will, just like any other type of set.

High-fidelity receivers are going to need more than servicing . . . they will require *maintenance*. We mean by this that reproduction may become poor without there being anything radically wrong with the set. Periodic checking may become a necessity, and it may be that when the time comes, the Service Man will wish to operate on a "retainer fee" . . . so much a year for keeping the set up to snuff.

The subject is so all-fired important that we intend covering the subject from every angle—beginning with the next issue. There's nothing like being prepared for a thing when it comes.

●

Milwaukee Extension Radio Course

The Annual Radio Short Course which was so popular with a large number of people last season will be repeated this year on March 26, 27 and 28 under the auspices of the Radio Department of the University Extension Division, with lecture sessions each morning, afternoon and evening.

For the nominal registration fee of $1.00, those enrolled will be entitled to attend all the lectures dealing with many of the most important and latest phases of radio which will be presented by engineers from representative manufacturers. Some of the topics to be presented are: new sets, new circuits, testing equipment and methods, public-address systems, television, facsimile, iron clad mercury-arc rectifiers, radio applied to aviation, x-rays in industry, and photo-electric cells.

Accommodations for those registering from out of town may be secured at nearby hotels at special rates.

Complete details may be secured by writing to Mr. Sam Snead, Chairman of the Radio Department, University of Wisconsin Extension Division, 623 W. State St., Milwaukee, Wisconsin.

●

19 Fighting Tubes

Howard Radio has announced a custom-made, 19-tube superheterodyne receiver which does everything but shake hands with the radio announcers. And 9 of the 19 tubes are used in the audio amplifier!

The receiver is called the "Explorer" and instead of stopping at the short- and broadcast-bands, keeps right on nosing about in the long-wave strata up to 140 kc which is . . . let's see . . . about 2142.8 meters.

There are three airplane-type dials on the set, one for band selection, one for tuning and one for station finding The station finder is a calibrated short-wave oscillator, so if you want a station whose frequency is 15,000 kc you just set the pointer of the station finder to 15,000 and then start tuning. When you hit 15,000 on the tuning dial you get a whistle, because the short-wave oscillator signal beats with the station signal. Then you push a toggle switch which disconnects the short-wave oscillator, and there's your station. No station, no whistle, of course.

Everything in the a-f amplifier is resistance coupled. The output stage uses four 2A5's in parallel push-pull and the output is given as 20 watts. One tube in the amplifier is used only for supplying fixed grid bias for the 2A5 tubes in the a-f section.

According to the fidelity curve, the response is practically flat from 100 to 10,000 cycles, and is only 5 db down at 30 cycles.

●

Air Mail to Antarctic!

In Schnectady, New York, there is a mailman who has what is without a doubt the longest "beat" in the world. Strangely enough, his feet never get tired, either, even if his throat does become a little raw at times. Every two weeks he delivers letters and postcards to eager recipients about 10,000 miles away—yet everyone arrives on time.

The mailbox which receives the letters is the short-wave studio of the General Electric Company—W2XAF. Their destination is the camp of the Byrd Antarctic Expedition in Little America—five and a half miles from the Bay of Whales, if you know where that is. The mode of delivery, it may be noted in passing, is "air mail" in the best sense of the world.

●

Floating Auditions

Freeman Lang, who has been master of ceremonies for most of the radio-ing of Hollywood premieres the past ten years, and who operates his own transcription studios, has installed complete equipment aboard his cruiser, the *Deirdre*.

The *Deirdre* will go into commission every once in a while as a floating audition salon. It will make stops at various ports up and down the west coast.

Radio facilities and equipment include recording apparatus and playback so that auditions may be made of talent at various coast cities. It may solve the problem of the continuous "new talent search" as well as a custom-made audition for sponsors who want to hear some special type of program.

Wanta go on the air?

●

Glow in Radio Tubes

Service Men need not be perturbed over the blue glow appearing in radio tubes during operation, states Roger Wise, Chief Tube Engineer of the Hygrade Sylvania Corporation. Most of the apprehension is based on the misunderstanding of the different types of glow that may be present in a tube during operation. These types are classed as fluorescent glow, mercury vapor base, and gas.

The fluorescent glow, states Mr. Wise is usually violet color and is noticeable around the inside surface of the glass bulb. This glow is a phenomenon caused by electronic bombardment taking place within the tube, and changes in intensity with that of the signal. It may at times be quite brilliant. Fluorescent glow has absolutely no effect on the operation of the receiver. In fact, tubes with this characteristic are particularly good as regards gas content.

Mercury vapor haze is a blue glow which is noticeable between plate and filament in types 82 and 83 rectifier tubes. The perfect operation of types 82 and 83 is dependent upon a mercury vapor that has been placed in the bulb during the exhaust period. Therefore this kind of blue haze is in no way detrimental to the operation of these tubes.

Gas is indicated by a blue haze usually confined to the vicinity of the plate and filament structure. Its presence, when of large content, affects the operation of a receiver to the extent that erratic performance is noticeable. Gassy tubes should always be replaced with new tubes.

Testing for the above conditions can be best accomplished by actual operation in a receiver. It is not necessary to test for the blue glow evident in types 82 and 83, since this is characteristic of these two tubes.

When in doubt as to the blue content of other types of tubes, a sure test can be made by bringing a magnet close to the bulb. A gassy tube will not be affected in any way by the presence of the magnet, while the fluorescent glow, which has no effect on the performance of the tube and set, will shift about as the magnetic field is shifted.

●

Hot Idea from M.R.S.A.

Mr. Ward Jensen. Secretary of the Minnesota Radio Servicemen's Association has given us the lowdown on an idea they have put into effect which ought to go well in all parts of the country.

The M. R. S. A. have asked the credit departments of the larger radio stores in St. Paul to furnish the Association with lists of the "skips," by which is meant customers who have moved without paying the balance due on their contracts. The M. R. S. A. feel that they are the only local medium which is sufficiently well equipped to supply the dealer with the present location of such "vanished" radio sets.

The idea is carried out in this manner: The dealer furnishes the list of such radio sets, with customer's name, make of radio, model number, serial number, and the amount of reward he will pay for the location of said radio.

Each member of the Association is given a copy of the list and a list is also posted on the bulletin board. When a Member discovers such a set, he says nothing to the customer, but immediately reports its location to the dealer who, in turn, is billed by the Association for the amount of the reward. This amount is turned over in full to the Member who turned in the report.

This is one of the slickest ideas we have run into for some time. It is possible that if various associations cooperated with each other, "skips" could be traced to other cities or states. In any event, the plan is of benefit to both the dealer and the Service Man, and we see no hitch in it.

Service Associations could well function as clearing houses in this respect, and develop a network system covering wide areas.

Mr. Jensen states that the M. R. S. A. would be glad to hear from other Associations regarding this policy. His address is 386 Minnesota St., Saint Paul, Minn.

THE FORUM . . .

We Can't Take It!

Editor, SERVICE:

I seen in your magazine SERVICE where you been kind of tryin' to find out what us Service Men do in our spare time to earn a livin'. I'm real sorry to know you're so gol-darned hard up, so will do what I can to help you keep the Wolf from starvin' at your back door.

Some of us has a OM (that's radio slang for your father) (*not ours!*—Ed.) who still has some money left. That's where some of us gets the price of a tube checker and a screw driver to go in business with. Others get a good job in a store or factory, which is one of the best ways I know of to be a successful radio expert.

Another good stunt is to repair anything folks bring in, and just to show you how easy it is, I will give you an example.

A lady brot in a electric percolator that wouldn't perk. After a few hours of pleasant work as they say in the advertisements, I got it apart and found that the resistance wire was burned out. Some men make a big secret out of the way they test things like that, but I'll let you in on it. I just looked at the coil and saw where the wire was busted right in two. Well, I happened to notice where it said 450 watts, so I went out to buy a new wire for sale. The man that runs the store had some 1,000-watt and some 600-watt coils, and I knew he wouldn't cut one of them for me, so I bought the 600-watt coil. To a man of my experience and ability, this was no problem at all, but of course I was pretty glad of my tecknickle training. I simply stretched that coil until it was six feet long and cut off exactly 1-foot, 6 inches, leaving the required 450 watts for the percolator. After taking out the kinks, I wound it on the mica and put the whole thing back together and was just trying it out when something blew the fuses on the switchboard. I had to go to supper right then, so I don't know yet what happened. But it just shows you how easy it is for a Service Man to get along if he knows how.

This ought to fill you full of hop for your future, and I will be glad to help you any way I can any old time.

H. M. BELL,
The Bell Radio Co.,
Massena, N. Y.

(*The trouble is you forgot to put cream in the coffee. Besides, the next time we want help we will call the Edison Company. And, have you ever thought of selling 250-watt lamps for making coffee? You put the lamp in the water and wait. Try* that. —*Ed.*)

•

Broadcast Interference

Editor, SERVICE:

Have noticed the letter on interference from the Paramount Radio & Electric Company in the Feruary issue of SERVICE.

For the past several months we have had the same trouble in this territory and for want of a better excuse blamed it on the more powerful of the Mexican and Cuban stations that cause us a lot of trouble. This may be the main cause after all, but am inclined to doubt it very much. It is almost impossible to tune in a station and go sit down and enjoy it for any length of time, for after a while the station fades and as a rule another station can be heard faintly. This on all makes of sets including the latest.

There is not very much difference here in WLW on 500,000 watts than on 50,000 watts. They come in here with about the same amount of signal strength as WSB in Atlanta, which uses 50,000 watts, but is closer to us. There is no difference in the tuning. This is our observation on about twenty-five tests.

J. GLEN KIRSTE,
Electric Service Co.,
Leesburg, Fla.

(*We presume that most of the trouble in your locality is due to the Mexican and Cuban stations. After all, U. S. broadcasters are fairly well separated and their frequencies do not vary more than* 50 *cycles. It is possible that some interference is experienced from U. S. stations in the north and west, whose frequencies are close to local stations. This would be particularly noticeable with AVC receivers if the local faded, for under such conditions the gain of the receiver is increased by the AVC circuit, and the selectivity of the receiver suffers somewhat.*

Have you determined whether this interference takes place on or near the frequencies used by the Mexican and Cuban stations? This data would be interesting to have.—(THE EDITORS).

•

Likes Present Diagrams

Editor, SERVICE:

With reference to your self-reading diagrams, let me urge that you stick to your present method. Should you change to the numbering system now, you would have to change again in June when the new system goes into effect.

You have a good method—my advice is to stick to it.

I've missed only two copies of your magazine, and my only criticism could be that, to quote a remark by a character in Sheridan's "School for Scandals," your reading matter sometimes reminds me of a "rivulet of text running through a meadow of margin." But, I'll forgive you that.

GEO. E. DOUGHTY,
SEARS & DOUGHTY,
Plymouth, Conn.

(*Thanks for your opinion regarding the diagrams. If we made a lake out of the rivulet, the diagrams would be submerged —and you can't dive into a magazine page! But the day may come when diagrams will no longer be necessary. We will have more to say about this in an early issue.* —THE EDITORS.)

•

Tube Numbering

Editor, SERVICE:

We believe your idea of numbering tube socket connections as advanced in the February issue of SERVICE to be an admirable one. One difficulty stands in the way today, however, and that is a division of opinion on socket numbering.

It would appear that the first duty of SERVICE would be to eliminate the difference in the system by negotiation with the two groups and then to employ the system really considered standard.

The writer would also suggest having all future diagrams indicate the point of attachment for oscillator leads when making intermediate-frequency and radio-frequency alignment of various component circuits. The wrong point of attachment—especially when making i-f alignment—very frequently results in alignment other than intended by the manufacturer, due to additional factors being introduced in the circuit.

Why not create a standard set of symbols to indicate these attachment points?

RALPH E. ROE,
Roe Radio & Electric Shop
126 Chestnut St.,
Roselle Park, N. J.

(*We do not doubt that some time in the near future the pin-tube numbering system will be standardized. In the meantime, we feel that a continuance of our arrangement of tube element designations will prove less confusing, since were we to revert to numbers they would be correct for the test equipment owned by one Service Man and incorrect for the test equipment owned by another. We did not take this point into consideration at the time.*

We are glad to have your suggestions regarding oscillator connections. This is an excellent plan and we hope to put it into effect shortly.—THE EDITORS.)

•

Tube Designations

Editor, SERVICE:

I don't see why you should change your diagrams. Your method of specifying what each element of a tube is, works out fine for me and I am sure others also like it.

Maybe the numbering system would be better for the man who uses a set analyzer, but I find that the only satisfactory way of testing new sets is with test probes. When I work this way, numbers don't mean a thing, while "P," "G," "SC," etc., are old friends of mine.

I say, keep your diagrams the way they are.

WARING MIKELL,
Scarsdale, N. Y.

(*Thanks for your viewpoint. It's clear we can't please everyone—but for the time being, anyway, we shall continue with the present system.*—THE EDITORS.)

•

High Fidelity

Editor, SERVICE:

The word is getting around that the manufacturers are going to bring out high-fidelity receivers this year sometime, and I'm just wondering whether this is going to be another headache for us Service Men.

I understand that "high fidelity" means the sets will reproduce more than they do at present, but does it mean anything else? In other words, what new servicing angles are going to enter the picture, if any?

W. RALPH FELSER,
4 The Fairway,
Upper Montclair, N. J.

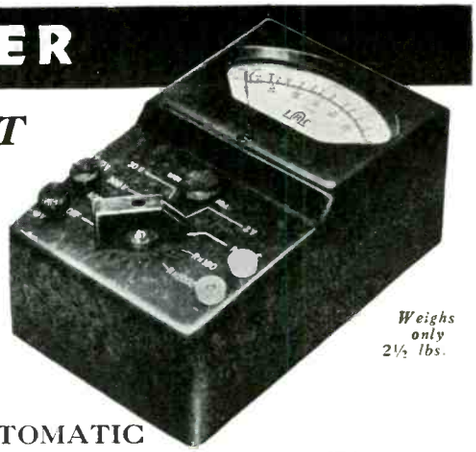
(*You have us! It depends a great deal on what new stunts the design engineers may work up. Off hand we should say that the only difference from the servicing angle will be a requirement for greater accuracy in alignment, etc. Read the article, "Noise-Reducing Aerials to the Fore" in this issue.*—THE EDITORS.)

IRC VOLT-OHMMETER

A COMPLETE SERVICE INSTRUMENT

Never Obsolete—Protected Against Burnouts

With this Volt-Ohmmeter and a tube checker you can do prompt accurate servicing by the point-to-point method. Automatically protected against meter and circuit burnouts. Will last indefinitely—does not become obsolete with the introduction of new tubes or circuits. All that you would find in the most expensive meters—and more—IRC now offers in this Volt-Ohmmeter at a surprisingly low price: Automatic vacuum relay; ample range coverage; full Bakelite case; special rotary switch; one set of pin jacks for all readings; convenient compensation for battery variations on ohmmeter and IRC 1% Precision Wire Wound Resistors. Only 7 in. long, 3 in. deep and 4½ in. wide.



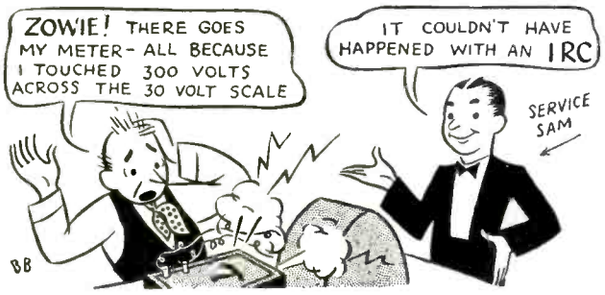
Weighs only 2½ lbs.

USE IT WHEREVER ELECTRICAL MEASUREMENTS ARE MADE

The accuracy of the IRC Volt-Ohmmeter coupled with its convenient size and burn-out protection make it unexcelled for use in schools, laboratories, electrical shops, etc., for experimental and practical purposes alike.

VOLTAGE RANGES
3, 30, 300 and 600

RESISTANCE RANGES
0 to 1,000—0 to 100,000 ohms
0 to 1 megohm



The **AUTOMATIC VACUUM RELAY DOES IT!**

Thanks to the IRC Automatic Vacuum Relay, there are no fuses to replace—no burn-outs even though you accidentally touch the test lead across a 300-volt section while working on a low scale. When overload occurs, the vacuum relay automatically opens—then closes when overload is removed.

$25.50 NET to servicemen—complete (LIST $42.50) with test leads

INTERNATIONAL RESISTANCE CO., 2100 Arch St., Philadelphia, Pa.

☐ Enclosed find $25.50 (check for M.O.) for IRC Volt-Ohmmeter. It is understood that I may return it prepaid for full credit if, within 5 days of receipt, I am not more than pleased.

☐ Send folder on the IRC Volt-Ohmmeter, telling how it can be used for better point-to-point serving.

NAME .....

STREET .....

CITY .....

NAME OF JOBBER S-3

BY THE MAKERS OF *Metallized* PRECISION AND POWER WIRE WOUND RESISTORS

KENYON  **PRODUCTS**

Audio or Filter Type Choke

KENYON *Replacements Keep Customers Sold!*

Audio Transformers and Chokes

Another example of Kenyon quality components despite low prices. Because we make our own laminations, wind our own coils, impregnate our windings and have research and engineering staffs constantly at work Kenyon products give you replacements that *stay replaced.* Exceptional production facilities allow generous proportions and guarantees of long satisfactory service with low prices.

Power Transformer

Write for Catalog and Replacement Chart. See your jobber or get in touch with us direct.

NRA MEMBER U.S. WE DO OUR PART

KENYON TRANSFORMER CO., Inc.
122-124 Cypress Avenue, New York City

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HEADQUARTERS FOR SHORT WAVE AND ALL WAVE ANTENNA SYSTEMS AND NOISE REDUCING EQUIPMENT

No receiver is better than its aerial. Therefore make certain that the aerial you install is properly designed to bring clear, noiseless reception free from man made static. On Short Wave installations it should be borne in mind that ORDINARY antenna systems fail to satisfy. For best results use an ICA system described below.

ICA S.W. DOUBLET ANTENNA
9½—217 meters

increases efficiency by picking up weak signals ordinarily lost due to man-made static. Complete kit comprises: 15 ICA transposition blocks, 1 ICA Doublet Coupler, 8 ICA INSULEX Antenna Insulators. 2-100 ft. Coils of special enameled S.W. wire. No. 659—List Price..... **$4.75**

ALL WAVE DOUBLET ANTENNA
9½—550 meters

for use on all makes of all-wave receivers. Kit comprises; 15 ICA transposition blocks, 1 ICA all-wave coupler, 8 Special Insulex Antenna Insulators. 2 coils special S.W. enamelled antenna wire, 100 ft. each. No. 660. List Price **$5.25**

ICA DYNATROL

A practical line noise filter and indoor aerial. Will also increase power and selectivity when used with outside aerial. Eliminates man-made static caused by motors, trolleys, refrigerators, etc. There's good profit to the serviceman who attaches Dynatrols No. 132. List Price. **$1.50**

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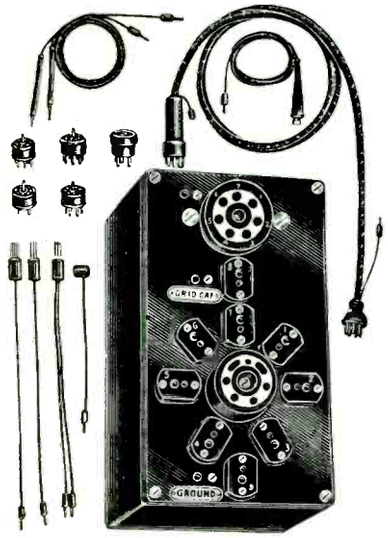
THE MANUFACTURERS . . .

Hickok No. 5200 Multi-Selector

The No. 5200 Multi-Selector, shown in the accompanying illustration, has been brought out by the Hickok Electrical Instrument Co., 10514 Dupont Ave., Cleveland, Ohio, as an adjunct to their line of testers. It is also applicable to other makes of set testers, volt-ohm-meters, etc.

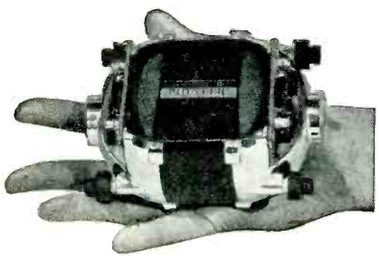


The main purpose of the 5200 Multi-Selector is, of course, to bring up-to-date such set testers not provided with the means of testing receivers with modern tubes—or the tubes themselves—and as a means of providing both "analyzer" and "point-to-point" methods of testing. This unit is equal to an 89 point switch. The top of the panel is of two-tone walnut Bakelite, and the entire unit is mounted in a steel case. It measures 6¼" long, 3½" wide and 3¾" deep. The unit is adaptable to the Hickok Models S. G. 4600 and 4700 Set Testers, the A.C. 4600 Set Tester, the Compactalab, the Portalab, and the Model 4855 Volt-Ohmmeter.

•

Gen-E-Motor Rotary Auto-Radio Plate Supply

The Pioneer Gen-E-Motor Corporation, of 1160 Chatham Court, Chicago, Illinois, has just announced a new rotary power supply device for auto-radio receivers. It is said that this is the smallest power supply unit that has ever been offered to manufacturers, regardless of type.



Of like importance is the fact that its output voltage is unidirectional and flat except for a commutator ripple that is only several percent of the total voltage. Thus the filtering problem is simple, requiring small condenser cost and assuring a very smooth voltage that allows excellent audio reproduction, it is stated.

•

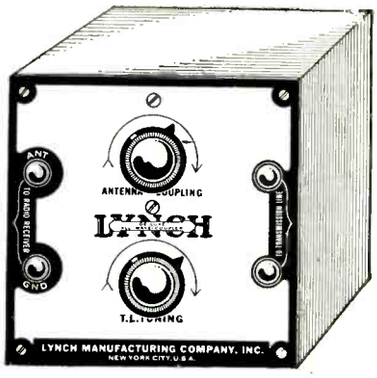
Willard Radio Power Cell

The Willard Storage Battery Company have recently developed a low-discharged power cell permitting a total of 10 separate charges and discharges. This unique feature is combined in both the DD-11-1 and the DD-7-1 batteries. The DD-11-1 has a capacity of 500 ampere-hours at a rate of 1 ampere, which will carry the average set about a year. The DD-7-1 has a capacity of 300 ampere-hours at a 1 ampere rate—the equivalent of about 200 days for the normal receiver. Another interesting feature is that the loss of power through self-discharge is only about 15 percent for a period of one year. These cells, it is claimed, give an economical operation for a long period, at a low initial cost.

•

Lynch Deluxe Antenna Coupler

The Lynch Manufacturing Company, Inc., 51 Vesey Street, New York City, have an antenna coupler for use between a transposed transmission line and an "All-Wave" receiver. The noise-reducing properties of a transmission line depend upon the electrical balance. If one side were grounded an unbalance would result. The Lynch coupler offsets this unbalance without losing the value of stability of operation which the ground makes possible.



The variable condenser in the coupler becomes a part of the transmission-line and enables the operator to keep it in balance and thus cut out interference.

The entire unit is in a shielded metal cabinet and can be attached to a receiver in a short time. The "DeLuxe" coupler, it is said, reduces interference, improves signal strength, and permits better station separation. Lightning arresters for the protection of the antenna, transmission-line, and receiver are included in the unit.

•

RCA Victor Replacement Vibrator

The RCA Victor Sealed Replacement Vibrator is an inverter-rectifier unit recommended for replacement in their M-34 automobile receiver. High efficiency, long life, and wide input voltage range are inherent features of this unit, they state.

The vibrator is 4½ inches high, and has a diameter of 2½ inches. The input voltage range is from 4 to 8 volts. The unit has an output of 265 volts at 50 milliamperes, with an input of 6 volts. The unit has a mechanical inverter circuit with

full-wave mechanical rectifier, and it is shielded by a double aluminum case with a felt insulator, the entire vibrator unit being rubber-mounted. It has an efficiency of about 60 percent.

This unit has a lead seal to prevent removal from the shielding cans.

•

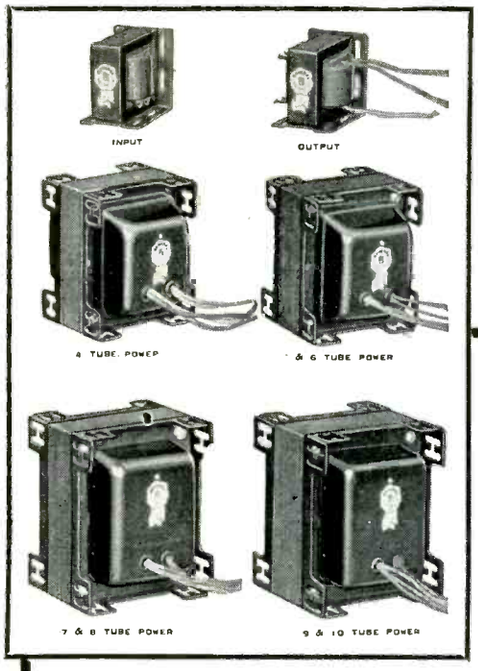
New Weston Selective Analyzer

The system of selective analysis sponsored by the Weston Electrical Instrument Corporation of Newark, N. J., has been further improved and simplified.

Whereas originally a group of four socket selectors were required, each of which carried a plug and cord, the new arrangement provides for a single 7-prong plug and cord with special adapter combinations which will reduce from the 7 prongs to 6, 5 or 4 prongs. Adapters for the large 7-prong tubes are also provided. To make identification easy, these adapters are furnished in colored bakelite—a separate color being used for each of the four adapters.

In order to take care of the requirement for marking the several terminals with the prong numbers, a special molded skirt is provided at the bottom of the 6, 5 and 4 hole adapters for the selector unit which indicate the correct numbers, in accordance with the new R.M.A. Numbering System applied to these tubes.

The assembly of adapters and socket selector is contained in an attractive display box and allows for the complete testing of all tubes and radio sets with a suitable volt-milliammeter such as the Model 665.



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Exact duplicates **ELECTRICALLY**

Provides immediate renewal of original performance in case of trouble in the power transformer (the heart of the radio) in any of more than 90% of all models—"orphaned" or current.

AC—110-120 V., 50-60 Cy.—220-240 V., 50-60 Cy. or 115 V., 25-40 Cy.

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for winning the replacement trade. Small stock investment—all staple items—quick turnovers—no slow movers or dead stock at any time, and—

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Universal Input Audio

Can efficiently feed any straight or push-pull audio stage on either A.C. or D.C. sets.

"Multi-Tap" Output

The Universal primary and the tapped secondary, from 2 to 30 ohms in 2 ohm steps, make it possible to feed practically any straight or push-pull output stage to any dynamic speaker.

Free for the Asking!

Send for "Multi-Tap" Bulletin No. 3-D, showing complete data on each model, and listing of 1898 models of radios with required "Multi-Taps."

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General Transformer Corp.
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Please send free Bulletin No. 3-D of "Multi-Tap" Universals and list of Radios on which they can be used for replacements.

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"Multi-Tap"

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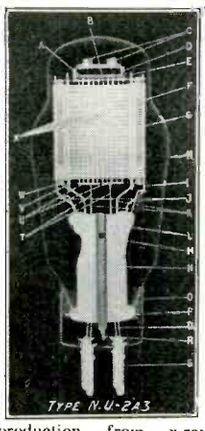
(Patent Applied For)

The wide range of adaptability of only four models "Multi-Tap" Universal Power Transformers is made possible through various taps in these units which may be used singly or in combinations. The required current values can be delivered to each of the several leads in the set with any combination of tubes, as accurately as by the original power units.

Easily Installed!
FULL DIRECTIONS WITH EACH UNIT

Furnished in dull satin black finish. All units are fully shielded and meet specifications of radios having Underwriters Laboratory approval, now required in many localities to protect fire insurance policies.

Complete set of units illustrated packed individually and in a carton as standard package for Service Engineers' initial stock. Additional stock of any unit may be had in any quantity.



Reproduction from x-ray photo. Consistent detail accuracy in National Union tubes is one reason they are sold by more service men than any other make. Parts of this tube are a. Top Mica; b. Top Fil. Support; c. Spiral Fil Hooks; d. Fil. Hook Support and Fil. Guide; e. Control Grid Support; f. Plate; g. Control Grid Laterals; h. Bulb; i. Plate Weld; j. Getter Flag Supports; k. Grid Welds; l. Stem Press; m. Exhaust Hole; n. Exhaust Tube; o. Basing Cement; p. Bulb to Stem Seal; q. Lead Wire; r. Exhaust Tube Tip; s. Base Pins; t. Fil. Welds; u. Fil. Supports; v. Bottom Mica; w. Mica Straps; x. Fil. Strands.

X-Ray Reveals National Union Radio Tube Accuracy-Quality

SERVICEMEN EVERYWHERE ACCLAIM FINE TUBES—FREE SHOP EQUIPMENT

Many thousands of service experts throughout the United States are finding it profitable to be tied-up with the National Union program. They have proven to their own complete satisfaction that National Union means more than—Radio Tubes. National Union stands as a symbol of more service business and better service business at a profit. No service man who appreciates the full significance of what National Union can mean to his success can possibly afford not to tie-up with National Union program. Resolve now to tie-up with National Union in your own best interests.

FREE SHOP EQUIPMENT

One of the principal objectives of National Union has been to supply the serviceman with modern shop equipment and data so that he would be in a position to do better service work and more of it at a profit. Testers, analyzers, service manuals and service tools are given with the purchase of National Union tubes. The wide awake dealer realizes the advantage of obtaining his equipment in this way as he has both the guarantee of the manufacturer and the backing of National Union

National Union offers include:

Servicing Tool Kit, Supreme No. 333 Analyzer, Service Manuals—Auto Manual, Triplett Oscillator and Output Meter, Triplett Tube Tester, Hickok Diamond Point Jr. Tube Tester, Supreme Model 85 Tube Tester.

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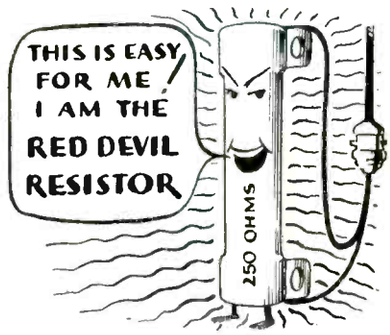

Ohmite Red Devil Resistors are the most popular replacement resistors because their five-to-one factor of safety protects your repair jobs against failures due to overloads. Play safe—eliminate return calls on your guaranteed jobs. Use the coupon below!

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Please send me a copy of your Catalog No. 9 and the name of my nearest Ohmite jobber.

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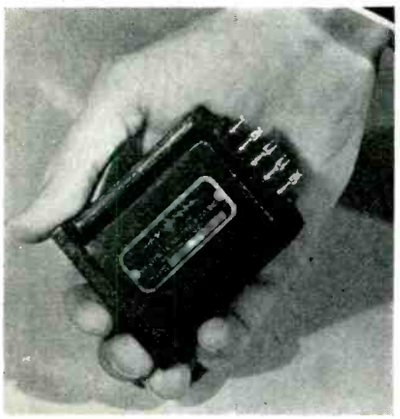
Kenyon Remote Pickup Equipment

The past year has brought about numerous changes in the design of portable remote pickup equipment. Many of these changes have been forced by the widespread use of the newer types of microphones which have improved frequency response but extremely low output levels. Other changes have been forced by the increasing number of outside pickup jobs which necessitate either more equipment, or more readily transported equipment, which will cut the time lost between pickups to a minimum.

To meet the demand for transformers for this type of equipment, Kenyon Transformer Co., Inc., has announced a new line of portable transformers which, they state, meet the exacting requirements of suitability for low-level and high-fidelity work in addition to being small in size and light in weight.

The line includes parallel-feed chokes, mixing, input, interstage and output transformers which are designed for use with the different tubes more commonly used in portable equipment. The line-matching input and output transformers have balanced 500-ohm windings with taps for a



200-ohm balanced connection. These windings can also be connected to give other impedances; i. e., 50, 125, 250 or 333 ohms. Input and output transformers have a complete electrostatic shield between the low and the high winding. This shield is grounded to the transformer core and a connection brought out to the terminal board. The core is completely insulated from the case. Balanced windings are tested for resistance, inductance and capacity balance. Interstage transformers are designed to allow the passage of the plate current, although if extreme low-frequency response is required, the use of parallel-feed chokes is recommended.

Use is made of the latest alloys for core material, different alloys being used for the different transformers depending on their intended use. These transformers have a new type of impregnation and sealing which makes them proof against failure due to adverse climatic conditions, it is stated.

The transformers are potted in aluminum cases which are similar in appearance to the Kenyon Laboratory Standard Line. The base size is 2⅛" x 2¾"; height of pot, 3"; height over terminals, 3½"; mounting dimensions. 1¾" x 2 5/16." The average weight is 20 ounces.

Electrad Precision and Center-Tap Resistors

Electrad, Inc., 175 Varick Street, New York City, are producing a precision wire wound resistor, wound on a grooved ceramic core with adjacent sections wound

in opposite directions, that has an extremely low distributed capacity, and that is wound to an accuracy of plus or minus one percent. The standard type 61', furnished with wire terminals, can be converted to the ferrule type resistor by adding ferrule terminals. These resistors are made in values ranging from one ohm to one megohm.

The center-tap resistors are 1½ inches long, ⅛ inch thick and ⅜ inch wide. They are color coded, made in values from 10 to 200 ohms, and have a center-tap accuracy to plus or minus one percent.

•

Acracon "Gadjet" Condensers

Condenser Corporation of America, makers of the Acracon condensers, now offer a novel idea in condensers expressly designed for service and replacement use. Known as "Gadjets,' because they may be used to advantage in so wide a variety of applications, they are easily identified from the standard line through the use of a green color scheme carried out on the labels and cartons.

Tubular and metal cased bypass units, of the paper type and special carton type dry electrolytic units covering all necessary capacities needed for service work are included in the new Acracon Green Line. It is said that the voltage rating of these units is ample to cover present servicing needs and their small physical size effects easy installation.

Dry electrolytic units are supplied with convenient mounting flanges without extra cost and these may be cut off easily where not desired. All units are of the dual carton construction, effectively sealing the unit and preventing corrosion.

The metal cased bypass units are supplied with a baked crackle finish, extremely durable and attractive while the tubular bypass units are offered in compact aluminum tubes covered with an outer cardboard cover of pleasing appearance. All units are clearly and permanently marked with their type number, capacity and voltage in an attractive manner.

The new Green Line contains in all, only 29 units, covering singly or in combination practically every requirement. Since 19 of these are tubular units of low cost, the investment with respect to condensers is unusually small.

•

Continental Filter Sections

There has just been added to the Continental Carbon Inc., of 13900 Lorain Ave., Cleveland, Ohio. Continental-Igrad condenser line, a complete range of paper filter sections to replace all electrolytic filter section failures.

These filter sections are offered in cardboard and round metal containers in all standard single and multiple section capacities.

Service Men have found that these replacements are especially advantageous where compact design or poor ventilation causes high operating temperatures.

A complete descriptive catalog is available upon request to the factory.

•

Lafayette "High Fidelity" Amplifiers

Wholesale Radio Service Co., 100 Sixth Ave., New York, N. Y., have introduced a new "High Fidelity" a-c amplifier which uses the 2B6 duo-triodes in push-pull in the output stage.

A new circuit is used in this amplifier, it is said. Six tubes are employed, consisting of a 53 duo-triode, two 56 triodes, two 2B6's, and an 83 amplifier. No input or interstage transformers are used.

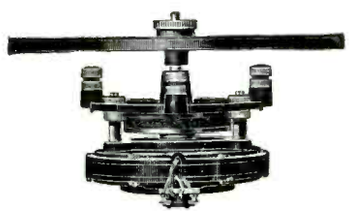
It is stated that the frequency response of this amplifier is absolutely flat from 20 to 17,000 cycles and the average gain, 78 db. Average power output is 15 watts with a peak of 20 watts.

Wholesale has also introduced a d-c amplifier—also high fidelity—with an output of 15 watts. The tubes employed are: one 77, a 37, and four 48's. Its average gain is 80 db. permitting the use of a carbon microphone without preamplifier.

•

"Saja" Synchronous Motors

The "Saja" Type B-S motor, manufactured by the Sound Apparatus Company, 400 East 81 Street, New York, N. Y., is a synchronous motor the speed of which is constant. It is designed for musical



recordings, and consists of a cast-iron turntable resting on a vibration filter which insulates the turntable from the motor. The following specifications are given:

Speed	78 r.p.m.
Torque	85.6 oz. in.
Height	5.25 in.
Weight	21 lbs.
Current	110 v., a-c, 60 cys.
Power Consumption	33 watts
Turntable	12 in. heavy size

It is equipped with a rubber pad and clamping screw, adjustable to any feeding mechanism.

The Type 33 1/3 motor produced by this company has a speed of 33 1/3 r.p.m., a torque of 220 oz. in., and a 16-inch extra heavy turntable.

The Type V motor, which is for reproducing only, has a speed of 78 r.p.m., a torque of 17.3 oz. in., and is equipped with a 12-inch velveteen-covered turntable. The Type V motor, unlike the others, may be used on either 110 or 250 volts, a-c, 60 cycles.

INDEX TO ADVERTISERS

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ACRACON GREEN LINE

GADJET

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- GREATER OPPORTUNITY

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worth of merchandise and service work on an investment of only

$31.20

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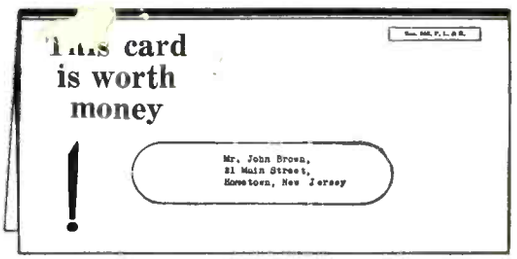

"TUNE-UP" POST CARD

Don't Believe It?

For detailed proof see your distributor, or write us. The extraordinarily successful "Tune-Up" campaign is only one of the many profit-making features included in the Cunningham-Radiotron Spring merchandising drive on Micro-Sensitive Radio Tubes. No alert dealer or service man can afford not to be interested.

RCA Cunningham Radiotron RADIO TUBES