

OCTOBER

1941

Radio

SERVICE DEALER

This Month

NEW SERVICE CHARGES

RIDER ON TUBE PHASE

ON USING GAIN DATA

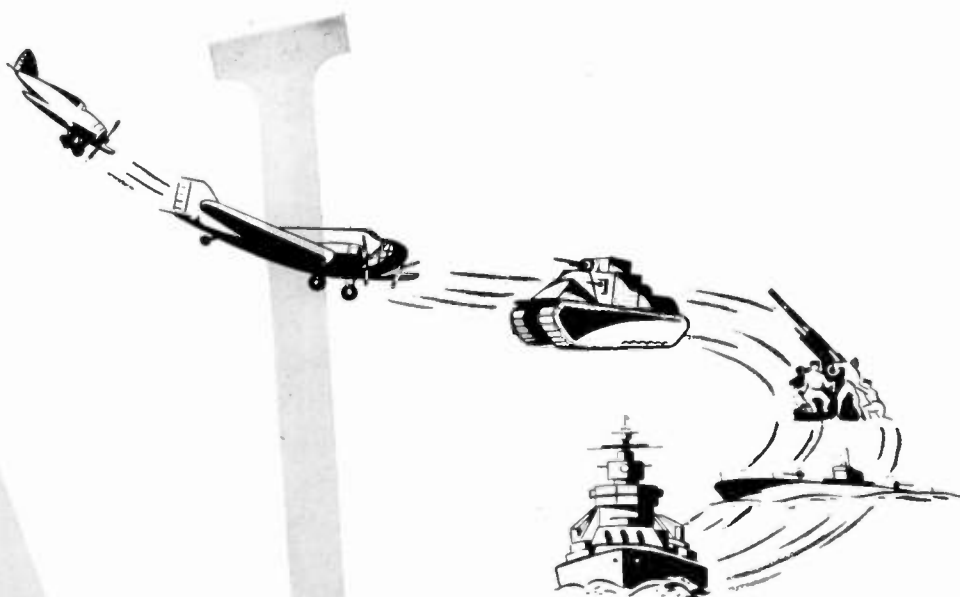
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SOUNDMAN AND JOBBER

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Cover Photo



★ Is your head in a whirl? Plenty of heads are. But plans for the immediate future are shaping up—so calm down and get behind the big push. See pages 3 and 4, for instance.

Published Monthly by

COWAN PUBLISHING CORP.

132 WEST 43rd ST., NEW YORK, N. Y.

Telephone: CHickering 4-3278-9

M. L. MUHLEMAN, EDITOR

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Subscription rate, \$2.00 a year in United States. Single copies, 25 cents. In foreign countries and Canada, \$3.00 a year. Editorial and advertising offices, 132 West 43rd St., New York, N. Y.

VOL. 2 NO. 10 ★ OCTOBER, 1941

Application Pending for Entry as Second Class Matter at the Post Office, East Stroudsburg, Penna.



RACON

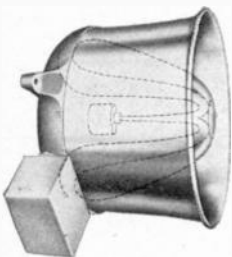
keeps 'em smiling!

The sound business is terrific! Thousands of factories, schools, stadia, ship-lines and other typical sound equipment users know that a properly planned and installed sound system is a valuable asset that soon pays for itself. But buyers of sound installations now-a-days give much thought to the 'maintenance factor' before signing a contract. They can't gamble on being able to buy replacement speakers. They insist on having, right from the outset, the speakers that are most dependable and efficient. They want RACONS!

For years all leading soundmen have specified RACON Horns, Speakers, Driving Units and Sound Reproducers when quoting on a potential sound installation sale or rental contract. The reasons are obvious: RACON Products are competitively priced, deliver maximum output and response for the size of driving unit used, have exclusive patented features such as Storm-Proof, Break-Proof, Acoustic Material . . . and there is a RACON sound reproducer for every conceivable purpose. Yes sir—buy and use RACON products . . . they keep you and your customers smiling.

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Re-entrant type speakers using horn type units for marine and general P-A applications — may be used as loud-speaker or as a microphone. Min-ature and regular sizes approved by the

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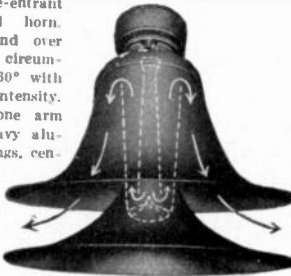


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Operating capacity 12-15 watts, peak 25 watts. Other P.M. units available from "baby unit" of 5 watts to "bull unit" with an operating capacity of 50 watts. Efficiencies of the highest order obtainable with the finest magnetic material and steel utilized.

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A 3½ foot re-entrant type Radial horn. Projects sound over a complete circumference of 360° with an even intensity. Base and tone arm made of heavy aluminum castings, centre deflector, and deflecting bells made of R A C O N ACOUSTIC material to prevent all resonant effects. Storm-proofed and guaranteed against all weather conditions. Uses Standard RACON Units.



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A compact trumpet of the double re-entrant type. Occupies but a small space, nevertheless has a long air column enabling it to deliver

highly concentrated sound of the greatest efficiency over long distances. Base and inside cone arm made of aluminum castings, outside bell of heavy gauge aluminum spinning, centre section of RACON ACOUSTIC material to prevent resonant effects. Available in 6', 4½', 3½', and 3' air column units.



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TRANSIENTS

AND NOW— A CALL TO ARMS

ON THE EVENING of October 29th, at a mass meeting sponsored by the Metropolitan New York Chapter of the RSA, John F. Rider echoed our "Storm Warning," published last month; although "echoed" is hardly the word to describe the manner in which Mr. Rider tore into the subject. It would be better to say that he manufactured his own counter-hurricane—and let the boys have it.

The theme, if we may call it such, was "The Reader's Digest-Power Companies-Public Suspicion-Individual Apathy and Disunion-Will-Get-You-If-You-Don't-Watch-Out-And-I-Don't-Mean-Maybe." His delivery was powerful, sincere, inspirational. We thought it quite the best speech he has ever made. We thought that what he said was quite the best he could have said, considering conditions as they are, and we agreed with him without reservations.

If you know anything about hurricanes, you will know that they strike with immense force, pause for breath, and then hit in the opposite direction with an even greater force. Mr. Rider's self-made hurricane lived up to its name. Having stated the dangers confronting the Independent Serviceman in convincing and no uncertain terms, he reversed his position and listed one reform after another that, taken as a group, would, in his opinion and in our's, not only preserve the status of the Independent but lift him right out of his present doubtful standing.

The storm warning, as Mr. Rider pointed out, and as we have pointed out, is, briefly, this: With a curtailment of retail business in the offing, due to national defense priorities, everyone wants to get on the servicing wagon as a means of obtaining a new source of revenue to make up for that lost—and, if necessary (and it would be necessary) to push off the Independent. And to use as a wedge in obtaining this business, the public suspicion of the Independent created by the *Reader's Digest* article. The situation is, therefore, a very serious one for the Independent.

To buck this force, Mr. Rider has proposed strong local groups (with New York as a test case) sufficiently unified and financially able to actually, and not theoretically, guarantee in all respects the repair work done by members. In connection with this, he has suggested the examination of servicemen before they are accepted as members; periodical inspection of member shops; the bonding of all members, and the bonding of receivers removed from homes; standardization of servicing procedure; abolition of free inspection and cut-rate service charges and the setting up of price lists; the employment of "work sheet" cards, to be signed by the customer, on which would be listed exactly what repair work was to be done; and the use of small seals or stickers to be put on every new part installed in the receiver, so that the customer can see what has been done. And, local advertising, with publicity as a trailer, to make the association known to the public.

These reforms, as you will see, are aimed to accomplish two things—unify servicing activities on a sound business basis, with the association carrying the responsibility, and to win public confidence by offering full and complete customer protection from inspection to finished job.

We recommend these reforms to every local association or association chapter, and to every Independent who has not as yet become a member of an association. It is essential that these or similar reforms be put into effect immediately—and it is also essential that every Independent realize that the time has passed when he can continue to survive on his own feet alone. The day for unification has arrived, and it cannot be put off.

A NEW SYSTEM OF SERVICE CHARGES

PRIMARILY for the purpose of promoting the welfare of members of Radio Manufacturers Service, and incidentally as a means of off-setting the harm done by "that magazine," Philco-sponsored RMS has compiled a standard schedule of radio service charges, based upon a careful estimate of the work and time involved in each process as performed by a competent radio serviceman. The complete schedule is reproduced below.

Here is a system of charges that takes into account the skill required to locate trouble in a radio and shows the customer that the actual labor involved in replacing a part is the least expensive part of radio service work.

The portion of the schedule covering "Intermittents" is especially interesting, as it permits the serviceman to

account for additional time required to locate the causes of intermittent conditions that are usually so troublesome.

But, above all, the prime value of such a schedule of service charges rests in proof to the customer that service charges are not figured on an "arbitrary" basis.

HOW IT OPERATES

Like any other system of professional charges, the suggested RMS standard service charges will be no more perfect than the manner in which they are used. They were intended for average conditions, but can be adapted to extreme cases requiring a minimum or a maximum amount of time.

For example, the suggested charge for replacing a volume control, while

satisfactory for the average case in which the faulty control is detected immediately through noisy or erratic operation, might be insufficient for locating trouble in a volume control involving considerable testing. In receivers using the volume control as part of the AVC network, an open circuit or excessive resistance in the control causes other effects than noisy operation. For the additional time used in tracing trouble to the control, the service charge covering "Automatic Volume Control System—resistor or condenser replacement, wiring repairs" might be used in addition to the charge for "Volume Control—replacement."

On the other hand, the usual charge for replacing the volume control may prove excessive for a set requiring a
(Continued on page 21)

STANDARD RMS SERVICE CHARGES

OFFICIALLY RECOMMENDED BY RADIO MANUFACTURERS' SERVICE

The standard RMS service charges listed below include only the work done on a radio in the shop or in the home. On outside service calls an additional charge is made for traveling time and for transportation, depending upon distance and the number of trips required to complete the work. On automobile radios brought to shop in cars an additional charge of \$1.00 will be made for removal and reinstallation.

REPLACEMENTS AND REPAIRS

These standard charges cover service only and include all testing required to locate trouble. Prices for materials used are extra and are listed in the Philco Catalog of Parts, Accessories, Tubes and Batteries.

Aerial (Built-in Loop)—replacement or repair	33.00
Audio Amplifier—resistor or condenser replacement, wiring repairs	2.50
Audio Transformer—replacement	3.00
Automatic Frequency Control System—resistor or condenser replacement, wiring repairs	3.00
Automatic Record Changer—cleaning, adjustment and lubrication	1.50
Automatic Volume Control System—resistor or condenser replacement, wiring repairs	2.75
Batteries (Portable Radio)—replacement	1.00
Condenser (Main Filter)—replacement	2.50
Condenser (Compensator)—replacement	3.00
Condenser (Tuning Gang)—adjustment	2.50
Condenser (Tuning Gang)—replacement	3.50
Detector Circuit (First)—resistor or condenser replacement, wiring repairs	2.50
Detector Circuit (Second)—resistor or condenser replacement, wiring repairs	2.75
Dial Drive Cable—replacement	1.75
Dial Drive Mechanism—replacement or repair	1.50
Dial Lamp—replacement	.50
Dial Pointer—replacement	.50
Dial Scale—replacement	1.00
Discriminator Circuit—resistor or condenser replacement, wiring repairs	3.00
Discriminator Transformer—replacement	3.50
Filter Choke—replacement	2.25
Intermediate Frequency Amplifier—resistor or condenser replacement, wiring repairs	2.00
Intermediate Frequency Transformer—replacement	2.50
Limiter Circuit—resistor or condenser replacement, wiring repairs	2.00
Oscillator Circuit—resistor or condenser replacement, wiring repairs	2.25
Oscillator Coil—replacement	2.75
Phonograph Motor—cleaning and lubrication	2.75
Phonograph Motor—replacement	2.00
Phonograph Pickup—replacement or adjustment	1.75
Power Supply Circuit—resistor replacement, wiring repairs	2.00
Power Transformer—replacement	3.50
Radio Frequency Amplifier—resistor or condenser replacement, wiring repairs	2.50
Radio Frequency Transformer—replacement	3.00
Resistor (Voltage Divider)—replacement	2.50
Shadow Tuning Meter—replacement or repair	2.00

Speaker Cone—recentering	1.00
Speaker Cone—replacement	2.00
Speaker Field Coil Assembly—replacement	3.00
Station Selector System (Mechanical)—adjustment and lubrication	1.50
Switch (On-Off)—replacement	1.50
Switch (Push Button)—cleaning and lubrication	2.00
Switch (Push Button)—replacement	2.75
Switch (Radio-Phone)—replacement	1.75
Switch (Wave Band—Single Section)—cleaning and lubrication	2.00
Switch (Wave Band—Single Section)—replacement	2.75
Switch (Wave Band—Multiple Section)—cleaning and lubrication	2.50
Switch (Wave Band—Multiple Section)—replacement	4.00
Tone Control—replacement	2.25
Tubes—replacement	1.00
Tube Socket—replacement	3.00
Tube Socket—repair contacts	2.00
Vibrator—replacement	1.50
Volume Control—replacement	2.25
Volume Expansion Amplifier—resistor or condenser replacement, wiring repairs	3.00
Wireless Remote Control Amplifier—resistor or condenser replacement, wiring repairs	3.50
Wireless Remote Control Transformer—replacement	4.00
Wireless Remote Control Stepper—replacement	4.50

ALIGNMENT OF TUNED CIRCUITS

Including Dial Calibration

Intermediate Frequency Stages	.50
Intermediate Frequency Stages (High Fidelity)	1.50
Standard Broadcast Band	1.00
Short Wave Band (each)	1.00
Automatic Frequency Control	1.75
Wireless Remote Control Amplifier	2.50
Frequency Modulation System	3.00

AUTOMATIC TUNING ADJUSTMENTS

Push Button Type	1.50
Motor Operated Type	2.00

The above prices are based on the correction of trouble that appears continuously, and without interruption. For correcting trouble which occurs intermittently, requiring additional testing over a period of time, prices will be higher than those listed, depending upon the amount of additional time required.

All parts, tubes and batteries replaced are returned to customer—be sure to ask for them.

**MINIMUM CHARGES \$1.00 ON ALL RADIOS BROUGHT TO SHOP
\$1.50 PLUS TRANSPORTATION ON OUTSIDE CALLS**

RMS has compiled this standard schedule of service charges, based upon a careful estimate of the work and time involved in each process as performed by the serviceman.

**RINGLING BROS and
BARNUM and BAILEY**

**THE GREATEST
SHOW
ON EARTH**

Depends on

**RAYTHEON
TUBES**



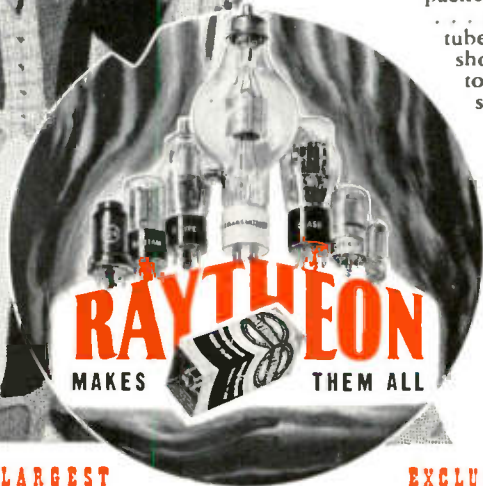
WHAT A THRILL! . . . when you hear the Ringling Bros and Barnum and Bailey announcer say L-A-D-I-E-S and G-E-N-T-L-E-M-E-N. Then you know you are about to witness The Greatest Show on Earth . . . a circus that is known to every man, woman and child in America.

When on tour the Ringling sound system is packed and unpacked twice each day . . . it is a gruelling test on radio tubes—always subjected to sudden shocks in transportation from truck to train . . . but twice each day the sound system goes into perfect operation because RAYTHEON TUBES are always on the job!

Ringling Bros, like thousands of radio servicemen, wanted a radio tube that will stand up no matter what the operating circumstance . . . that's why they choose RAYTHEON!

Your RAYTHEON distributor has an interesting offer . . . it will pay you to ask him!

RAYTHEON PRODUCTION CORPORATION
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WORLD'S LARGEST

EXCLUSIVE RADIO TUBE MANUFACTURERS

RIDER on Tube Phase

KP AND G—PART I

AT first glance it may appear as if this were a story of military punishment for a misdemeanor, but it is not so. This is a story of the relationships existing between the cathode, plate, and control grid of the conventional triode vacuum tube. Therein are to be found very interesting material, which can be correlated with many different types of special tube circuits, and when that is done, many of the complexities of these singular systems become more easily understandable.

The reason for selecting the triode as the subject of basic discussion is simple; it is basic and as far as amplification is concerned—which is the stepping stone to the final destination—an explanation of the triode embraces the multi-electrode tubes as well. The addition of the other electrodes does not change the basic conditions necessary for amplification. Indeed, it is surprising to note how much valuable information can be gathered from a simple analysis of the phase relations existing between the grid voltage, plate current, and plate voltage, among the various tube elements which are associated with these quantities.

BASIC TRIODE CIRCUIT

To furnish the basis for description, we show the simple triode circuit of Fig. 1. Since the heater does not enter into any of the explanations, it has been omitted. Starting with the grid circuit, certain notations must be explained. The signal voltage fed into the system from whatever source you wish to imagine is identified as e_g . The grid

bias battery E_{cc} also represents the grid voltage. The instantaneous grid voltage effective between the control grid and the cathode of the tube is identified as e_c . Since the grid bias voltage source E_{cc} is in series with the signal voltage e_g , the actual voltage effective between the control grid and the cathode is the sum of e_g and E_{cc} . At times the voltage effective between the control grid and cathode will exceed the bias voltage, as for example when the polarity of e_g is the same as that of E_{cc} , which is negative. At another time, when the polarity of e_g is positive with respect to the cathode, the signal voltage and bias voltage will tend to buck one another.

To facilitate comprehension of these conditions, let us inject some actual values. For the present, let us assume that e_g has a peak value of 13.5 volts and E_{cc} is rated at -13.5 volts. This means that the total swing of e_c is from -13.5 volts to $+13.5$ volts, or a total of 27 volts. With E_{cc} , the grid bias voltage identified as being -13.5 volts, the range of the grid voltage effective between the control grid and the cathode, will be from 0 to -27 volts, for when the signal voltage e_g is at its peak value, but positive with respect to the cathode, it cancels out the bias voltage; and when the signal voltage e_g is at its peak, but negative with respect to the cathode, it complements the bias voltage E_{cc} .

John F. Rider

In the plate circuit, we also show elements, values and notations. The plate circuit outside of the tube contains the plate voltage supply source E_{bb} , rated at 350 volts, and the load resistor R_b , rated at 20,000 ohms. Obviously, the ohmic value of the load resistance is lower than is commonplace in practice, but its selection is purely one of choice to illustrate a point concurrently with some other material which is mentioned. Forgetting that for a moment, the low value of plate load resistance does not in any way change what we can discuss as far as phase relations are concerned.

POLARITY DESIGNATIONS

As to the remaining notations, the plus and minus signs associated with the load resistance, e_{R_b} , $i_b R_b$, i_b and e_b ; note that the polarity signs at the two limits of the load resistance are enclosed in parentheses, and indicate the polarity relation of the two ends of the load resistor with respect to the cathode of the tube. If the cathode is selected as a reference point, the polarity of the high end of the resistor and the low end are the same, for all points in the plate circuit are positive with respect to the cathode. Irrespective of which convention you accept as far as direction of current flow is concerned, we do know that the cathode is the most negative point in the plate circuit. But as far as any two points in the plate circuit are concerned, they may have relative polarities with respect to each other, even though both of these points may have the same polarity with respect to a third. This is like a well contained within a house. As far as the bottom of the well is concerned, it is below both the surface of the earth and the roof; hence, if we say that the bottom of the well represents the most negative point, then the surface of the earth as well as the roof are positive points. However, as far as the rela-

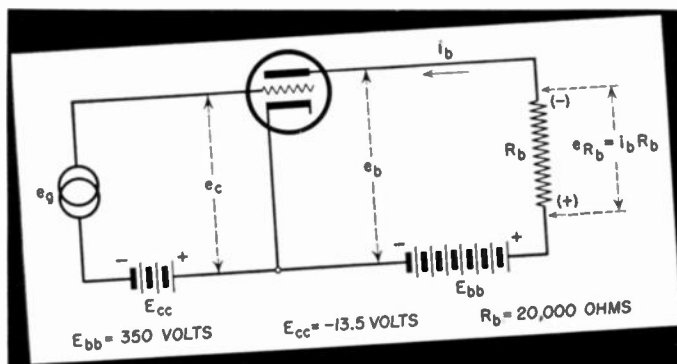


Fig. 1. Simple triode circuit with voltage, current and load designations used for explaining phase relations.

relationship between the surface of the earth and the roof is concerned, their relative polarities with respect to themselves depend entirely upon what reference point is selected.

In the case we cite—the plate load resistor—the polarity designations are due entirely to the direction of the current flow through the resistor. If you wish to adopt the modern convention that electron flow is from minus to plus, which is what happens within the tube, from the cathode to the plate, then the direction of current flow makes the top end of the resistor negative with respect to the bottom end, although both are still positive with respect to the cathode. If you wish to work with the old convention, which is done herein so as to be in line with conventional practice, wherein the direction of electric current is from plus to minus, the top end of the resistor is still negative with respect to the bottom.

PHASE DIFFERENCE

The current we are talking about is i_b , the instantaneous value of plate current. Since this current flows through the plate circuit, it naturally flows through R_b , the load resistor. This means that a voltage drop $i_b R_b$ is developed across this resistor and the polarity of this voltage, must of necessity be the same as we indicated for the two limits of the resistor. But if this is so, then a peculiarity seems to exist in the plate circuit. According to the polarity designations for the voltage drop across the plate load resistance and the polarity ratings of the plate voltage supply unit, these two voltages seem to buck each other. That is entirely correct, and this gives rise to the condition that the voltage actually effective at the plate—the voltage we designate as e_b is the difference between the supply voltage and the voltage drop across the plate load resistor. In other words,

$$e_b = E_{bb} - i_b R_b$$

or

$$e_b = E_{bb} - e_{Rb}$$

where $i_b R_b = e_{Rb}$

It is in the examination of the manner in which this instantaneous plate voltage e_b varies with the instantaneous value of grid voltage e_g , that we find the difference in phase between grid and plate voltage. Let's look into this by stating certain values for the various quantities indicated in the plate circuit. These are not imagined values, but rather actual functional data for one of the well-known tubes.

Suppose that we assume one instant of operation; namely, when the signal voltage is zero, or when the grid is operating at the quiescent point. This means that the effective grid voltage

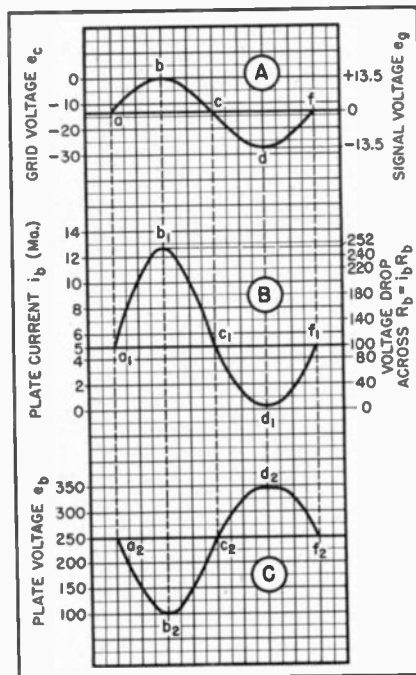


Fig. 2. Waves showing the phase relations existing in a triode.

e_g is equal to the bias voltage E_{cg} of -13.5 volts. When this condition exists in the grid circuit, the plate current i_b is .005 ampere (5.0 milliamperes). This means that the voltage drop $i_b R_b$ is $.005 \times 20,000$ or 100 volts. And according to the method of establishing the effective plate voltage e_b , it is equal to $350 - 100$ or 250 volts.

Let us now assume another instant, when the signal voltage e_g is at its peak value of 13.5 volts and of such polarity that it is positive with respect to the cathode. Then the effective grid voltage e_g is $(+13.5) - (-13.5)$ or 0. At this instant the plate current is .0126 ampere or 12.6 milliamperes. The voltage drop across the load resistor then is $.0126 \times 20,000$ or 252 volts. The effective plate voltage e_b , then is $350 - 252$ or 98 volts.

Now let us take still another extreme condition, the other limit; namely, when the signal voltage is again at its peak value of 13.5 volts, but this time of such polarity that it is negative with respect to the cathode. This time the final effective grid voltage e_g is $(-13.5) + (-13.5)$ or a total of -27 volts. At this instant the plate current i_b is .0002 ampere or 0.2 milliampere and the drop across the load resistor is $.0002 \times 20,000$ or 4.0 volts. This means that the effective plate voltage e_b is $350 - 4$ or 346 volts.

POSITIVE ALTERATIONS

We now have the conditions existing in the plate circuit for zero grid voltage as well as both extreme limits. Of course, intermediate values of grid voltage could be quoted, but they are not necessary in order to illustrate the

point. Suppose that we present these facts in the form of a table for greater ease of visualization. The notations correspond with those in Fig. 1 and the load resistor is 20,000 ohms.

e_g	e_c	i_b	$i_b R_b$	e_b
+13.5	0	12.6	252	98
0	-13.5	5.0	100	250
-13.5	-27	0.2	4	346

Let's analyse this table of figures: Suppose we start with the signal voltage e_g and the plate current i_b . The change in signal voltage in both directions from 0 is uniform, yet we note that the increase or decrease in plate current from the quiescent value of 5.0 milliamperes corresponding to zero-signal input, is not uniform. We note that when the signal voltage rises in the positive direction from zero, the plate current also rises in the positive direction from the quiescent value—and then, when the signal voltage rises in the negative direction from 0, the plate current also rises in the negative direction.

The previous sentence may be confusing in the light of the obvious decrease of plate current from 5.0 milliamperes to 0.2 milliampere as shown in the table, yet we talk of an increase in the negative direction. What we have in mind is representation of these two conditions in the form of waves, as shown in A and B of Fig. 2. In this case, we consider the change in plate current as taking place around the quiescent value, 5.0 milliamperes, and the decrease in plate current corresponding to the negative half of the input signal cycle is the equivalent of the negative half of the waveform representation.

It is to be remembered that in general, the plate current flow in an amplifier tube circuit always is in the same direction, and that whatever alternating component of current is supposed to exist in the plate circuit is in reality, the fluctuation in current above and below the value which exists when there is no signal applied to the grid. What we call the positive half of the alternating current component cycle is actually the rise in plate current and what we call the negative half of the alternating current component cycle, actually is the decrease in plate current below the no-signal input value.

If now we look at Fig. 2, we note that since the input signal voltage and the plate current pass through their minimum and maximum points at the same time and in the same direction, these two quantities are in phase with each other.

PLATE CURRENT & VOLTAGE

Let us now compare the plate cur-
(Continued on page 19)

Set of the Month—

Airline FM Receiver-Converter



THE effort to reduce the cost without sacrificing the principal benefits to be derived from a frequency-modulation receiver has led to a number of interesting designs, one of which is the new *Montgomery Ward* Airline Model 14BR-613A Frequency Modulation Receiver and Converter.

As may be determined from the accompanying schematic, it is of the acdc type and employs 7 tubes with considerable economy with regard to the results offered. The tuning range is 42 to 50 mc, and the undistorted power output is 4 watts into a 5-inch p-m speaker which serves as a tweeter, if desired, when the unit is employed as a converter in conjunction with the audio system of another receiver. The total power consumption is 70 watts; the quieting sensitivity 30 microvolts. An intermediate frequency of 4.3 mc is employed.

THE CIRCUIT

The antenna transformer *T1* and the oscillator coil *T2* are permeability-tuned, the arrangement shown in *Fig. 1* being used. This neatly dispenses with the expensive variable air gang con-

denser that would otherwise be required, and as a further means of minimizing frequency drift, which can be quite extensive at the high frequencies involved, the antenna and oscillator trimmers *C4* and *C5* are of the new ceramic type.

The secondaries of the first and second i-f transformers, *T3* and *T4* are shunted by resistors to broaden their characteristics. No shunt resistor is used on the limiter transformer, *T5*,

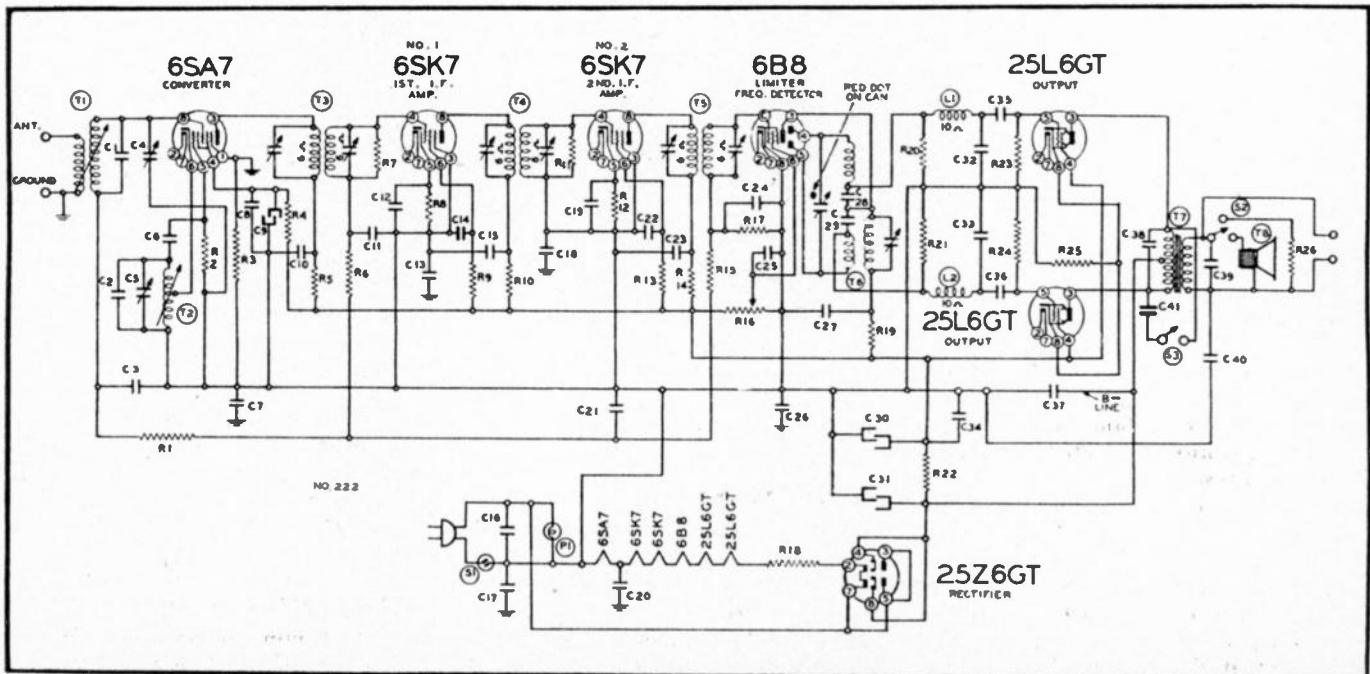
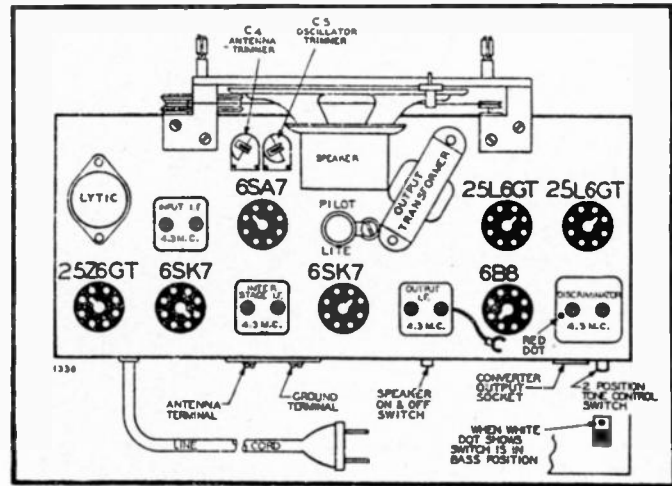
as the limiting action serves to flatten the nose of the signal peak.

It is interesting to observe that the functions of limiting and frequency detection are assigned to a single tube—a 6B8 duo-diode pentode. The pentode section serves as the limiter, the two diodes as the discriminator.

Unlike previous f-m circuits, volume in this receiver is controlled by varying the voltage on the screen of the 6B8 by means of the 50,000-ohm poten-

Fig. 2. Chassis layout showing location of trimmers, tone switch, etc.

Below: Schematic of Montgomery Ward FM Receiver and Converter.



tiometer *R16*. This method is made convenient by the fact that there is no portion of the audio system that is single-ended; hence, control of volume in the a-f circuit would call for a dual potentiometer.

The discriminator transformer *T6* is similar to other types with the exception that the secondary is split and series condensers *C28* and *C29* inserted. The output is essentially push-pull, the diode voltages being equal and opposite in phase. These voltages are developed across the load resistors *R20* and *R21*.

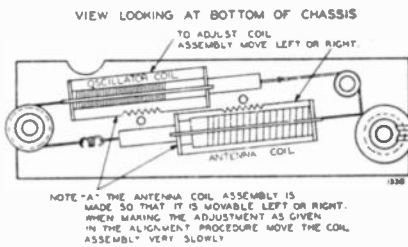


Fig. 1. Permeability-tuned r-f coils.

The chokes *L1* and *L2* and the condensers *C32* and *C33* serve as r-f filters and prevent i-f voltages from reaching and loading the grids of the 25L6GT beam-power tubes connected in push-pull.

Since discriminator stages in f-m receivers provide considerable poop, the discriminator in this job is able to directly drive the beam-power tubes, which have considerable gain or sensitivity to begin with. Slight degeneration is introduced in the output stage by leaving the common cathode resistor *R25* unbypassed.

The switch *S2* in the speaker circuit permits the p-m speaker *T8* to be cut out if desired, in which case the 3-ohm resistor *R26* is substituted as a load on the secondary of the output transformer.

A simple resistance-capacity filter is employed in the power-supply circuit. This is sufficient, as the current drain through the filter resistor *R22* is small. Since the output is push-pull, the plates of the 25L6GT tubes can be supplied directly from the cathodes of the 25Z6GT rectifier.

Note that a 110-volt pilot lamp is employed, this being connected across the supply line on the switch side. Also note that r.f. in the circuit of the 6SA7 mixer-oscillator is kept out of the heater circuits of the remainder of the tubes by means of the bypass condenser *C20*.

ALIGNMENT DATA

Complete alignment data is provided in the accompanying chart which should be of interest whether or not you require the information for actual use. Location of the various trimmers is given in Fig. 2.

ALIGNMENT PROCEDURE

CAUTION: A—D.C. reading vacuum tube voltmeter must be used to make some of the following adjustments.

- Volume control—Minimum all adjustments.
- Connect radio chassis to ground post of signal generator with a short heavy lead.
- Connect dummy antenna value in series with generator output lead.
- Allow chassis and signal generator to "heat up" for several minutes.

The following equipment is required for aligning:

- An all wave signal generator which will provide an accurately calibrated signal at the test frequencies as listed.
- Vacuum tube voltmeter.
- Non-metallic screwdriver.
- Dummy antennas—1 mf., 400 ohms.

BAND	SIGNAL GENERATOR Frequency Setting	Dummy Antenna	Connectors to Radio	Dial Pointer Setting	Trimmers Adjusted in Order Shown	Trimmer Function	Adjustment
L. F.	4.3 Mc.	.1 MFD.	Grid of 6SK7 No. 2	45 Mc.	Two trimmers on top of T5	Limiter I. F.	Adjust to maximum voltage (See Note "A")
	4.3 Mc.	.1 MFD.	Grid of 6SA7	45 Mc.	Two trimmers on top of T3	Input I. F.	Adjust to maximum voltage (See Notes "A" and "B")
	4.3 Mc.	.1 MFD.	Grid of 6SK7 No. 1	45 Mc.	Two trimmers on top of T4	2nd I. F.	Adjust to maximum voltage (See Notes "A" and "C")
	4.3 Mc.	.1 MFD.	Grid of 6B8	45 Mc.	Trimmer with red dot on top of T6	Disc. I. F.	Adjust to zero signal (See Note "D")
	4225 Kc. and 4375 Kc.	.1 MFD.	Grid of 6B8	45 Mc.	Trimmer without red dot on top of T6	Disc. I. F.	See Notes "D" and "E"
R. F.	50.5 Mc.	400 Ohms	Antenna Lead	50.5 Mc.	C5 C4	Osc. Ant.	Adjust to maximum voltage (See Note "A")

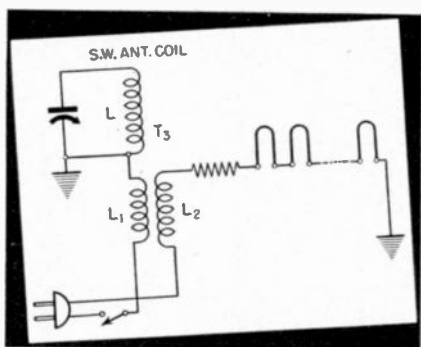
- NOTE "A":** Connect a D.C. reading vacuum tube voltmeter in parallel with *C24*. Use only enough signal to obtain a medium scale deflection. Use an unmodulated signal.
- NOTE "B":** Before aligning this stage one trimmer of *T4* must be adjusted to maximum capacity and the other adjusted to minimum capacity.
- NOTE "C":** Do not realign or "Go Over" the I.F. adjustments after the above procedure has been followed or unsymmetrical wave shape will result.
- NOTE "D":** Connect an output meter across the speaker voice coil. Use a modulated signal.
- NOTE "E":** Adjust trimmer so that the same output reading will be obtained with the signal generator set at both 4225 K.C. and 4375 K.C., that is, 75 K.C. each side of the I.F. frequency. Check adjustment of trimmer with red dot after this adjustment.

Alignment procedure chart. Observe notes with regard to alignment methods.

CIRCUIT COURT

POWER LINE AERIAL

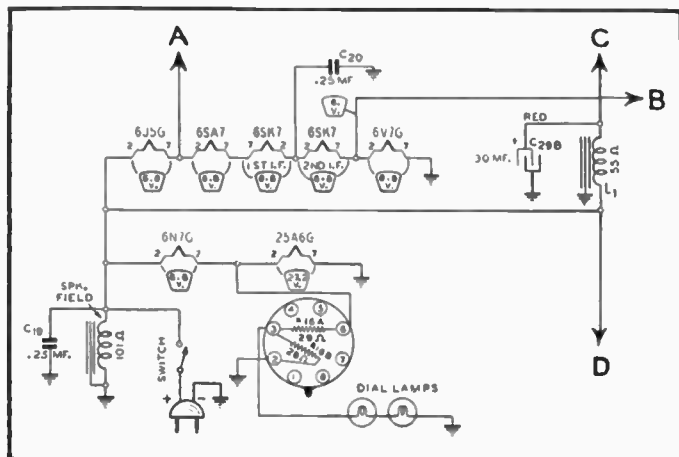
IN THE NEW *Emerson* Models FH-413 and FH-440, the power line is employed as the antenna in the short-wave band. The usual input bypass condenser is dispensed with, and a coupling coil placed in series with each side of the line, as shown in the accompanying diagram.



These coils (*L1* and *L2*) are a part of the short-wave antenna transformer *T3*, and are inductively coupled to the secondary *L*. The two primaries *L1* and *L2* are used so that one will be effective irrespective of which way the power plug is inserted in the outlet.

STRAIGHT 32-VOLT SET

THE USUAL TYPE of 32-volt farm receiver employs a vibrator unit with step-up transformer or a motor-generator for the power supply. But not the latest *Montgomery Ward* Airline Models 14WG-756 and -757. In these



receivers, the 32 volts d.c. as supplied by the storage batteries serves, without step-up or step-down, as both the "A" and "B" supply, as shown in the diagram.

Two series heater strings, each equaling approximately 32 volts, are connected in parallel across the line. The voltage drop across each heater is given. The 101-ohm dynamic speaker field is also connected across the line, as in auto-radio practice. Two dial lamps are in series with a ballast.

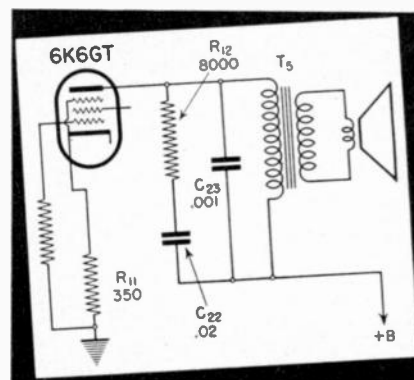
Lead *D* (32 volts) supplies the plates of the 6N7G push-pull output tube. Lead *C* supplies the plate and screen voltages for the remainder of the tubes. Lead *B* (which is 6 volts above ground) supplies bias for the grids of the output tube. Lead *A* (at 27 volts) supplies grids *G2* & *G4* of the 6SA7 1st detector.

In order to provide adequate gain at these low voltages, regeneration is introduced in the i-f stages by means of tickler windings in the i-f transformers.

OUTPUT FILTER

WITH THE EXTENSIVE use of degenerative circuits in conjunction with output pentodes and beam-power tubes, you may have lost sight of the fact that distortion in these high-impedance tubes can be materially reduced by means of a corrective filter. Just such an arrangement is employed in the new *Westinghouse* Model M-102, as shown in the accompanying diagram.

The filter consists of the resistor *R12* and the condenser *C22* connected

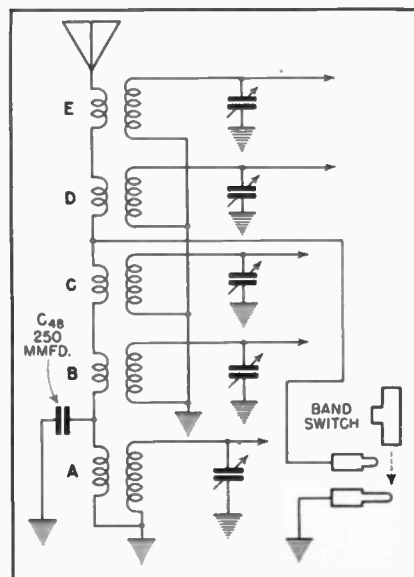


in series across the primary of the output transformer *T5*. Hence, it is in parallel with the plate-load impedance reflected from the speaker voice coil by the output transformer. The magnitude of this reflected impedance increases with increasing frequency in the middle and upper audio range. The impedance of the filter, however, decreases with increasing frequency. Therefore the effective load impedance on the 6K6GT output tube is made practically constant for all frequencies in the middle and upper range.

SIMPLIFIED SWITCHING

THE ANTENNA transformers in the *Westinghouse* Models M-110 and M-114 five-band receivers have all of their primaries connected permanently in series, as shown in the diagram.

(Continued on page 21)



Power supply circuit of Ward Airline 32-volt receiver. Plate and screen values do not exceed the 32-volt source.

TECHNICAL

SERVICE PORTFOLIO

SECTION XIV

NEW RCA GAIN DATA INSTRUCTIONS

COMPLETE gain data are published in the Service Notes for RCA Victor radio receivers, starting with 1941 models.

For speed and convenience, the gain data is printed on the schematic diagram of each model.

For the utmost utility in signal tracing, so that any trouble may be quickly narrowed down to a single point, the gain is given for each separate r-f, i-f and a-f tube, and also for each r-f and i-f transformer. In addition, the avc voltage is shown, and also the oscillator grid voltage on all frequency ranges.

To provide more definite operating conditions, the r-f and i-f gain data for RCA Victor Service Notes is now obtained with a fixed 3-volt bias on the avc bus.

To duplicate this gain data, it is necessary to connect a 3-volt bias battery temporarily to the set as indicated in the service notes. The negative side of the 3-volt battery should be connected to the avc bus, and the positive side of the battery should be connected to the chassis. In a.c.-d.c. receivers, the positive side of the battery should be connected to the common negative wiring.

The battery may consist of two small flashlight cells connected in series.

Use of the fixed bias eliminates necessity for shorting out the avc circuit, and minimizes difficulty due to overloading with resultant grid current.

(A few RCA Service Notes show gain data with the avc working, and also shorted out.)

Several variable factors influence the

gain of sections in a receiver, including tubes, which may vary more than 25%, regeneration, adjustment of the tuned circuits, accuracy of tuning, line voltage, and experience on the part of the operator.

Obviously it is impossible to specify definite receiver tolerances. Two-to-one variations may be regarded as normal.

All gain checks throughout the entire receiver circuit (radio-frequency, intermediate-frequency, and audio-frequency sections) can be made with the signal generator connected to one point (the antenna terminal), and tuned to one frequency (600 kc).

This naturally simplifies the procedure and speeds up the work.

PRELIMINARY SET-UP

Connect the output cable of the signal generator to the antenna and ground terminals of the receiver.

Use the recommended dummy (usually 100, 200, or 300 mmfd for the broadcast band) in series with the antenna terminal.

Adjust the signal generator to 600 kc, or to some frequency near 600 kc that is free from local broadcast interference.

The exact frequency is not important. If the signal generator is slightly off calibration, set it to the 600 kc mark, because both the receiver and the Chanalyst will be tuned to the actual generator frequency even though this may be slightly above or below 600 kc. In other words, the generator frequency is the starting point, and both the receiver and the Chanalyst will be tuned to it.

Set the signal generator to give 400

cycle internal audio modulation on the 600 kc signal. The percentage of modulation is not important in making gain checks, but the standard value of 30% is recommended.

Strap two 1½ volt flash-light cells together and connect them in series. Connect the negative to the avc bus in receiver. Connect the positive to the chassis, or to the common negative wiring in a.c.-d.c. sets.

Tune the receiver carefully for peak output on the signal (assumed to be 600 kc) from the generator.

Connect the clip on the end of the Chanalyst ground lead (black) to the receiver chassis. In a.c.-d.c. sets, connect the Chanalyst ground lead to the common negative wiring.

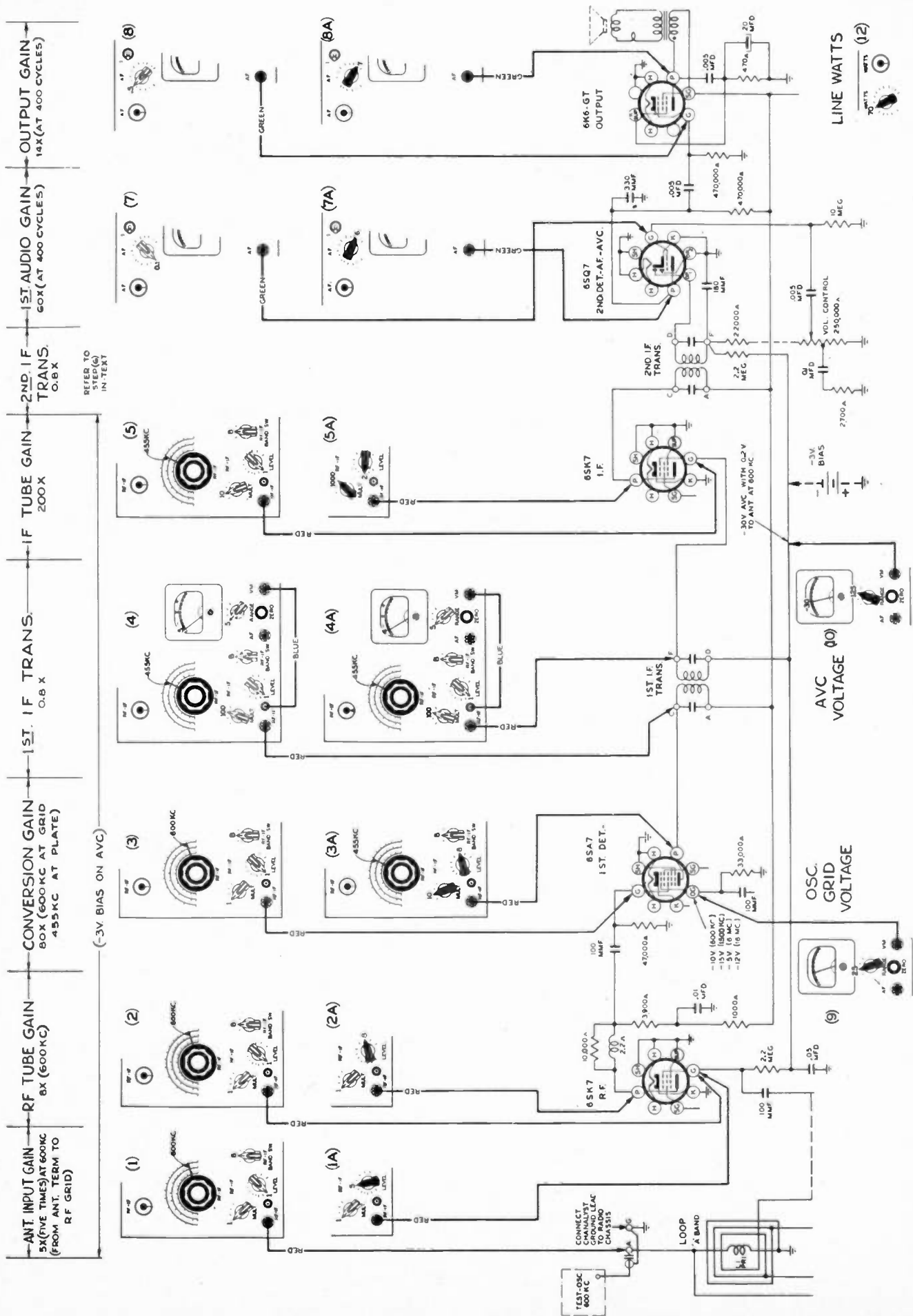
Place the Chanalyst RF-IF probe (red cable) on the receiver antenna terminal. Set the RF-IF controls as shown in step (1), (see diagram) and tune the RF-IF channel for peak output as indicated on the RF-IF magic eye.

MAKING GAIN CHECKS

Step (1). Antenna Input Gain

With the r-f, i-f channel tuned to the 600 kc signal, and with the level and multiplier controls set at 1 and 1, as shown at (1) in the drawing, adjust the output of the signal generator until the RF-IF Magic Eye just closes (or electronic voltmeter reads 5 volts). See note under "Miscellaneous Data" about using the electronic voltmeter in conjunction with the magic eye.

Move the RF-IF probe from the antenna terminal to the grid prong of the r-f tube. If there is a gain, the RF-



This block schematic shows Chanalyst control settings for checking each stage, tube gain, etc. See text for examples.

IF magic eye will overlap. Adjust the level control until the eye is just closed. In this example, the level control has been turned from 1 to 5, indicating a voltage step-up or gain of five times from the antenna terminal to the grid of the first tube. (This is the gain from the antenna coil to the tuned loop.)

The service note for this particular model (Model 16T3) specifies an approximate gain of five times from the antenna terminal to the r-f control grid. If the gain is appreciably less than specified, the tracking should be checked. The simplest and most definite method for doing this is described later.

Step (2). R-F Tube Gain

Place RF-IF probe on grid of r-f tube. Set RF-IF input controls as shown in (2). Adjust signal generator output until RF-IF Magic Eye is just closed.

Move RF-IF probe to plate of r-f tube. Adjust level control until RF-IF eye just closes. If new level setting is 8 the gain from grid to plate is 8 times.

Move the probe to the grid of the 1st-detector tube, which is resistance-coupled to the r-f tube in this particular model. There should be only a slight drop through the coupling circuit.

With a receiver that has transformer coupling between the r-f and 1st-detector tubes, check the gain from primary to secondary.

Step (3). 1st-Detector Conversion Gain

Place the RF-IF probe on 1st-detector control grid and turn RF-IF level and multiplier controls to 1 and 1. Adjust signal generator output so the RF-IF Magic Eye is just closed.

Move the RF-IF probe to the 1st-detector plate. Tune the RF-IF channel for peak output on the i-f signal. Adjust multiplier and level controls so RF-IF Magic Eye is just closed.

In this example (3A) the multiplier is turned from 1 to 10 (10 times), and the level control is turned from 1 to 8 (8 times). The conversion gain is therefore 80 times.

The i-f signal voltage across the plate circuit of the 1st-detector tube is 80 times greater than the 600 kc signal voltage across the 1st-detector grid circuit.

If the conversion gain is appreciably less than specified, it may be due to incorrect i-f alignment, but first try retuning the set for peak output. (The voltmeter channel provides an excel-

lent output meter for this purpose by using it to measure avc voltage.)

Step (4). Checking 1st I-F Transformer

On this set, there is a decrease or loss, instead of a gain, from primary to secondary of the 1st i-f transformer.

Place the RF-IF probe on the primary of the 1st i-f transformer and adjust the signal generator output so the RF-IF Magic Eye just closes, or so the electronic voltmeter indicates -5 volts.

Move the probe to the secondary. In this example (4A), the eye opens slightly, and the meter drops to -4 volts, indicating a loss of 5 to 4 or 0.8 times.

Step (5). I-F Tube Gain

Place RF-IF probe on the i-f grid. Set multiplier at 10 and level at 1. Adjust signal generator output so that RF-IF Magic Eye is just closed.

Move RF-IF probe to plate of the i-f tube and adjust multiplier and level controls until eye is just closed.

In this example (5A) the multiplier is turned from 10 to 1000 (100 times) and the level control is turned from 1 to 2 (2 times). The gain is therefore 100 times 2, or 200.

Owing to the high gain obtained in the i-f stage, there may be some tendency toward regeneration or oscillation when measuring i-f gain. To minimize this effect, the RF-IF probe should be placed so that it does not increase coupling between the i-f grid and plate circuits.

Step (6). Checking 2nd I-F Transformer

In this particular set, the 2nd i-f transformer has the same loss as the 1st i-f transformer, and is checked as in step (4), except with multiplier at 1000.

Step (7). 1st-Audio Gain

In making audio gain checks, the tone controls should be set for maximum response.

Turn Chanalyst AF control to 0.1 and set AF toggle switch to 1.

Place the AF channel probe (green cable) on the arm of the receiver volume control. Adjust the receiver volume control so the AF channel Magic Eye just closes.

Move the probe to the 1st-audio grid. There should be only a slight drop through the coupling condenser.

With the AF channel probe on the grid of the 1st-audio tube, reset the receiver volume control so the AF eye is just closed.

Move the AF probe to the plate of

the 1st-audio tube. Adjust the AF channel control so the AF eye is just closed. In this example (7A) the control is turned from 0.1 to 6.0, indicating a voltage step-up or gain of 60 times (0.1 divided into 6.0 equals 60.)

Move the AF probe to the grid of the output tube. There should be only a slight drop through the coupling capacitor.

If the receiver has a phase inverter tube, check its gain in the same way as described for the 1st-audio tube.

Step (8). Output Stage Gain

Turn Chanalyst AF control to 0.5 and place AF probe on the grid of the output tube. Adjust the receiver volume control so the AF Magic Eye is just closed.

Move the probe to the plate of the output tube. Adjust the AF channel control so the AF eye is just closed. In this example (8A), the control is turned from 0.5 to 7.0, indicating a voltage step-up or gain of 14 times (0.5 divided into 7.0 equals 14).

With a push-pull (or parallel push-pull) output stage, check each tube separately, with the other output tube (or tubes) removed from the set. This gives a definite check on each output tube. The published data gives the gain with all of the output tubes in operation.

On some sets, particularly ac-dc types, hum voltage on the output tube plate may be quite high, reaching values of 10 or 15 volts. In such cases, it is necessary to use a strong signal at the output grid, so that the signal at the plate will be high enough to "mask" the hum voltage. An AF Adaptor will prove very helpful in making accurate a-f gain measurements because it attenuates the 60- and 120-cycle hum components without materially affecting the 400-cycle signal. The adaptor is designed to "plug-in" between the AF cable and the AF input jack on Chanalyst.

Step (9). Measuring Oscillator Grid Voltage

Checking the oscillator grid current (by measuring the rectified oscillator signal across the oscillator grid leak) is a valuable and quick method of determining whether the oscillator is working throughout the range on each band.

Connect the electronic voltmeter channel probe (blue cable) to the oscillator grid. Observe the voltage reading while tuning across each band.

The published RCA gain data gives
(Continued on page 16)

Serviceman's Diary

J. P. Hollister

SATURDAY—I hopped out of the bus which brought me to the dude ranch and passed in review before eighty-five pairs of feminine orbs on my way to the proprietor's office. The damsels were strewn all over the place—on benches, chairs, on the grass and in nearly every squattable section in the immediate vicinity. They looked lonesome; but it didn't look as if I were going to be lonesome too. There were only two or three men in sight. And, amid such a setup, I was to spend my vacation!

After signing the register, I was given a button with my name on it, shoved out a side door, and left to my fate. None of the mob was around this exit, so I was able to get to my quarters in a cabin called the Bullpen, without incident. After changing my

clothes, I gazed out the back window over the quiet valley and saw the snow-capped Adirondacks rising steeply in the distance. It was so calm and peaceful. My vacation had started. Then I opened my cabin door and walked right smack into the arms of two girls in bathing suits. My vacation had ended.

"New stuff!" they yelled, waving to other girls coming up the path. They, too, took up the cry and pretty soon I was surrounded by a dozen chattering, laughing females. You'd think they'd never seen a man before.

"We're going to take your picture," a cute little blonde told me.

"Okay by me," I said, "Where shall I stand?"

"You don't stand!" she replied. "You sit!" And they pushed me into a big

wooden chair on the porch. Then the two in bathing suits squeezed in with me.

"Come on, get friendly!" the little blonde photographer said. The girls in the chair put their arms around my neck. Then she snapped the camera. I began to think that I was going to like this place.

"Now," one of them said, "do you know anything about radio?"

"No," I answered. After all, this was a vacation.

"Yes!" she contradicted. "Otherwise you wouldn't write your address on the register as care of a radio shop. And we've got a job for you."

I began to think of checking out. But it was my own fault.

We went down to the recreation hall and they showed me the p.a. system. It seemed that it howled when they tried to play it loud. It wasn't hard to fix. The speakers were so arranged that the sound would ping right back into the mike, so all I had to do was to change the position of the speakers and it was fixed. I breathed easier.

When I finished, it was about time for dinner, so I went back to the cabin to get washed up. There I met the other fellows who were staying at the ranch, about fifteen in all. None of them looked as if they had had much sleep, and they told me I had better grab as much shuteye now as I could, because after a day or so, the girls would start to wear me down, as they had them. This got me a little scared again. I like my sleep.

"After dinner there was dancing. Bill, one of the fellows I had met in the cabin, brought up a swell little dark-eyed girl.

"This," he said, "is Lola. I'm just introducing you to her so you will know who I mean when I tell you to keep away from my girl. You can have her just for this dance; then I want her back."

"Baloney," said Lola. "I heard you say the same thing about Alice when you took her over to Jack yesterday afternoon!"

"Yes," Bill agreed mournfully, "and I haven't seen either of them since!"

While we were dancing Lola told me that Jack and Alice had been out all night and were back in their cabins, sleeping. Said she couldn't understand why people had to sleep so much . . . especially the men. Maybe I would like to drive her and her friends around

(Continued on page 24)



"They pushed me into a big chair on the porch. Then the two in bathing suits squeezed in with me."

The RADIOFRONT

KARL A. KOPETZKY

DURING the month just passed, things have been singularly quiet on the surface, but underneath, the pot is beginning to boil. As foretold here last month, the *OPM* has assigned 250 men to field work to see that priority orders are being carried out. This is the "Compliance Section" which we mentioned. The section is working together with the Census Bureau and will investigate, among other things, the manner in which priority orders are being filled, and the use of the valuable priority certificates. It has been rumored that more than one firm has been using these ducats for civilian usage where they were issued for military orders only.

The *Radio Manufacturers Assn.*, (*RMA*), has been holding a series of meetings to help the *OPM* to decide what will be best for the industry; and the preparation for Defense contracts to come, etc. Also the manufacturers have been conferring among themselves to iron out problems of the changes wrought by priorities, and shortage of material. The results will not be known for some time. But ideas have been swapped and there is a feeling that each will help the other out, to the best of his ability.

And, as foretold here, the copper situation has tightened up much more than the steel and aluminum one. And that even though the Pot-&-Pan campaign netted Uncle Sam only 50% of the old aluminum which he had expected. The copper men are at their wits' end trying to meet the requirements of the industry and at the same time keep up with National Defense; with the bulk of radio contracts still to be let.

Although Floyd B. Odlum has done a Herculean job of trying to wean sub-contracts away from the prime contract holders, he has been meeting with considerable resistance. Not only will it take time to evaluate the ability of the smaller firms to do the work, but there is a marked reluctance on the part of the larger firms to give the small fellow a chance. Mostly the picayune shop is met with a polite but firm refusal, or a statement that the large firm has "nothing to give out at the present." This is the sort of occurrence which has been putting the small fellow on the spot and threatens to close him up entirely.

To give you a picture of how the prime contracts are held, suffice it to

state that 75% of all the Army and Navy contracts are held by approximately 56 firms!

Said Odlum recently, "Because of the tremendous all-out Defense effort, thousands of small businesses which have been busy up until now face a shutdown due to lack of materials for civilian production.

"Thousands of communities depend upon the operation of these small businesses.

"You can well imagine the social catastrophe and economic dislocation which might follow if these small enterprises are put out of business.

"Such a tragedy must not happen . . . Letter writing will not help. We must have practical action at once."

But the practical action is the most we have the least of! We know of firms who have written their hands down to the well-known bone; have sent men out into the field, all with little result. The biggies are just not going to sub-contract until Uncle Sam *makes* them do it.

So here we offer Mr. Odlum a practical suggestion! In awarding prime contracts, make it a prerequisite that the bidder must, under penalty of not getting the award, sub-contract at least 50%. Not only that, but the prime contractor is not to be permitted to sub-contract to the same firm in each case; after one sub-contract has been awarded to a smallie, then no further sub-contract must be signed with that same fellow, until his turn comes around again. Thus will everyone get a chance, always provided that the small businessman can meet the requirements of the job. Radical? Perhaps, but in the final analysis the only way in which the condition can be remedied. It might be that under that sort of terms, the biggie might refuse to bid. Well, there may be a lot of smallies who would be willing to, when not frozen out by the biggies. Or else the Government can step in and, under existing law, compel the biggie to take the contract. Anyway, it's just a suggestion . . . —

Radio has been on the sidelines in many respects. No very large contracts have found their way into the news, and the industry has been moving along smoothly preparing for the new year. Some of the '42 models have made their appearance in some of the stores and there has been a sharp demand. Excise taxes have uncovered a

lot of customers who staged a mad buying rush just before the dead-line. Some of the materials, other than copper, have eased up quite a bit, and the industry thinks that it will be able to go along normally until about the first of the year.

The position of the serviceman has not changed in Washington. He is still to be considered one of the mainstays of the radio picture. Washington realizes that, what with the reduction planned in the production of new sets, the serviceman will have to repair many more old ones than heretofore. With this in mind, the *RMA* and the *OPM* have released a plan whereby, should the service shop co-operate, the manufacturer of parts will be able to supply him with replacements. The plan is just being made public, and all servicemen are urged to help. It means just a small bit of extra bookkeeping, but in the end, it will result in his being able to keep his stocks up to par.

In the meanwhile a plan will be worked out, we are certain, which will assure that the serviceman will have all that he needs to keep present radio sets in repair. The plan will be a more direct one, based perhaps on the dollar-value which the serviceman does per year in repairs. On reporting this figure, he will be able to get a priority rating, or a suitable allotment, depending on which is more workable. The serviceman, right now, is getting serious and favorable consideration by the *OPM*.

The fight between the *Defense Communications Board* and the *Signal Corps* anent the status of the hams has been going on, sub-rosa for months. Mr. Jett, Chief Engineer of the *FCC*, member of the *DCB*, and champion of the hams, has advanced the theory that the amateurs are the only communications link in time of emergency. The *FCC* thinks, that, therefore, the manufacturers catering to this trade should be allowed a blanket priority of some sort so that the hams' equipment can be kept up to snuff. The *Signal Corps*, also a member of the *DCB*, on the other hand, finds it impossible to agree with Mr. Jett, and states that the Army will now be able to give complete and adequate communications service in an emergency, and hence believes that the ham equipment manufacturers should take second place to the producers of *Signal Corps* units. The fight goes on,
(Continued on page 20)



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● By truck and by train, a steady procession of Utah parts bridges the distance between this shipping room and scores of receiving platforms. The needs of Utah customers from coast to coast are today being met as promptly and completely as possible.

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Utah appreciates the loyalty of its regular accounts and will continue to give them the best service which can be maintained. The shipping room door will continue to be nearest to our customers.

Utah Radio Products Company, 836 Orleans Street, Chicago, Illinois. Canadian Office: 560 King Street, West, Toronto. In Argentine: Ucoa Radio Products Co., SRL Buenos Aires. Cable Address: Utaradio, Chicago.



SERVICE PORTFOLIO

(Continued from page 13)

the oscillator grid voltage at the high-frequency and low-frequency end of each band.

It will be observed that the oscillator grid voltage generally increases when tuning through stations. The published data is taken at quiet points on the dial.

"Dead spots" or points where the oscillator ceases to work may be caused by absorption due to resonance in adjacent coils through defects in short-

ing action of the range switch and will show up as dips in the oscillator grid voltages.

Step (10). Measuring AVC Voltage

Remove the 3-volt bias battery.

Connect the voltmeter channel probe (blue cable) to the avc bus. Turn the signal generator from low output up to high output and observe the avc voltage. It will be found to increase rapidly at first, and then more slowly up to an approximate maximum (in this particular example) of —30 volts.

In the published RCA gain data, the

avc voltage is given for a large input to the antenna. The specified avc voltage may be regarded as the approximate maximum.

Checking Oscillator Frequency

Place the oscillator channel probe (brown cable) near the oscillator circuit in the receiver. Tune the oscillator channel for maximum indication on the oscillator channel Magic Eye.

The correct oscillator frequency should equal the sum of the input signal frequency plus the intermediate frequency. In this particular example, the input signal is 600 kc, and the intermediate frequency is 455 kc, so the correct oscillator frequency is 600 plus 455, or 1055 kc.

Wattage Indicator

Plug the Chanalyst into a 110-volt a.c. supply, and plug the receiver into the Chanalyst test watts receptacle. Turn on the power switches of both Chanalyst and receiver. After a brief warm-up period, adjust the watts control so the watts Magic Eye just closes. The setting of the watts control indicates the power consumption of the receiver.

The rated power consumption of radio receivers (as printed in service data and on the chassis or cabinet labels) is seldom accurate to within 10% of the actual consumption.

QUICK OVER-ALL GAIN CHECKS

The approximate over-all gain of any section (r.f., i.f., or a.f.) can be found by multiplying together the gain of the parts that comprise the particular section.

Using the accompanying diagram as an example:

The r-f section extends from the antenna terminal to the 1st-detector grid. This includes the antenna transformer (which in this case has a primary coil and a loop secondary) with a gain of 5, and the r-f tube, with a gain of 8. The overall r-f gain is 5 times 8, or 40.

The 1st-detector conversion gain, and the 1st i-f transformer should be checked separately.

The i-f tube and the 2nd i-f transformer may be checked as one section, feeding i-f signal from the generator into the i-f grid.

The a-f section extends from the 1st a-f grid to the output plate, and includes the 1st a-f tube and the output tube. The overall a-f gain is 60 times 14, or approximately 800.

MISCELLANEOUS DATA

When tuning the RF-IF channel, the electronic voltmeter may be used as

an auxiliary resonance indicator, and for level checks as shown in step (4).

Connect the voltmeter cable (blue) between the VM jack and the RF-IF tip jack.

Set the meter range to 5, and, with no signal input to the RF-IF channel, adjust the zero control so the meter needle is at center zero.

When connected in this way, the meter indicates the rectified signal voltage at the grid of the RF-IF Magic Eye. Approximately -5 volts are required to just close the eye.

Tracking at 600 kc

In using the published gain data it is advisable to check, and if necessary adjust, the tracking between the r-f tuned circuits and the oscillator circuit.

The following method is unequalled for speed and accuracy because no "rocking" of the gang condenser is necessary.

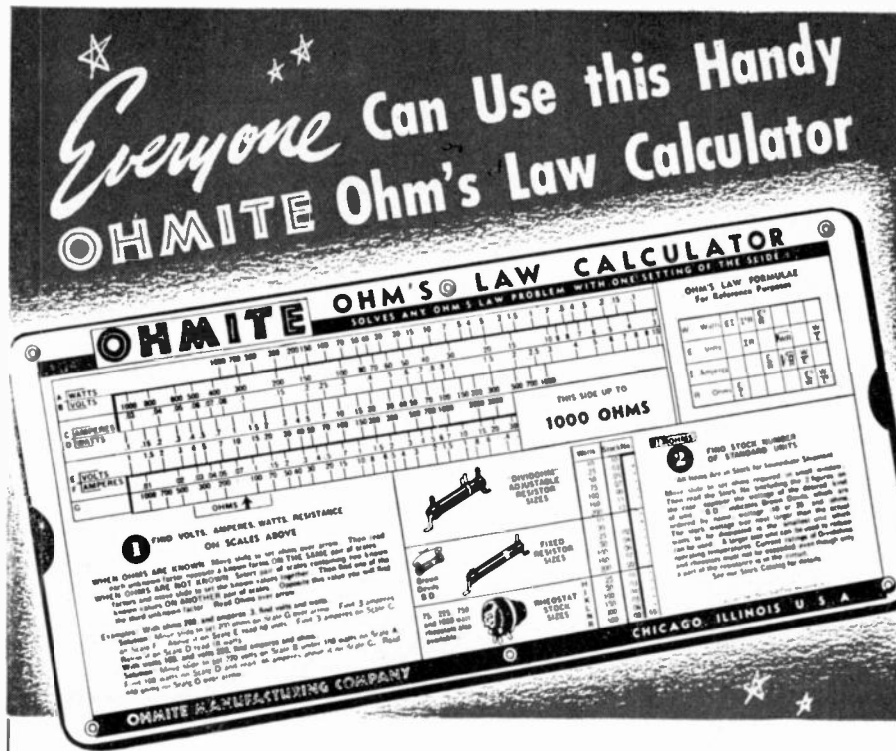
- Align the i.f. to the correct i-f frequency.
- Feed a 600-kc signal into the antenna circuit of receiver through the specified dummy antenna.
- Place RF-IF probe (red cable) on grid of first tube in receiver, and tune the RF-IF channel to the 600-kc signal.
- Carefully turn the receiver gang condenser for maximum output on the RF-IF Magic Eye (not for maximum output on the receiver.)
- Leave the receiver gang in this position even though the receiver dial may indicate 10 or 20 kc off, because this is the correct setting of the gang to tune the receiver's antenna circuit to 600 kc.
- Connect the electronic voltmeter probe (blue cable) to the avc circuit of the receiver.
- Adjust the oscillator magnetite core or low-frequency padder for maximum avc voltage as indicated on the electronic voltmeter.

Another simple method is as follows: Place the RF-IF probe (red cable) on the 1st-detector plate and tune the Chanalyst to the 600 kc signal.

Turn the receiver gang condenser for maximum output on the RF-IF eye. Adjust Chanalyst RF-IF controls so the RF-IF eye is just closed. Adjust the oscillator core of low-frequency padder in the set for maximum opening of the RF-IF eye. (The eye opens when the oscillator in the set is tuned to the correct point because the avc voltage increases and this decreases the gain of the r-f or 1st-detector.)

Input to Loop Receivers

Some loop receivers have a link that must be opened when feeding the



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range of resistances from .1 ohm to 10 megohms, also the range of currents, wattages and voltages commonly used in radio and commercial work. A setting of the slide also tells you the stock number of the resistor or rheostat you may need. Size of Calculator only $4\frac{1}{8}'' \times 9''$.

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signal generator into the antenna terminal.

On console loop receivers, such as RCA Model 110K, if only the chassis has been brought in for service, and the loop is not available, connect the signal generator through an .01-mfd capacitor to the control grid of the first tube. Tune the receiver for maximum avc voltage on the 600-kc signal.

Chanalyst Ground Connection

On ac-dc receivers where one side of the 110-volt line is connected to the chassis, attach the Chanalyst ground lead to the receiver chassis.

If the 110-volt line is isolated from the receiver chassis, connect the Chanalyst ground lead to the common negative wiring in the chassis.

In either of these cases it must be remembered that the receiver and the Chanalyst may be "hot," and due care must be taken to prevent grounding of either. The best method is to use an isolating power transformer as described below.

Isolating Power Transformer

When working on ac-dc receivers, it is becoming general practice to use a

(Continued from page 17)

one-to-one ratio power transformer between the a-c power supply and the receiver. This avoids grounding difficulties and certain hum conditions.

The isolation power transformer may be used in conjunction with the Chanalyst when testing ac-dc receivers by plugging one winding of the transformer into the Chanalyst test-watts receptacle, and connecting the ac-dc receiver to the other winding.

KP AND G

(Continued from page 7)

rent is with the plate voltage e_b and we can keep one eye cocked on the voltage drop across the load resistor. It is easy to see that the effective plate voltage and the plate current do not vary in like manner; one goes up as the other one goes down. Expressed differently, the mode of variation around the quiescent value is in the opposite direction. When the plate current is *maximum* the effective plate voltage is *minimum* and vice versa.

That such should be the case is a natural conclusion according to what has been said about the effect of the voltage drop across the load resistance R_b and its effect upon the effective plate voltage e_b , for if the plate current is a maximum, then the maximum voltage drop must take place across the load resistance. Since the value of the load resistance is fixed, and the value of the plate voltage supply source is fixed, the effective value of plate voltage is determined solely by the plate current and the consequent drop in voltage due to the flow of this plate current through the load resistor. In turn, when the plate current is minimum, the current flow through the load resistor is minimum and the drop across R_b is minimum; hence, the voltage effective between the plate and cathode is maximum.

All of this is shown in Fig. 2 by a comparison of curves B and C, where in C is shown the change in value of the effective plate voltage e_b for various changes in plate current. Once more, as in the case of the plate current—although this time the action is just the opposite—we interpret the variation in effective plate voltage around the quiescent (no signal) value of 250 volts as representing the negative and positive halves of a cycle of alternating voltage. We speak about the *decrease* in effective plate voltage as corresponding to the *negative* alternation and the *increase* in plate voltage as being the equivalent of the *positive* alternation.

If now we compare i_b and e_b in the

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table, and curves B and C in Fig. 2, we note that they pass through their maximum and minimum values at the same time but moving in the *opposite direction*. In other words, the plate current and plate voltage are 180 degrees out of phase, and since the plate current and grid voltage are in phase, that makes the grid voltage and plate voltage 180 degrees out of phase.

APPARENT CONTRADICTION

Before concluding this installment of the article, there is one point which must be clarified for fear that some confusion may develop. We are re-

ferring to the voltage drop across the load resistor. It would seem from Fig. 2 that this voltage is in phase with the grid voltage, and so it is, but this contradiction of the phase shift taking place in the plate circuit does not really exist. The reason is that the voltage which actually represents the signal voltage taken out of the tube is not $i_b R_b$, but rather $E_{cb} - i_b R_b$, for no matter what the manner of connection across the load resistor, one of the terminals, the top one, is the same as connecting to the plate, for point A on resistor R_b joins the plate.

As to the lower end of R_b (point B) this is equivalent to a connection to the cathode, even with the plate supply battery present in the circuit. Under normal conditions, the internal resistance of this voltage supply source is sufficiently low, so that the B end of the load resistor is substantially at the potential of the cathode. And if we imagine the use of bypass condensers which shunt the plate voltage supply source, then the junction between point B on the load resistor and the cathode is very evident, as far as a-c variations in the plate circuit are concerned. So as far as the signal voltage is concerned, we speak about the voltage across the load resistance or impedance, whichever it may be, but it always is with respect to the cathode; in other words, it is the curve C in Fig. 2, rather than curve B in the same figure.

Having established the basic relations between grid voltage, plate current and plate voltage, we now can look into the actions taking place in the cathode circuit, with respect to the grid circuit and plate circuit. In so doing we establish the manner in which phase inversion systems are created as well as the use of positive and negative feedback in amplifying circuits.

(To be continued)

THE RADIOFRONT

(Continued from page 15)

and the end is nowhere in sight. Meanwhile, except for certain units, the hams are still able to purchase mostly anything that they desire.

In the Louisiana Maneuvers recently completed, the weakest link in our Army was found to be communications. Not enough training in the matter of what is called "radio discipline," plus inadequate equipment. The former will be rapidly corrected as the officers push training further, and the latter will be adjusted as soon as the newer units come off the production line. There is in this whole world no finer radio equipment than that which Uncle Sam will have when he gets delivery, which should be any month now.

The sending of messages "in the clear" such as the Nazis use, has not quite been perfected here, but it is expected that the use of frequency modulation will greatly assist, because there would be a mixture of both a-m and f-m signals in the field, the messages only being interceptable by the proper receivers. The *Signal Corps* is said to be working on this scheme.

ODDS & ENDS

All hams whose licenses would have

expired between July 1, 1940, and December 31, 1941, who have made application for a renewal but who have not received their certificate back yet, have had their licenses automatically renewed until December 31, 1941. But they must have complied with all the other FCC orders, etc . . . —

Latest stunt by radio manufacturers who have one kind of wire and need another, is to swap with another man whose condition is vice-versa . . . —

The *Signal Corps* is still looking for about 350 radio physicists. The commission is that of 2nd Lt., the pay about \$300 per month, and that with duty in England. Write George Bailey, 2101 Constitution Ave., Washington, D. C., if you are interested. Sounds like a swell job, and many of the big firms have indicated that they will be wanting men with that type of experience After Hitler Has Been Crushed . . . —

The Navy is looking for the same type also. Write the same man and name your preference . . . —

Servicemen report a boom month in recordings and record players . . . —

The radio neophyte, which everyone in the trade thought would become legion, due to the *Present Unpleasantness*,—ain't . . . —

Good substitute for copper is silver.

Radio service organizations having one of these decalcomanias on their store window meet with less sales resistance, get more business and obtain better prices from their customers —

One of these distinctive "Certified Service-Dealer" decalcomanias which are 6 inches square, beautifully lithographed in four colors (red, white, blue and gold) and which will help your business, will be sent FREE to all RSD subscribers who are classified as independent radio service dealers.



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Sirs: Here is my check (or money order) for \$.... Enter my subscription order to RSD for the next issues. (12 issues cost \$2.—24 issues cost \$3.) Canadian and Foreign subscriptions are \$3 annually. The information given below is accurate. If my subscription is rejected I expect an immediate refund in full.

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(If any other, state what it is)

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- Selling, renting or servicing Sound Equipment
- Jobber Any other classification
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We stock the following checked items:

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- Signal Generator
- Volt-Ohm Meter
- Others
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But don't start melting down your mother's best spoons just yet . . . —

Whatever became of the radio sonic altimeter developed by *United Airlines*? Has it gone to England to become a *Blitz Bomber Spotter*? . . . —

Three years ago we said, "Radio will win the war." It looks like we'll bat 1.000 on that one . . . —

Well, buy yourself a Defense Bond, and keep 'em rolling . . . —

CIRCUIT COURT

(Continued from page 10)

In the D and E ranges (12.5 to 15.4 mc and 17.6 to 21.8 mc) that portion of the band switch shown shorts the A, B and C primary coils to ground. In the B and C ranges that portion of the band switch shown is open, and the 250-mmfd condenser, C48, provides a suitable bypass around the A (broadcast band) primary. In the A range, where the frequencies are comparatively low, C48 has little effect as a bypass, with the result that the r-f voltage builds up across the A primary.

No other switching is involved in the primary circuits.

SERVICE CHARGES

(Continued from page 4)

new volume control in addition to several other repairs or general tune-up charges for alignment, etc. In such cases, a serviceman may wish to reduce or eliminate the separate charge for the replacement of the volume control. Other similar exceptions to the general rule will be found.

In looking over these service charges, you will note that the lowest priced items are those requiring no testing to locate the faulty part such as "Dial Drive Cable—replacement," "Dial Scale—replacement," etc. Furthermore, a charge for minor repairs such as replacing a resistor or condenser, or repairing a short or open circuit in wiring is priced according to the amount of testing required to locate such faults. Thus a repair of this kind in the power supply circuit is listed at \$2.00, in the audio amplifier at \$2.50 and in the discriminator circuit at \$3.00.

The minimum charge will be useful in many ways to cover minor operations, depending upon the service policy of individual servicemen. For example, the minimum charge on outside service calls would be justified in the case of a simple single operation such as replacing a pilot lamp, whereas a similar replacement performed in the shop where no additional time would

be required, might be covered by the standard charge for this operation.

Aligning charges have been broken down into separate operations, some of which are never performed separately. This has been done to enable

the serviceman to make up a composite charge according to the type of radio and the number of aligning operations required. Thus, it is possible with this arrangement to make up a total align-

(Continued on page 24)

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1. Every RSA member, whether member-at-large or Chapter member, is eligible.

2. Five prizes (as above) will be awarded to the five RSA members sending in the most new applicants for National RSA membership.

3. Each and every RSA member sending in five or more new applicants for National RSA membership will receive an RSA leather card case (described above). Don't wait until you get five though. Send each one as soon as you get it—we'll keep your score.

4. Only acceptable applicants sent in by you yourself will count for you toward prizes. If the applicant sends the application in himself, it will not count for you unless he specifies when sending it in that his membership is to be credited to you.

5. Each applicant's name and address must be accompanied by one year's national dues. You need only send in the name and address of each applicant with his dues; we'll send him a formal membership application blank to fill out and sign.

6. Send all applications and dues to: Membership Contest, Radio Servicemen of America, 1216 W. American St., Freeport, Ill. Be sure to enclose your own name as well as those of applicants.

7. Contest closes midnight, December 31, 1941.

There you are! You can easily win a swell RSA card case . . . and you may win one of the other valuable prizes too. RSA, to be strong and to accomplish our purposes, needs every ethical serviceman as a member. You need a strong RSA to insure your future and the future of the servicing industry. You can get every ethical serviceman in your city as an RSA member with just a little effort, and you can charge that effort up to an investment in your own future.

Getting RSA memberships is a "pipe," with all the advantages of being a member including the monthly technical and news magazine. Every serviceman wants to be a part of his industry organization, but he has to be told about RSA. You are the one to tell him.

Those handy and good looking RSA card cases and the five other prizes are waiting for you, and you, and you, and . . . Let's go RSA!



H. W. Cunningham, National Treasurer, RSA.

• • • —

Priorities on Parts

RSA is continuing to cooperate with the Priorities Committees of the radio industry to obtain preference rating on parts for repair and maintenance of home receivers.

It's vitally essential to us of the radio servicing industry to be able to continue to get sufficient parts to do our work of keeping America's radios in operation. RSA, as your national organization, is doing all possible to help insure your supply of parts under the national defense plan. We feel certain that a definite preferred rating on radio replacement parts will be made soon by OPM in response to the radio industry's efforts.

You may be sure that RSA is on the job for you all the time.

• • • —

Radio Quiz

Quizzes on the radio, quizzes in magazines—from "Information Please" down, the popularity of quizzes is unquestioned.

When your Chapter hits a "dead spot" in the meeting program, pep it up with a short quiz period. You'll be surprised how much fun you'll have, how much you'll learn, and how many good old arguments you'll start! Run as a spell-down, or in any of the other forms so popular on the radio; it is effective in any Chapter's program.

Lehigh Valley Chapter RSA has a Radio Quiz as a regular feature of their meetings. Just to show you how it goes, here's ten questions picked at random from their lists. They're easy. You ought to get 100, but you probably won't!

1. What is the effect on a normally operating receiver of connecting a resistor across an i-f transformer winding?

2. What is the simplest way (without instruments) to determine the proper connections for a hum-bucking coil?

3. Two speakers operating in parallel within one foot of each other, but out of phase, will give what effect?

4. How old is Janet, to whom Rider publications are dedicated?

5. Is there any similarity of circuits in a 6H6 detector employed in fm and a 6H6 afc discriminator as used in am?

6. What is the effect (a) of a small capacitor connected in series with a crystal pickup; (b) of a resistor connected in series with a crystal pickup?

7. If we wanted to measure 5 volts with a 500 microammeter, and wanted half-scale deflection, what size resistor should be used in series with the microammeter?

8. What is the usual effect of a 5M-ohm resistor connected from cathode to filament (or a 5M-ohm internal K-H leakage) of a 6K7 i-f tube?

9. How many grooves are there in a 10" Victor record?—A 12" Victor record?

10. What is the meaning of the following abbreviations: AVC, AM, L, BFO, EMF, AFC, CPS, C, QAVC, RSA?

Answers, to check up on yourself, will be found on page 24.

• • • —

CHAPTER CHATTER

Cleveland Chapter:

The Eighth Annual Radio Industry Picnic sponsored by the Cleveland Chapter RSA was held Sunday, August 31, at Brunswick Lake. From nine in the morning until ??, games, contests, refreshments, dancing, etc., kept the many members, their families, and guests busy and entertained.

We enjoyed the ball game between the jobbers and the RSA chassis jerkers. The decisions of the umpire were especially interesting. The tug-o-war, which ended in a spill for every one on a certain end of the rope, topped off the events of the day.

Ed George was General Chairman of the Picnic Committee.

—Don Bruns, Director, District 12

• • • —

Danville Chapter:

The radio service business in Danville has really been good. Every shop is loaded and some are turning down jobs rather than take on more work than they can turn out in a short time. We wonder if the "advertising" we received from the Reader's Digest helped do it?

Danville Chapter RSA now has a bowling team. Boy, are they hot! They bowled last Wednesday night and got beat, but it was a lot of fun just the same. Doc McKinney is captain of the team which includes Robert Roesler, Harry Longer, Earl Drollinger, and Lyal Cummings. The season lasts thirty-five weeks and we just hope our men will last that long.

Our new President, Mike Mosier, had

a bright idea last meeting night. He bought an inexpensive service manual (\$1.50) and we sold chances at ten cents per and gave the manual to the lucky man. Every man there took at least one chance and some took two or three. *Clarence Koloa*, Cayuga, Indiana, was the lucky man. After the drawing, our Treasurer was right there with his hand out to get the profit! Of course this doesn't make a lot of money for the treasury, but it does help and it peeps up a meeting.

—*Erard C. Welch, Secretary*

• • • —

Fremont Chapter:

Mr. Robert J. Bay of the Warren Radio Company presented the RCA Dynamic Demonstrator to our Chapter for any tests we wished to make at our September 24th meeting. Bob Uhl checked the board with the 'scope and r-f oscillator, while Don Bruns used a Chanalyst. Circuit faults were set up and the results observed. The meeting was conducted as a radio school in which the members could actually use the Board and equipment for any tests they wished to make.

The Secretary was instructed to congratulate Don Storer for the fine work on the *Reader's Digest* matter. The members appreciate someone going to bat.

—*Robert M. Uhl, Secretary*

• • • —

Interstate Chapter:

Our September 9th meeting was held at O. H. Olson's home. A thorough discussion of the national RSA problems brought a vote of approval and commendation of the policies and activities of the National Office of RSA. Members of the Chapter expressed a willingness to "sell all our test equipment except 'a voltmeter and a few other little things' if necessary to help RSA go places nationally."

In recognition of the goodness of Dr. Z. P. Harvalik of St. Ambrose College, Davenport, Iowa, in cooperating with the Chapter on program activities, he was voted an honorary associate membership in RSA. Dr. Harvalik is to address us again at our next meeting, which will be held at St. Ambrose College.

—*Oscar W. Olson, Secretary*

• • • —

LaPorte Chapter:

We have been organized for the past two years, but only recently have joined the RSA. We meet the second and fourth Wednesdays of each month, the first meeting being business and the second being a discussion of our different service problems and the passing along of service kinks and hints we encounter in our work.

One of the things we are very proud of is that all members are willing at all times to help any member with any service problem. We also warn each other about customers who lag in the paying of their bills.

We are now revising our bylaws to conform with the national RSA bylaws and are working on a coding system for marking classes.

We feel that all of our members have benefited from their RSA membership and that it would be to the advantage of all servicemen to belong to the RSA.

—*Stanley A. Kubit, Secretary*

TREASURER'S LETTER

Wilmette, Illinois,
September 30, 1941

To RSA Members,
Present and Future:

Today we are facing the greatest crisis the world has ever known. The outcome will depend upon the united efforts of our entire nation: no effort or sacrifice will be too great, if we are to remain a free and peace-loving people. To take our part in the defense effort of our country, radio servicemen must unite their efforts if radio servicing is to survive as an independent industry. Individually we can do little, as local groups we can accomplish only local achievements, but united nationally as an industry we can accomplish real results.

NOW is the time to make an effort to make RSA the strongest national organization of its kind, to protect us now and in the future when the calm will follow the storm. Now, and in the future, one must have a greater knowledge of his profession in order to stay in it and be successful. To keep your knowledge up to

date, join RSA, get to know your fellow servicemen, exchange ideas, make use of the prestige RSA has built up for you to help you do a better job at a greater profit. I have been an active member of RSA since its inception, for I recognize the value of such an organization to me in the furtherance of my profession.

Due to the remarks of a national magazine about the unethical practices of some radio servicemen, the public is going to be suspiciously alert. If you can show your credentials as a member of a nationally-known radio service organization, founded for "the purpose of advancing the ethical practices and technical efficiency of the radio servicing profession," then the road will become much smoother.

So get behind the wheel, fellows, and give RSA a boost that will send it into high toward the betterment of every serviceman, wherever he be.

Sincerely yours,

RADIO SERVICEMEN OF AMERICA
Harold W. Cunningham (Signed)
National Treasurer

Lehigh Valley Chapter:

Our meeting of September 8th was a grand success. That boy Frank D. Langstroth of Hygrade Sylvania certainly is good. He talked on "Solving Modern Service Problems."

On the 22nd, Sandy Coxan of Radio Service-Dealer magazine talked straight from the shoulder about the problems of this business of radio servicing. Members of the PRSMA of Philadelphia and RSA members from Reading were our guests.

LVRSA went on the air over WCBA on September 9th with our first full quarter-hour program. The subject matter was a rebuttal to the recent *Digest* item. The speaker was ye scribe.

—*Ray E. P. Abbott, Secretary*

• • • —

Metropolitan New York Chapter:

Continuing our policy of making our meetings as interesting, instructive, and valuable as possible to servicemen, we started our lecture program this fall (September 29) with a talk by John F. Rider. Unlike some of our past lecture meetings, Mr. Rider did not discuss a technical subject, but spoke about the general problems of radio servicing, the attitude of the public toward servicemen, and the attitude of the serviceman toward the public. We who earn our living by radio service work need to think deeply about this, and John F. Rider is the one person who can advise us rightly. The meeting was an open meeting, with a great gathering of guest servicemen.

—*The RSA Bulletin,*
Max Spitalny, Editor

• • • —

Pittsburgh Chapter:

At the regular meeting of this association on September 11, Mr. Henry Kaiser, Chief Engineer of WWSW and W47P

spoke on, and demonstrated all features of f.m. FM station W47P broadcast a special program especially for us. An f.m. receiver was on hand for the demonstration.

—*Bill Irlam, Secretary*

• • • —

Westchester Chapter:

On Sunday, August 17th, through the courtesy of our local jobber, Mr. A. Davis (Dave) who gave us the use of his large power boat, our members were able to revel in a day's outing on Long Island Sound. With the exception of a couple of incurables, the men were glad to forget the subject of radio for at least one day.

On Sunday, August 31st, we really went to town with our annual clambake. Mr. Robert Jones ran the bake, assisted by Hinkelbein, Donaldson, Harris, Arrington, and (most important) Mrs. Jones. Grub? Brother, listen: All you could eat of clam chowder, clam broth, and clams with a sauce the recipe for which Bob has a safe deposit box in his bank, a half a chicken and a half pound of fish per person! Not to mention onions, potatoes, the usual condiments, rolls, soda, etc. Oh yes! And for those addicted to the stuff, there was plenty of . . . must I say it? Well, all right . . . beer. Dancing, ball games, horse shoes, games and races with prizes . . . but why go on? Even if you weren't there, do you doubt we had a swell time?

But now summer is over, and our Chapter is planning again to justify its true purpose by giving a series of interesting lectures and many other services to its members. We plan to work with our neighboring Chapters, so that we may enable this RSA of ours to best serve the interests of the radio serviceman. We need your help. Will you do your bit by joining with us?

—*Henry M. Lutters,*
Director, District 18

(Continued from page 21)

ing charge for sets with different numbers of short wave bands, or sets with additional features such as f.m., afc, etc.

EXAMPLES

Here are two examples of bills made up from the RMS standard service charges from which it can be seen that a customer could readily check the various items on the invoice and thereby become better satisfied than if a lump sum charge were made.

Example of Charge for Repairing Home Radio with Open oscillator coil:

Testing set and replacing oscillator coil	\$2.75
Aligning intermediate frequency stages50
Aligning broadcast band	1.00
Philco Part No.	
oscillator coil	2.50

Total Charge \$6.75

Example of Charge for Repairing Auto Radio with Worn out vibrator:

Removing set from car and reinstalling	\$1.00
Testing set and replacing vibrator	1.50
Philco Part No.	
vibrator	2.50

Total Charge \$5.00

SOLAR CONDENSER
Quick-check Analyzer
MODEL QCA

- ✓ Measures Capacity
- ✓ Indicates Leakage
- ✓ Shows Insulation Resistance
- ✓ Indicates Power Factor
- ✓ Affords Dynamic Checking for

OPENS . . . SHORTS INTERMITTENTS

- ✓ Acts as Continuity Meter
- ✓ Indicates R. F. Impedance

Model QCA-1-60
Complete Analyzer, ready to operate . . . ONLY **\$24.90**
SOLAR MFG. CORP., Bayonne, N. J.

SERVICEMAN'S DIARY

(Continued from page 14)

until daybreak—it looked so wonderful to watch the sun come up over the mountains.

I told her I was here for a rest, and besides, I had no car. She said she had the car, and I had better forget about the rest. If I didn't want to be a good sport, they wouldn't speak to me at all.

I asked Bill's advice, after the dance. "Listen, kid," he advised, "if those wild women are after you, you'll never get away from them. Especially if Lola is in on it."

"Suppose," I suggested, "that I switch rooms with one of the other fellows—"

"Fat chance!" he scoffed. "They're all wise to that stunt, and nobody'll swap" Then he thought a bit.

"Tell you what you might do," he said. "Don't sleep in the cabin. There

are lots of cars parked around in back. Curl up in the back seat of one and they'll never find you."

It sounded good, so as soon as the dance broke up, I went around and picked out a big, black Buick sedan, climbed in the back seat and settled myself for a good night's sleep. It seemed very comfortable.

I had hardly slept an hour before I was awakened by noise and talking nearby. I got up and peeked through the car window and saw the girls trying to break into my cabin. It struck me funny and I started to laugh.

"Yeah, girls!" I chuckled, "I sure put one over on you that time!"

"Says you!" came from a voice right beside me. It was Lola, sitting on the car step. "Next time you pick a hide-out, don't take my car!" she said. "Now, let's get going."

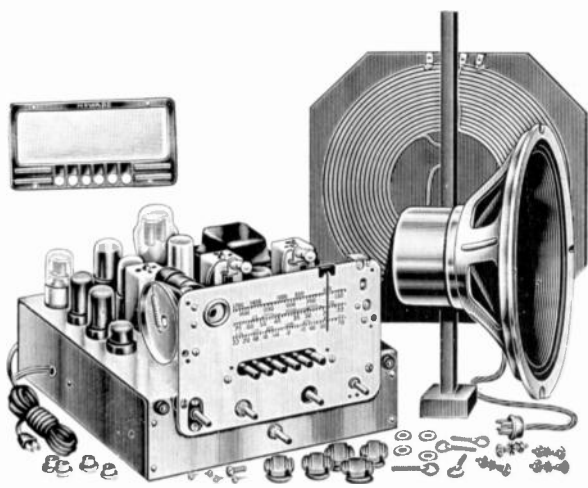
P.S. I drove until daybreak.

ANSWERS TO RADIO QUIZ

(As supplied by Lehigh Valley Chapter RSA—we assume no responsibility and refuse to enter the argument on any question!):

1. Broadens tuning (and reduces gain) of stage.
2. Shorting the hum-bucking coil should increase the hum if the coil is properly connected.
3. Decreases volume and cuts out low frequencies (by cancellation).
4. Nine and a half years old!
5. Yes (same basic circuit).
6. (a) Decreases low-frequency response; (b) decreases high-frequency response.
7. 20,000 ohms.
8. Modulation (tunable) hum.
9. One in each case. (Bet you got fooled that time!)
10. Automatic volume control, amplitude modulation, inductance, beat-frequency oscillator, electro-motive force (voltage), automatic frequency control, cycles per second, capacity, quiet automatic volume control, Reliable Service Assured.

• • • —



Cash-In on FREQUENCY MODULATION
With the New HOWARD Chassis

The famous line of HOWARD Chassis is making real money for hundreds of progressive radio men. Now, HOWARD makes available the finest and most modern of all chassis—the 718X-FM. Complete tuning range includes the Frequency Modulation band from 41 to 50 MC and three AM standard broadcast and short wave bands from 540 KC to 18 MC. Has 14 tubes, RF stage on all bands, full fidelity push-pull 10 watt audio system with separate bass and treble controls, 12" Jensen FM speaker, electric push button tuning, built-in antenna, phono jack with "off-on" switch and dozens of other HOWARD quality features. Chassis Model 718X—12 tubes—without FM band also available. Send at once for full details about HOWARD replacement chassis. It will pay you well.

America's Oldest Radio Manufacturer

HOWARD RADIO COMPANY
1731-35 Belmont Av., Chicago, Ill. - Cable Address: HOWARDCO, USA

APPOINTMENTS

Sylvania—Paul S. Ellison has been appointed Director of Advertising and Sales Promotion for the Hygrade Sylvania Corporation.

Mr. Ellison joined the company ten years ago and has held the post of Advertising Manager and Renewal Sales Manager of the Radio Tube Division until his new appointment to responsibility for all advertising, sales promotion, market research and general publicity for the entire company. No personnel changes are contemplated at present.

Mr. Ellison, a prominent member of the Association of National Advertisers, was formerly Advertising Manager of the Brunswick-Balke-Collender Co., and prior



PAUL S. ELLISON
Now Director of Advertising and Sales Promotion for Hygrade Sylvania.

to that, a member of the Advertising Dept. of the Vacuum Oil Co.

Mr. Ellison will complete his fifteenth year in the radio industry in January 1942. Prominent in many industrial activities, Mr. Ellison was chairman of the Sales Managers Club, Eastern Group, from September '38 to September '40.

Turner—Named as Sales Representative for The Turner Company is *L. M. Bornstein*, 333 Manufacturer's Exchange Bldg., Kansas City, Mo. Mr. Bornstein will cover Iowa, Nebraska, Eastern Kansas, Missouri and the southeastern section of Illinois.

NEW BOOKS

The new revised second edition of *Ghirardi's Radio Troubleshooters Handbook*, just made available by the Radio & Technical Publishing Co., 45 Astor Place, New York, N. Y., retains all of the features of the old edition, but every page has been completely revised and brought up to date. Over 200 pages of new material has been added.

Featured among its 710 manual-sized, 8½" x 11" pages are 386 pages of trouble "Case Histories" covering over 4600 receiver and automatic record changer models; a 50-page tabulation of i-f peaks and alignment data; 60 pages of tabulated data and charts for the auto-radio specialist; replacement and comparable battery specifications and data charts for 1250 portables; and a 20-page tube data and characteristic tabulation.

Included among the remaining 180 pages are comprehensive trade directories, and 53 more reference charts and graphs presenting permanently useful data on a variety of important subjects.

The revised Handbook is bound in handsome gold-lettered black Fabrikoid with a stiff cover.

The new 40-page book, *Photoelectric Control*, published by Worner Products Corp., 1019 West Lake St., Chicago, is a simple exposition of the practical applications of photo-electric equipment to practical problems and present-day needs.

In it the underlying operating principles are also discussed in plain nontechnical language.

The book also tells how to analyze one's individual problems and how to obtain exact information which will solve them.

Some of the applications covered and illustrated are Safety Devices, Synchronizing Conveyor Operations, Counting and Sorting, Smoke Measurement and Control, Lighting Control, Burglar Alarms, Turbidity Control, Drinking Fountain Operation, Opening and Closing Doors, Service Station Announcer, etc. Also included is data on light sources and the various types of photo-cells.

Copies are available at 50 cents each from the publisher.

ONE RCP TEST INSTRUMENT

does the work of many!

**QUICKER, SURER,
MORE PROFITABLY**

You can be ready for the servicing boom with a single RCP test instrument. Designed to perform the work of many ordinary instruments—swift, dependable RCP test equipment saves you important money, valuable space—yet you're completely, impressively equipped to test and repair all radio receivers. See your jobber today. Look at what he has to offer you!

RCP 803 Combination TUBE & SET TESTER

Complete **\$39.95**

Portable "service shop," tests all the latest tubes—all filament voltages. Hot interelement short and leakage tests on multi-purpose tubes. Line voltage regulation 103 to 135 volts, meter indication. Noise test for tubes which otherwise test "good". 28 range set tester for measuring current, resistance, decibels, and AC and DC volts. 10 index tube charts. Complete, ready to use, with test leads.



RCP 411 AC-DC Multi SUPERTESTER

Complete **\$19.45**

It's 33 test instruments in one! Has 3-inch square D'Arsonval meter with movement of 200 microamperes or 5000 ohms per volt.

DC Volts	0/10/100/250/1000/5000
DC Amps	0/1/10/25
DC Millamps	0/10/100
DC Microamps	0-200
AC Volts	0/10/100/250/1000/5000
AC Amps	0/2.5/5/25
AC Millamps	0/500

Natural finish case, all bakelite body jacks. **FREE COPY** of the new RCP catalog describing in detail this big dependable line of profit-making test equipment, write TODAY.



RCP
dependable
instruments

RADIO CITY

PRODUCTS COMPANY, INC.

88 PARK PLACE • NEW YORK, N. Y.



**Better
PAPER
TUBULARS**

- Sold by the hundreds of thousands, true, but each and every Aerovox paper tubular is individually tested. Please remember that. Also, constant refinement has resulted in a high-quality product regardless of the low cost. And now these quality paper tubulars are dressed in sparkling yellow, black and red varnished-paper jackets. They look as good as they really are. You'll like them.

TUBULAR PAPER CONDENSERS

Type 484—400 v. D.C.W.
.01 to 1.0 mfd.

Type 684—600 v. D.C.W.
.001 to .5 mfd.

Type 1084—1000 v. D.C.W.
.001 to .1 mfd.

Type 1684—1600 v. D.C.W.
.004 to .05 mfd.

• Ask Your Jobber . . .

He'll gladly show you and supply you with these paper tubulars. Ask for latest catalog. Also free subscription to the monthly Aerovox Research Worker. Or write direct.

AEROVOX
CORPORATION
NEW BEDFORD, MASS.
IN CANADA: AEROVOX CANADA, Limited, Hamilton, Ont.

10 heat treatments PROTECT TRIPLETT PRECISION

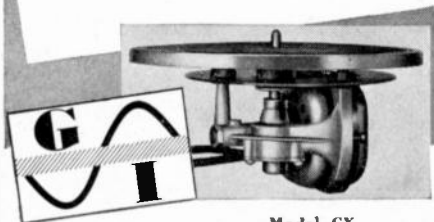


The need for controlled processes and uniform quality in parts has been answered by Triplett in setting up manufacturing facilities that make the company practically self-sustaining in the fabrication of instrument and tester components.

Shown here is a view of one section of the automatic screw machine department in the modern Triplett plant where essential parts—some as minute as the smallest used in watches—are turned out 24 hours a day. More and more, Triplett has turned to wholly automatic fabrication of materials to speed up production and to eliminate any possibility of human error. To assure parts best suited for Triplett needs, company engineers have pioneered in the design and manufacture of countless fabricated materials including switches, bar knobs, resistors, jacks, special adapters, etc.—a complete service intended to give each user the fullest measure of satisfaction.

THE TRIPLETT ELECTRICAL INSTRUMENT CO.
Bluffton, Ohio

Get the Help of G. I. "Smooth Power" Phono Products for Remodeling



Model CX

BRINGING in your share of the increased business in rebuilding phonographs and combinations calls for the kind of help you get from G. I. "Smooth Power" phono motors. Superior in design, precision built, they deliver the smooth turntable speed that helps so much in getting fine reproduction. Get them in light, medium and heavy weights. Get them also in all easy-to-operate, streamlined G. I. recorders, record-changers and recorder-and-changer units.

General Industries makes the most complete line of phono power products obtainable from one manufacturer. Order through your Jobber. Catalog and prices on request.

The GENERAL INDUSTRIES CO.
DEPT. 17 ELYRIA, OHIO

Order your Cutting and Play-Back Needles from our affiliate, General Phonograph Mfg. Co., Inc., Putnam, Conn.

NEWS

Rider Broadcast—John F. Rider, in his talk, "Know Your Radio Doctor Better", broadcast over WABC, New York, and the Columbia chain, did a fine job the afternoon of September 22nd toward the improvement of relations between the radio serviceman and the listening public.

Paralleling the complexities of a radio to those of the human body, Mr. Rider made it clear that such troubles as noise are not easily traced, may take hours if not days, to locate, and are not the simple problems the public has presumed them to be. He made the commonsense plea that the radio listener give the serviceman the same consideration the average man gives his doctor, and not expect the serviceman to work miracles.

Mr. Rider also stressed the importance to the radio listener of the final overall check-up of a radio receiver if he wishes to get the most for his money, and cautioned him to question the radio serviceman who failed to provide this service.

In closing his address, Mr. Rider said, "The personnel of this industry—and there are 30,000 of them—are sort of forgotten men. Most certainly it is hoped that in the future, a greater understanding will develop between the public at large and the American radio serviceman, for he is entitled to as much consideration as everyone else who renders a service to the people of the nation."

Raytheon Fall Plans—Shifting personnel to give better cooperation to their jobbers is among the new fall plans announced by E. S. Riedel, general sales manager for Raytheon tubes. Ralph Haines, formerly in charge of Raytheon replacement sales in the middle west, has been transferred to New York where he will assume charge of sales promotion work under A. E. Akeroyd, who has been promoted to national manager of replacement sales.

R. O. Lund, who for the past fourteen years has been identified with the radio parts industry, has been placed in charge of tube replacement sales in the middle west, with headquarters in Chicago.

Enlarged Pacific Coast warehouse facilities have been opened in Los Angeles, in charge of J. J. Perlmuth, which make possible better shipping service to west coast jobbers.

In line with Raytheon's expansion program, a series of new window and counter displays are now available for distribution. According to Mr. Riedel, the new jobber expansion program will not only expedite shipments, but give better cooperation to all their jobbers.

Radio Pioneers Elect—Radio Pioneers of Southern California held their annual election of officers recently, at the Mayfair Hotel, Los Angeles. The following were elected: George Tivy, President; Jack Magner, 1st Vice President; George Marshall, 2nd Vice President. Jack Perlmuth was re-elected as Secretary for the fifth year.

Radio Pioneers of Southern California is the oldest organization of its kind in the U. S., as membership is limited to manufacturers, manufacturers' representatives, jobbers, and dealers who have been actively engaged in the radio business since 1924.

RTG—The Third Annual Info-Meet of the Radio Technicians' Guild of Rochester, will be held on Sunday, November

HUGELY
EXPANDED
NATIONAL
ADVERTISING

means hugely

EXPANDED
PROFITS

for ALL

RECOTON
DEALERS



RECOTON'S large scale national advertising campaign is now reaching millions of readers monthly. . . . RECOTON has scheduled advertising in class and mass market magazines, simultaneously we introduced "CONCERTO", our new, louder tone pho-needle and many new packages. . . . all to send you more business.

A brilliant multi-color display that no one can miss. This eye-catching silent salesman for home recording needles is a unique dispenser and sells on sight. Stocks RECOTON Steel Cutting, Stellite Cutting, and Transcription Playback needles. The hardest pushing sales aid seen anywhere. Write for facts.



RECOTON CORP.

21-10 49th Avenue

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Address Change?

Notify RSD'S circulation department at 132 West 43rd Street, New York City of your new address 2 or 3 weeks before you move. The Post Office Department does not forward magazines sent to a wrong address unless you pay additional postage. We cannot duplicate copies mailed to your old address. Thank You!

A Better POWER RHEOSTAT



Insulated metal-core winding embedded in exclusive inorganic cement. Maximum heat radiation. Unique tripod rotor. Heat-resistant ceramic body. Graphited-copper contact. 25 watt rating even at 1/2 setting.

★ For years Clarostat engineers worked for a better power rheostat. They examined, tested, compared, all types. Hundreds of models were built, tested, worn out, criticized. And now comes the end result—the Clarostat Power Rheostat Series PW25. ★ The next time you need a power rheostat, order a Clarostat from your jobber. ★ Literature on request.

CLAROSTAT MFG. CO., INC.
285-7 No. 6th St. Brooklyn, N. Y.



STOCK DEWALD

for nice profits



Model 562 AC-DC "JEWEL" Series
Five rich jewel-like Catalin colored cabinets that emulate precious stones to choose from: Model 562-AI, Alabaster with Ivory trim—Model 562-AIB, Alabaster-Blue trim—Model 562-OB, Onyx with Ivory trim—Model 562-MI, Maroon-Ivory trim. 5 new type high-efficiency single ended tubes; advanced superhet circuit; new tilt-top easy-vision slide rule dial; high ratio Vernier Tuning; AVC; beam power output; large dynamic speaker; built-in Loop-tenna; tuning range—General Broadcast and Extended State Police Bands. List \$19.95 subject to Service-Dealer Discounts.

WRITE FOR FREE CATALOG
JOBBERs write for details of our new, profit-making merchandising plan. It's a honey!

DeWald Radio Mfg. Corp.
440 Lafayette St., New York, N. Y.

9th. As last year, it will be held in conjunction with the I.R.E. Fall Meeting, which takes place November 10th, 11th and 12th. Both events will take place at the Sagamore Hotel, in Rochester.

To date the speakers have not all been definitely arranged for, but we have been assured that *Walter R. Jones* of Sylvania, together with additional speakers from I.R.E., will be present.

The outstanding success of last year's Meet, which was attended by servicemen from as far away as Boston on the east and Erie, Pa. on the west, leads us to believe that this year's Meet will be bigger than ever.

The Info-Meet is open to any serviceman who is interested enough in his profession to want to stay in it; and it is not in any way a sales convention.

W. E. Brewerton, Publicity

Sylvania-Americana—When the judges at the Atlantic City beauty pageant crowned *Rosemary La Planche*, Miss America 1941, they unwittingly paid tribute to the advertising department of the Hygrade Sylvania Corporation and the Einson-Freeman Lithography Co., as the 1941 Sylvania Radio Tube girl appearing on the current window display. When picking her to pose for the display, the Sylvania and Einson-Freeman people felt that she was a bundle of charm, grace and personality that could hardly be surpassed.

One phrase of the display copy, which appears directly over the lovely head of Miss La Planche, says "You'll Cheer Too." It almost seems like this copy, written a year ago, was coincidentally a prophetic phrase of encouragement for Miss La Planche.

For the Duration—Due to the requirements of National Defense, it has become necessary to put into effect a new policy concerning visitors at the Emporium plant of Hygrade Sylvania Corporation. Hereafter, only those persons having business to transact with the company will be admitted. This is necessary, and Sylvania trusts that everyone will understand the situation.

Jensen Catalogs—Condensed catalog No. 125 describes new Hypex Projectors, coaxial speakers and reproducers with High Frequency Control.

Form No. 126, a treatise on "Hypex Horns", by Vincent Salmon. Form No. 127, on "Loudspeakers for Speech and Music Reproduction," by Ralph P. Glover, analyzes the requirements for speech and music reproduction. Data Sheet No. 123 describes Hypex Projectors employing the new formula non-exponential "Hypex" Horn and "Annular" Driver Unit. Address Jensen Radio Mfg. Co., 6601 So. Laramie Ave., Chicago.

Pincor Dynamotors—New line of "Pincor" Dynamotors includes single output units ranging from the tiny Model DS, rated up to 15 watts, to the giant Model TS capable of 850 watts output, with intervening ranges for every receiving and transmitting application, totally enclosed or ventilated. Featured also is the new Pincor combination double input and double output dynamotor (illustrated) for both transmitting and receiving.

New catalog No. D-EJD-41 describes complete line. By Pioneer Gen-E-Motor, 5841 Dickens Ave., Chicago.

BRACH Antennae

Automobile
Home — All types
F-M Systems
Television
Police • Marine
Multiple Systems
Complete Kits
Accessories

Made by World's Oldest and Largest
Manufacturers of Radio Aerial Systems

L. S. BRACH MFG. CORP.
55 DICKERSON STREET
NEWARK, N. J.

PUBLIC ADDRESS HEADQUARTERS

RADOLEK'S
NEW 1941 RADIO PROFIT GUIDE
FREE! Indispensable to every serviceman, dealer and sound engineer. Send for big FREE Radolek Profit Guide now!

SEND TODAY! PASTE ON A PENNY POST CARD

RADOLEK CO., Dept. SD-59
601 W. Randolph St., Chicago, Ill.

Please send information on Radolek Public Address equipment—also the Big Radio Profit Guide.

Name
Address
 DEALER SERVICEMAN ENGINEER

DEFENSE FRONT

Chicago. Analyzing the problems confronting the radio parts industry, the Sales Managers' Club of Chicago appointed a Priorities Committee consisting of *S. N. Shure*, President of Shure Bros., Chicago; *W. J. Halligan*, President The Hallcrafters, Inc., Chicago; *H. E. Osmun*, Vice President Centralab Division, Globe-Union Inc., Milwaukee. The Committee

retained *Kenneth G. Prince* as its counsel to prepare a brief on behalf of the radio parts industry and present it in Washington.

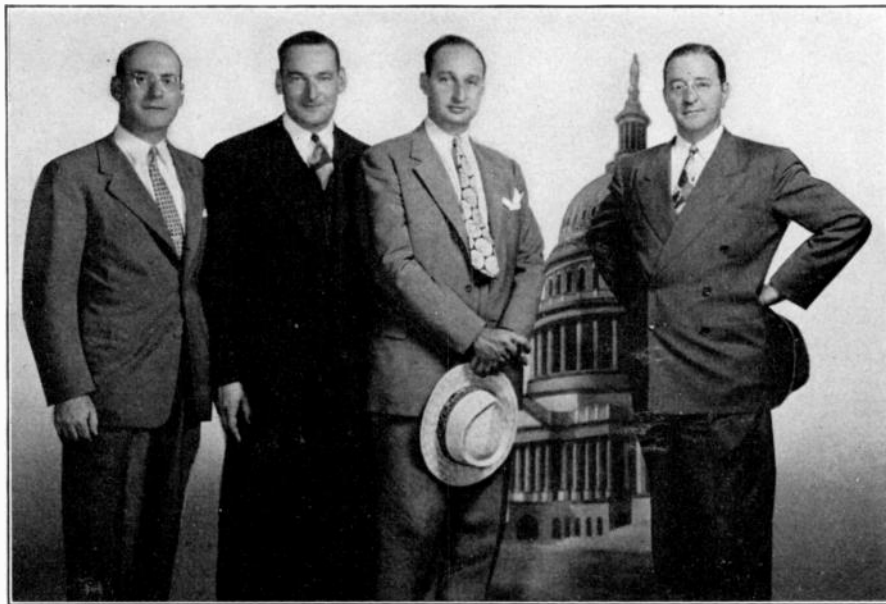
The Committee held frequent meetings to study the problems in the radio parts industry, and to evolve a means of obtaining consideration in Washington for a preference rating. Working in unison with the RMA Priorities Committee for the betterment of the entire radio industry

the Committee and its counsel presented a brief to the office of Price Administration and Civilian Supply and to the Office of Production Management.

The brief asked for an allocation on sufficient raw materials to enable radio parts manufacturers to fabricate replacement parts for repair and maintenance of existing receivers. It is necessary that the industry furnish OPACS with figures showing the exact tonnage of each type of scarce material used by the industry annually, so that OPACS can know precisely how much of each raw material to allocate. OPACS realizes the difficulties which would be encountered in attempting to collect this information to allocate to the radio parts manufacturers approximately 60% of the raw material used by them in 1940 for the fabrication of repair and maintenance parts.

The 60% figure is predicated upon OPACS' belief that 40% of the existing home receivers are what they term as "secondary sets" (the 2nd, 3rd or 4th set in a home) which it is not essential to keep in repair.

The Committee were advised that manufacturers of radio parts might obtain an A-10 rating for that portion of the raw materials used to manufacture radio parts or accessories which found their way either directly or indirectly into Defense Supplies. It is estimated by the Committee that approximately 20% of all sales made by jobbers are now going into Defense Supplies and that if the jobber keeps accurate records, as the Committee will later recommend, a manufacturer can, in turn, receive an A-10 rating of 20% of his raw material requirements, which will put him in a position to re-stock the jobber.



Left to right: *S. N. Shure*, *J. J. Kahn*, *K. G. Prince*, *W. J. Halligan*.

QUIT BEING COMPLACENT!

DO YOU REALIZE . . .

... that the utility companies are talking of going into competition with independent servicemen? Since Reader's Digest has badly undermined public confidence in independent shops, you know what that would mean.

... that the army is training thousands of radio servicemen? What is going to happen to servicing when these men return to civil life?

... that only a national organization can have a voice of sufficient numerical authority to really accomplish results?

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RADIO SERVICEMEN OF AMERICA, Inc.

"Reliable Service Assured"

Donald H. Stover — Executive Secretary

Nat'l. Headquarters: 1216 W. American St., Freeport, Ill.



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Anyone of high ethics, legitimately engaged in the radio servicing profession, whether he owns his own business or not, is eligible for membership in the National Association of RSA.

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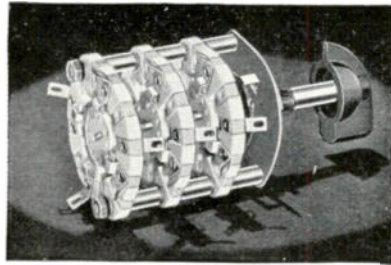
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City State

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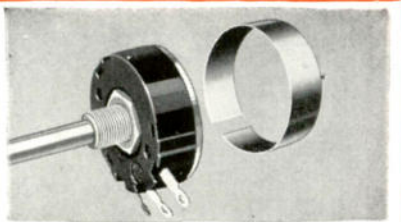
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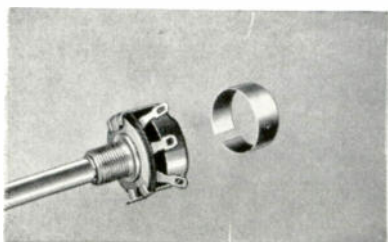
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Wall type resistor. Exclusive non-rubbing contact band. 1 3/8" diameter x 9/16" deep. Available single, twin or triple, plain or tapped . . . with S.P.S.T., D.P.S.T. or S.P.D.T.



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Companion to "standard" . . . small size but large control efficiency. Available single, dual or triple . . . plain or one, two or three taps . . . with S.P.S.T., S.P.D.T., or D.P.S.T. Moulded bakelite case, 1 1/8" diameter, 1/4" metal shaft 3 3/8" long.



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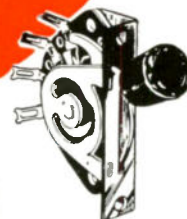
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For standard and wirewound resistors (Radiohms) as well as Midget and Elf Radiohms . . . S.P.S.T. . . . S.P.D.T. . . . D.P.S.T. . . . four point . . . S.P.D.T. (operates at clockwise position) and S.P.S.T. with Dummy Lug.



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Used singly or in groups . . . for broadcasting, receiving, public address, test instruments and industrial uses. Available in any one of ten different combinations including positive and spring return action.

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Body is insulated by inert ceramic jacket . . . proof against vibration and humidity . . . will withstand five times rated load without permanent change. In two sizes . . . RMA coded . . . 1/2 watt at 1/8" x 3/8" and 1 watt at 1/4" x 1" . . . Also supplied in conventional RADIAL LEAD Style . . . 1/2 watt - 1 watt or 2 watt.



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