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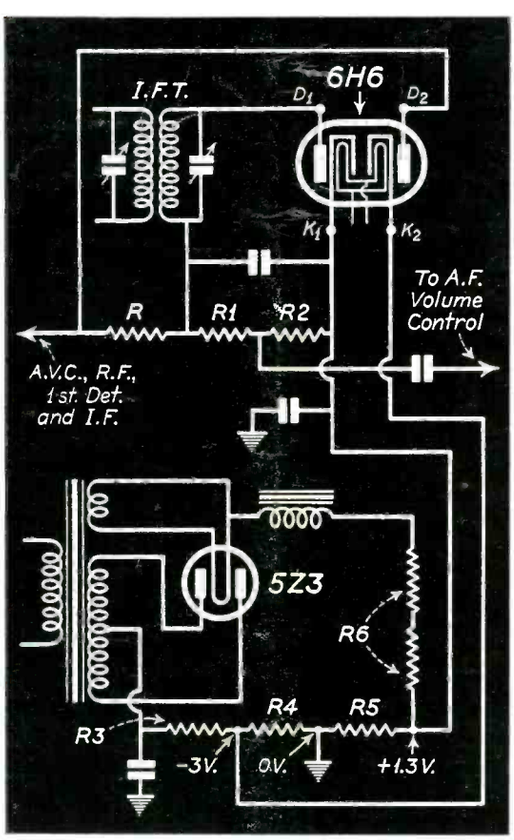
A MONTHLY DIGEST OF RADIO AND ALLIED MAINTENANCE



Automatic Initial Bias Circuit

(*See Page* 439)

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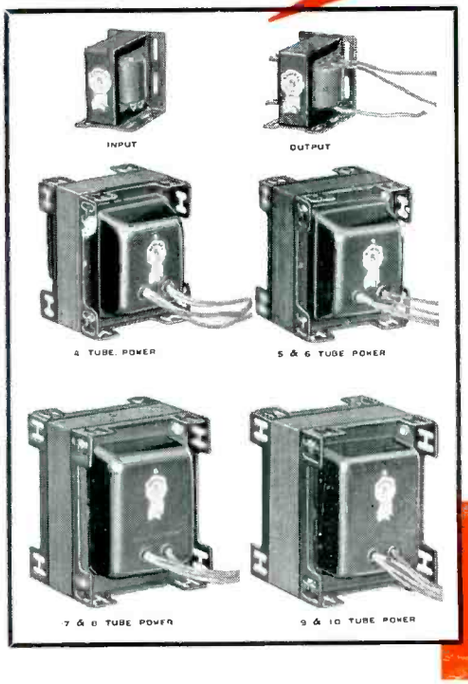
POWER UNIT EMERGENCY STOCK



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SERVICE

A Monthly Digest of Radio and Allied Maintenance

Reg. U. S. Patent Office. Member, Audit Bureau of Circulations

Vol. 4, No. 10
OCTOBER, 1935

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THE ANTENNA . . .

New Business

NEW P-A BUSINESS

THROUGH THE EFFORTS of the Radio Manufacturers Association, the Federal Housing Administration has finally agreed to make eligible for FHA financing under its Modernization Credit Plan any public-address systems of a permanent character. This includes installations for apartment buildings, hotels, office and other commercial buildings, hospitals, orphanages, colleges, factories and schools. It does not, however, include installations for private residences.

What this means is that anyone wishing a public-address system installation which is to be permanent, may apply through any of the many FHA credit outlets—local banks, etc.—for a loan to cover the complete cost of the job. The loan is repaid in equal installments over a period of from one to five years.

Here is a fine chance for the Service Man or Service Organization to whip up new business. Since the amount of interest one has to pay on the loan is decidedly moderate, and since the payments may be extended over a considerable period of time, it is actually possible to make the public-address installation pay its own way, with no initial outlay of cash on the part of the owner.

We offer the suggestion that you pick up your old public-address leads and also go after some new ones. Canvass your territory, but before doing so get some copies of the FHA Booklet which gives all the details on the loans and how they can be obtained. Your local bank should have copies of this Booklet available. Then show your prospects how easy it is to get a complete p-a installation.

Go to your local bank and get all the dope on how you should handle the jobs. You will find that all you have to do is submit the plans and installation costs to the credit agency. If everything looks okay, they will put up the entire amount required to cover both the cost of the public-address equipment and the installation charges.

Here is a big chance to increase your business. Don't let it slip by. Get all the dope on available public-address equipment right away so that you will be in a position to submit plans and costs on a moment's notice. Get organized on this . . . if you don't the other fellow is going to beat you to it.

BUILT-IN RADIOS

WORD HAS BEEN received that the FHA has also made eligible for financing under its Modernization Credit Plan any type of radio that is built into a home. This means that the owner of a private residence can borrow money to cover the cost of such an installation.

Here again there is offered to you a chance to increase your local business by undertaking the installation of built-in radio receivers for the home.

There are a number of manufacturers turning out "centralized" radio systems. These can be built into new homes in much the same manner as the electric wiring is installed. Or they can be worked into finished homes with very little extra effort.

Most of these centralized radio systems are rather elaborate. If the home owner finds them too expensive, you can always turn to stock equipment and work out your own system. We will have some very interesting dope on this in the next issue.

The point is that the radio equipment must be a permanent installation, just as an oil burner or a complete cooking range are permanent installations, in that they can't be moved about. They are "integral parts" of the house, and the built-in radio must also be an integral part of the house if it is to be eligible for a government loan.

Thus, if you were to take a stock radio, disassemble it and install the chassis and speaker in the wall or in a built-in cabinet, the installation would be classed as permanent. So long as the radio remains in a separate cabinet which may be moved about from room to room or removed from the house like a piece of furniture, it is *not* a permanent installation and would therefore not be eligible for an FHA loan. We mention this because electrical refrigerators *are* eligible and are classed as permanent installations, yet they could be removed as readily as a stock radio.

Better start working on plans for canvassing your neighborhood, but first work out a few acceptable installations so that you will have something concrete to offer to prospects.

We will welcome data on installations made and the manner in which you went about closing the deals. Your experiences will assist other Service Men just as their experiences will assist you . . . so, don't keep it a dark secret.

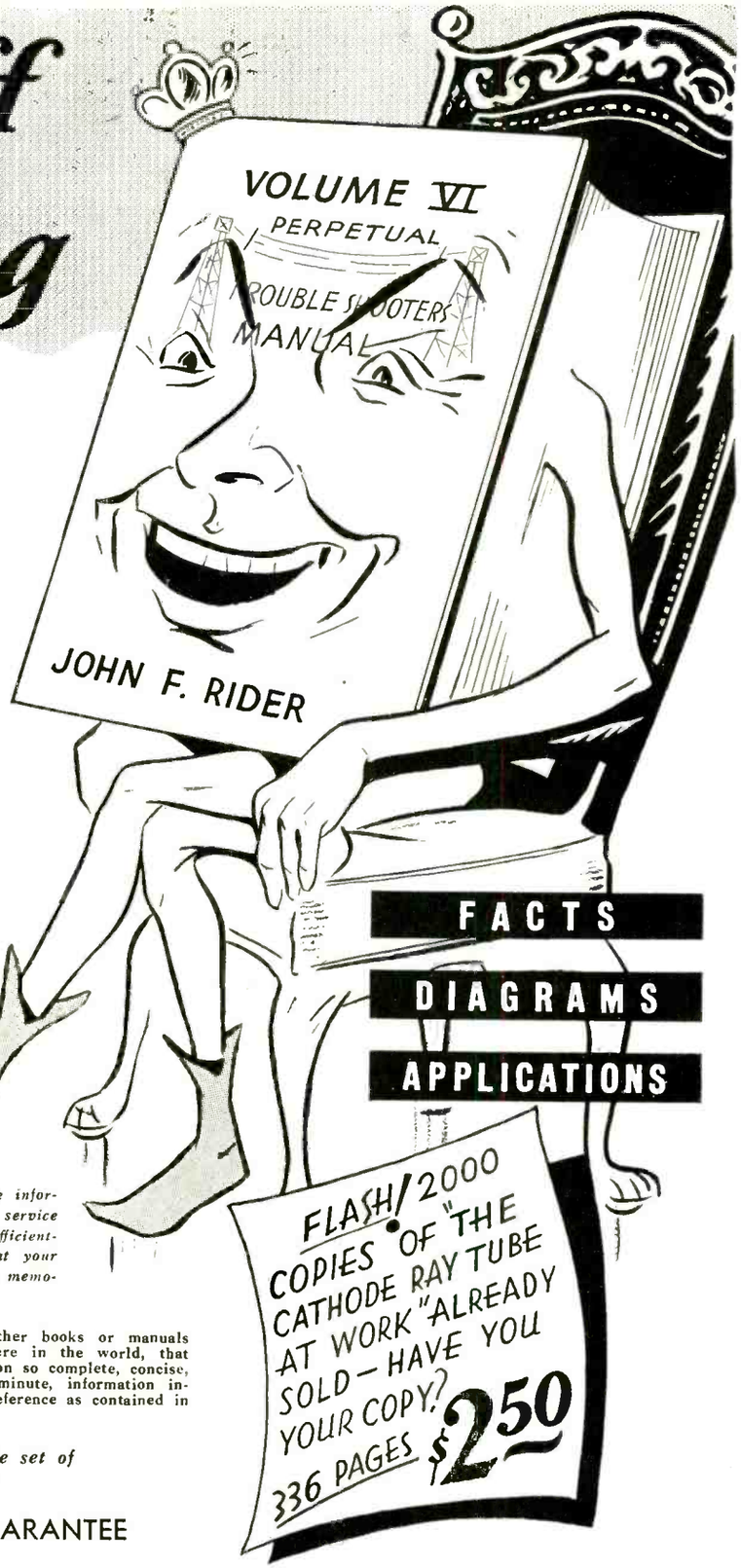
SERVICING AND WAR

ACCORDING TO THE Radio Manufacturers Association, the public interest in short-wave radio is increasing by leaps and bounds. A part of this interest is undoubtedly due to the fact that "all-wave" or "dual-wave" features are practically "standard equipment" in the modern radio, so that the purchaser has these bands opened up to him as a matter of course. So—being inquisitive—he tries out these bands, and usually ends up an avid short-wave bug.

In any event, there are an enormous number of short-wave listeners today and the number is rapidly increasing. As cruel and as odious as war may be, it has an almost irresistible dramatic appeal, and radio listeners will find of absorbing interest the details of the conflict in Ethiopia. Anything may happen over there, and the broadcasting companies are all set to provide the details to the listening public. A good part of the drama will be presented on the broadcast band, but there is no telling what may come over some of the foreign short-wave stations. That's why the public wants a front-row seat in all broadcast wavebands.

The stage is set—are the radios? That's your job. Why not send out a teaser to your customers—suggesting that they let you "tune up" their all-wave receivers so that they won't miss any of the show, or suggesting that they purchase an all-wave receiver in the event that they do not own one.

Hats Off to the New King



Volume VI

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SERVICE

A Monthly Digest of Radio and Allied Maintenance

FOR OCTOBER, 1935

PROFITS IN OLD SET CONVERSION WITH MODERN METHODS

By Tobe Deutschmann*

This is the first of a series of articles on the modernization of antiquated receivers, bringing them to a par with high grade 1936 models. This series will be entirely of a practical nature, and will describe conversions made on various popular and representative receivers of by-gone vintage, with the sole purpose of enabling the Service Man to duplicate these jobs. All of the "bugs" will be eliminated, and the way paved toward profits for the Service Man, with metal and glass tube modernizations.

ACCORDING to a recent report in the New York *Times*, 25% of all receivers now in use are obsolete. This number includes not merely receivers which were purchased a half decade ago, and which are obviously out-of-date, but even more recent models manufactured prior to the advent of all-wave popularity. There are, of course, other contributory factors toward obsolescence, such as automatic volume control, ease of operation, economy, high fidelity, low background noise, etc., and it is not an exaggeration to state that any set not incorporating every one of these features is not wholly modern.

*President, Tobe Deutschmann Corp.

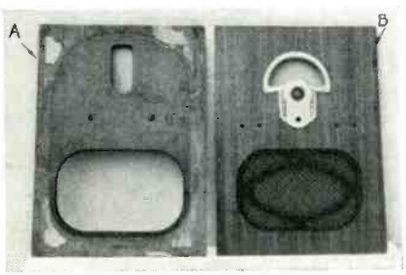


Fig. 1. Showing the original Majestic panel, A, and the new panel, B, prepared for the modernization job.

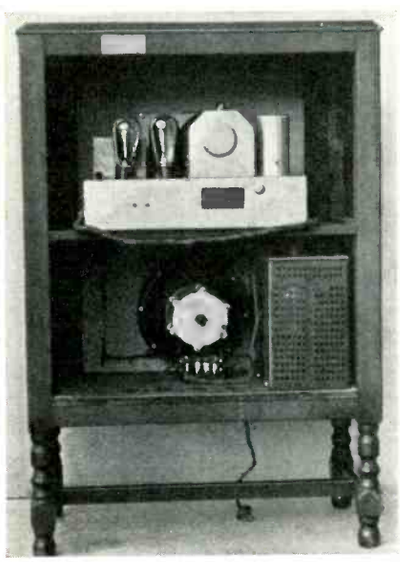


Fig. 3. Rear view of the Majestic 91 before modernization, and . . . (See Fig. 4).

Modernization Advantages

There is no doubt that a large number of these obsolete receivers will be replaced with new sets—which is as it should be. On the other hand, the fact that from five to eight million receivers are today antiquated offers opportunities of considerable potentiality to the Service Man in the modernization of such sets. Much has been written lately on this revived theme, and the arguments in favor of modernization are well known. Recapitulated they are: Economy—the securing of new set operation at one-third new set cost (for comparable results, providing the Service Man does a good job); the salvaging of a good portion of the original investment which in many instances ran into hundreds of dollars; retention of the old cabinet which the owner may be reluctant to relinquish through sentimental attachment or because it fits in with his individual scheme of interior decoration.

Mechanics of Conversion

The mechanics of such modernization are simple, and consist of substituting the essential part of an all-wave chassis for the existing tuner, retaining as much of the original installation as is practical—always the cabinet, and often the power supply, loudspeaker and audio amplifier. There are several all-wave chassis on the market available for this purpose. In this series, the writer will employ the Browning-35, because of his familiarity with the circuit and the inherent flexibility of the set which contributes greatly to its adaptability. Also,

Fig. 4. After modernization. The power pack, as will be observed, has been retained.

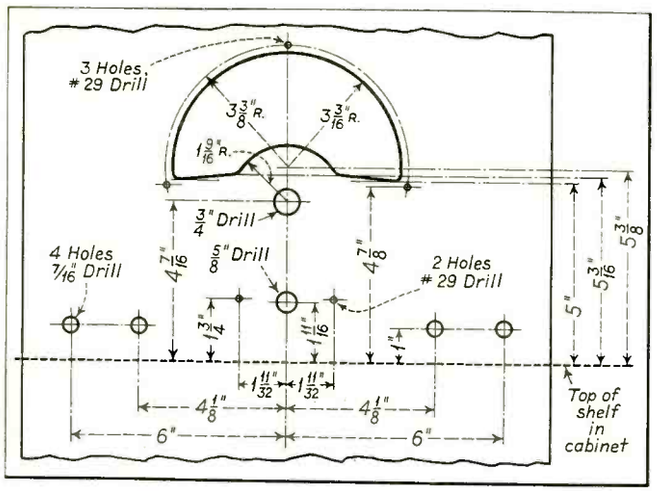


Fig. 2. Panel layout for the modernized Majestic 91. An escutcheon will frame the dial opening.

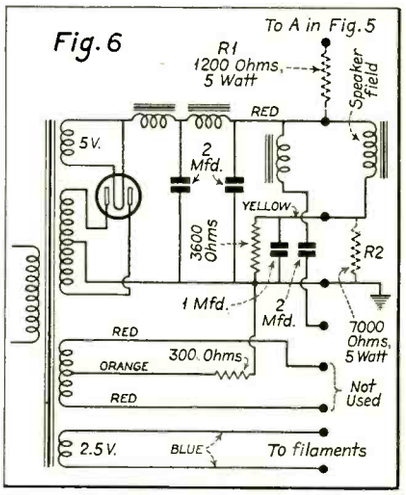
it is obtainable in kit form, which adds considerably to the Service Man's profits. The Service Man charges for the construction time—a charge which the consumer would have to pay, anyway, and which otherwise would go to the manufacturer. (The fact that the tuner unit, in the kit, is completely wired facilitates the construction job, and keeps the assembly costs within limits comparable to the tariff which would be absorbed in a factory-built receiver.)

Modernizing the Majestic 91

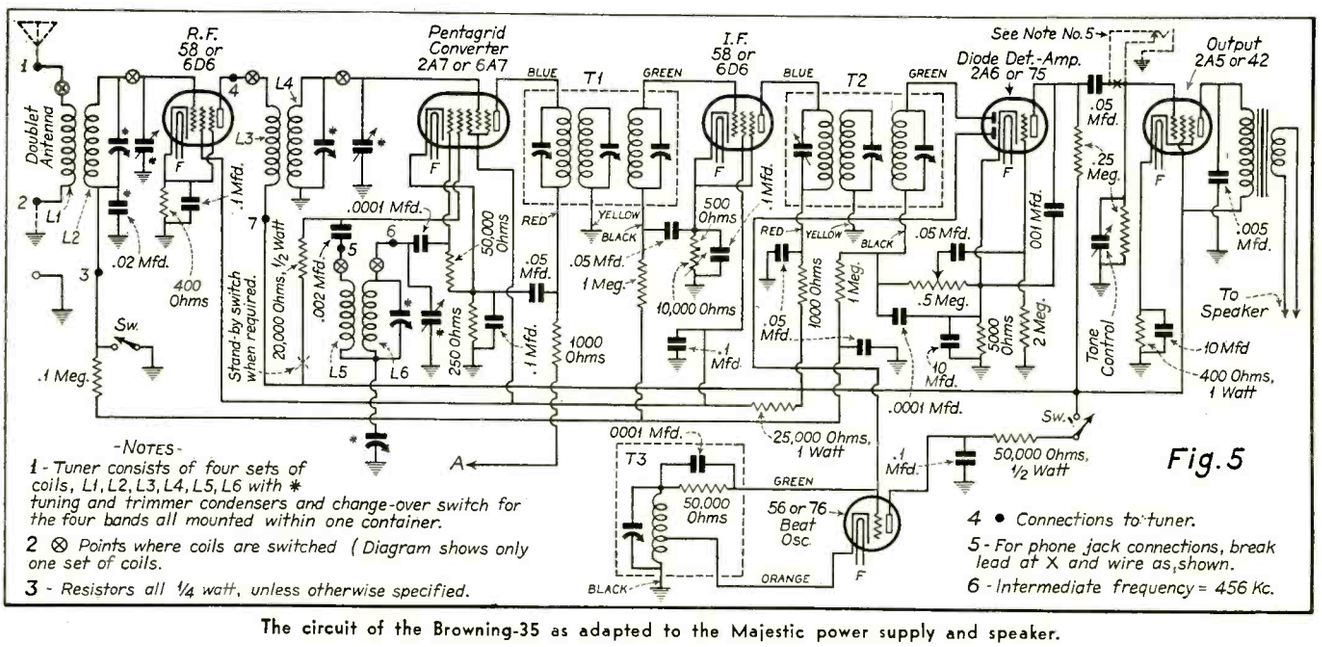
This was a highly popular receiver in the years 1928 and 1929, and represented, even in those pre-depression days, an investment of no mean magnitude. It was, for those times, an excellent set, and incorporated an audio system of the finest design then available. The speaker is an unusually good dynamic, and is retained in the conversion. The power supply is also altogether adequate. The retention of these two items reduces the cost to the customer while not necessarily affecting the Service Man's profit.

The first step in modernization is the demounting of all parts from the cabinet, preliminary to the removal of the wooden panel, which is glued in with the usual glue blocks. To effect this removal, it is necessary to take off the top of the cabinet, which is held to the sides by means of screws and angle brackets. The old panel is shown as A in Fig. 1, while the new panel, cut to the same size, is illustrated at B. The original panel is used as a template for the loudspeaker opening. The positions of the chassis and escutcheon mounting holes are shown in Fig. 2.

In the case of the conversion job photographed, a 3/8-inch solid walnut panel was secured. Three-ply wood, however, will serve equally well. The cutting and drilling was done at the lumber yard for a nominal cost ($1.50), the bevel around the loudspeaker opening being cut by machine. The Service Man, however, can do this work himself with a scroll or fret saw. Care should be observed in cutting the speaker opening which should be sandpapered smooth, as this edge will be exposed. Less caution need be taken in the case of the drilled holes and dial card opening, as these will be covered with the knobs and handsome escutcheon. The panel was rubbed with walnut stain (applied with a cloth, and rubbed in to the desired shade). After the stain was allowed to dry, the panel was polished with furniture wax—the result being a highly pleasing and altogether professional finish. The original grille and tapestry were then mounted on the new panel, and the panel, in turn, glued into the cabinet and the top replaced. Some of the mechanical details are suggested in Figs. 3 and 4, showing respectively the rear views of the receiver before and after modernization.



Showing the changes in the power-supply circuit. Dotted lines indicate the additional resistors.



-Notes-

1 - Tuner consists of four sets of coils, L1, L2, L3, L4, L5, L6 with * tuning and trimmer condensers and change-over switch for the four bands all mounted within one container.

2 ⊗ Points where coils are switched (Diagram shows only one set of coils.

3 - Resistors all 1/4 watt, unless otherwise specified.

4 • Connections to tuner.

5 - For phone jack connections, break lead at X and wire as shown.

6 - Intermediate frequency = 456 Kc.

The circuit of the Browning-35 as adapted to the Majestic power supply and speaker.

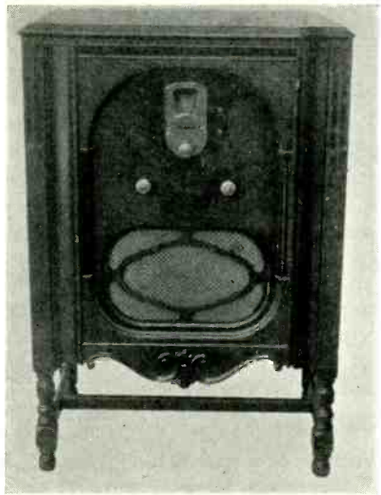


Fig. 7. The Majestic 91, vintage 1928-29.

Relatively simple electrical changes were required to effect the adaption. The circuit diagram of the simplified Browning as used in the conversion is shown in Fig. 5. The following parts have been eliminated from the standard kits and circuit: Power transformer, two 8-mfd filter condensers, the rectifying tube socket, the rectifying tube (providing that in the Majestic power pack is in good condition) and the loudspeaker. An output transformer, with an 8,000-ohm primary and a 4-ohm secondary has been added.

The power pack circuit is shown in Fig. 6, and is self-explanatory. Resistors R_1 and R_2 have been added, the first to supply the correct plate voltage to the chassis, and the second as a bleeder resistance to provide excitation for the speaker field. The connections between the chassis unit and the power unit are indicated on the diagrams.

Reassembling the Receiver

The escutcheon is mounted with either five wood screws, or nuts and bolts, depending upon the exact method of reassembling decided upon by the individual Service Man. Probably the most satisfactory method is to assemble the complete Browning-35 chassis (less the omitted parts, of course) utilizing the standard metal panel which holds the dial card. This greatly facilitates servicing, as the receiver can be removed from the cabinet and aligned with the dial card in position, on the service bench. In this instance, the escutcheon is fastened to the front, or wood panel, with good screws. Extension shafts (which are standard with this receiver for conversion purposes) are attached to the control shafts, and the chassis is pushed, on the cabinet shelf, into position. When the metal panel is flat against the wooden panel, the shafts will extend the correct distance and the knobs may then be mounted.

The second procedure eliminates the metal panel. The escutcheon is mounted with nuts and bolts, after being first used as a template to punch mounting holes in the dial card. The dial card is then mounted behind the escutcheon, spaced from the panel by the escutcheon bolts. This space provides room for the dial pointer. The dial card is secured by means of three additional nuts, the machine screws being sufficient length

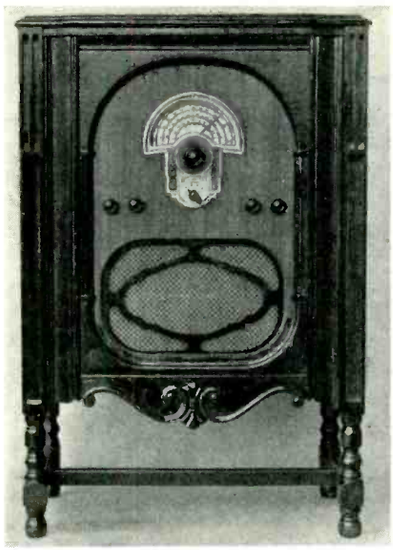


Fig. 8. The Majestic 91, vintage 1936!

to accommodate this mounting. The chassis is then secured to the wood panel by the nuts holding the lower controls to the chassis.

It is not necessary to "float" or otherwise cushion the chassis. The construction of the Browning receiver mitigates against the effects of acoustic feedback to such an extent that this *tour de force* will rarely be necessary. The tuning unit itself is cushioned from the chassis.

Contrast

Figs. 7 and 8 demonstrate the pleasing contrast between the old and modernized receivers. The contrast in performances is comparable!

(To be continued)

AUTOMATIC INITIAL BIAS CIRCUIT

(See Front Cover)

RESIDUAL bias for tubes placed on automatic volume control is usually obtained through the use of separate cathode resistors, or by connecting the cathodes or grid-return leads to a point or points on a tapped resistor either positive or negative with respect to the chasis ground, depending upon the method used for obtaining the bias.

More recently, a few receivers have appeared wherein the residual bias—a negative voltage in this case—is impressed on the grids of the automatic bias-controlled tubes directly through the same lead that supplies the avc. However, the automatic residual bias system used in a number of the new RCA receivers is, to our knowledge, an entirely new way of obtaining this bias.

What It Does

Referring to the circuit on the front cover, the modulated signal as obtained from the output of the i-f system is detected by one diode of the 6H6 tube. The a-f obtained by this process is passed on to the a-f amplifier. The d-c voltage which results from detection of the signal is used in the usual manner for avc, and this voltage is impressed on the grids of the r-f, mixer and i-f tubes. The second diode of the 6H6 is used to supply the residual bias for these controlled tubes under conditions of little or no signal. This diode, under such conditions, draws current, which flows through resistors R, R-1 and R-2, thereby maintaining the desired minimum operating bias on the controlled tubes. On application of signal energy above a certain level, however, the auxiliary bias diode ceases to draw current and the avc diode takes over the biasing function. Thus it is seen that there is an electrical "see-saw" action between the two diodes, the signal, or lack of signal, being the determining factor.

Operation

The cathode K-1 and diode D-1 of the signal-avc diode have positive potential in respect to chassis-ground as well as in respect to the cathodes of the controlled tubes when no signal is being received. This positive voltage is obtained by connecting the cathode K-1 to a point on the voltage divider plus 1.3 volts above ground. Since the residual bias diode connects to the cathode K-1 through resistors R, R-1 and R-2, it is also positive under no-signal conditions, and since its cathode K-2 is connected to a point between resistors R-3 and R-4 which is negative 3 volts with respect to ground, diode D-2 draws current. This produces a voltage drop across resistors R, R-1 and R-2 which overcomes the positive voltage and runs the circuit negative. With the application of a signal of sufficient voltage, the signal-diode circuit becomes negative and this also makes the residual-bias diode D-2 negative and it ceases to draw current. It is at this point that the signal diode takes over the bias control.

General Data . . .

RCA Victor Model C 15-3

This is a 15-tube (metal) five-band receiver and uses the 6E5 (Magic Eye) cathode-ray tuning indicator. This receiver covers the extraordinary wavelength range of 140 to 60,000 kc with a slight hole above 410 kc for the i-f peak frequency of the set.

A worthwhile description of the circuit and its features takes so much space that we shall hold over the alignment data until next month. This in itself is highly interesting since it provides a practical explanation of the manner in which to align a large receiver of this type with a cathode-ray oscillograph.

Tube Complement

Referring to the diagram of the Model C 15-3 on the opposite page, the tube line-up is as follows: An r-f stage using a 6K7; a 6L7 hexode first detector; a 6J7 oscillator; two i-f stages using 6K7's; an avc i-f stage using a 6K7 which feeds a 6H6 avc diode; a 6H6 diode second detector; a 6C5 in the first a-f stage; two 6C5's in push-pull in the a-f driver stage; two 6F6 tubes, pentode connected, in the push-pull output stage; a 5Z3 (glass) full-wave power rectifier and, last but not least, a 6E5 tuning indicator tube.

Electrical Specifications

The receiver is provided with a universal power transformer and may be used on lines having a wide range of voltages and frequencies. The power consumption of the receiver is 145 watts.

The set has an undistorted output of 10 watts and a maximum output of 15 watts.

The 12-inch speaker has a voice-coil impedance of 7.5 ohms at 400 cycles.

The Circuit

Six adjustable tuned circuits are used in the i-f system, each resonating at 460 kc. A three-section variable condenser tunes the secondary of the antenna transformer, the secondary of the detector input transformer and the oscillator coil on all bands with the exception of D, which has only its detector and oscillator tuned. Each tuning range has its own group of r-f and oscillator coils, they being selected as desired by operation of the band-change switch. Trimmer condensers are provided on all of the tuned circuits for use in obtaining precise alignment.

Band D Tuning

Special notice should be taken of the manner of tuning this ultra short-wave band (18 to 60 mc.). The r-f stage is unused when the range switch is turned to its Band D position and the signal is fed from the antenna directly to the first detector input circuit. The inductance of this circuit consists of a short length of bus wire to which the antenna lead is tapped at a definite predetermined point. The total length of this inductive wire from the stator of the tuning capacitor to ground represents the secondary of a high-frequency autotransformer, while the inductive section included between the antenna lead tap and ground forms the primary. Alteration of the dimentions and position of this wiring will change the tuning and alignment of the circuit, resulting in total lack of operation or seriously poor operation. *It is therefore necessary when servicing to avoid changes in the wiring which includes Band D detector and oscillator r-f circuits unless the arrangement is restored to its exact original condition.* Similar caution should be observed when exchanging bypass condensers in these same circuits, since their values, physical positions, length of leads, quality of dielectric, etc., are critical and variations will definitely affect operation of the receiver. The small heater bypass condensers and ground terminals installed at the tube sockets are very important in this respect.

Oscillator Stage

The heterodyne oscillator circuit used in this receiver is an improved type, having exceptional frequency stability and uniformity of output over its various tuning ranges. It operates on fundamental frequencies which are fed to the 6L7 first detector hexode tube on an auxiliary mixing grid. The oscillator generates a signal which is at all times above the frequency of the incoming signal by 460 kc. As shown by the schematic diagram, the cathode of the oscillator tube is above ground potential for r-f, while the plate is effectively at ground potential. This particular arrangement, together with the plate and screen series resistors, makes the circuit independent of supply voltage variations in regard to stability and uniformity of output. Separate coils are used for each of the tuning ranges. The switching of the different bands is such as to short circuit certain unused coils which would absorb energy from the circuits used.

Intermediate Amplifier

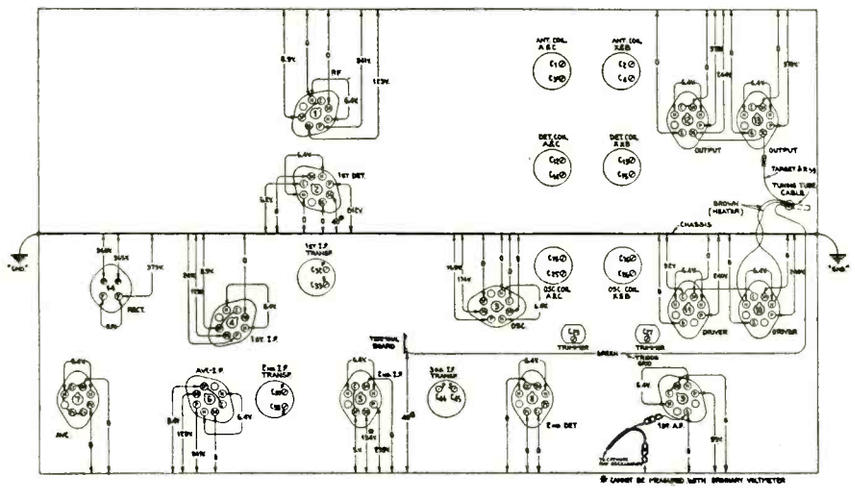
Two stages of i-f amplification comprising three tuned transformers and two 6K7 tubes are arranged in cascade to operate at 460 kc. The transformers have their primaries as well as secondaries tuned by adjustable trimmer capacitors. These trimmers are designed to resist moisture, temperature and other detrimental factors which may affect their adjustments. Litz wire is used for the windings of the third transformer in order to provide the proper efficiency in driving the diode second detector.

Second Detector

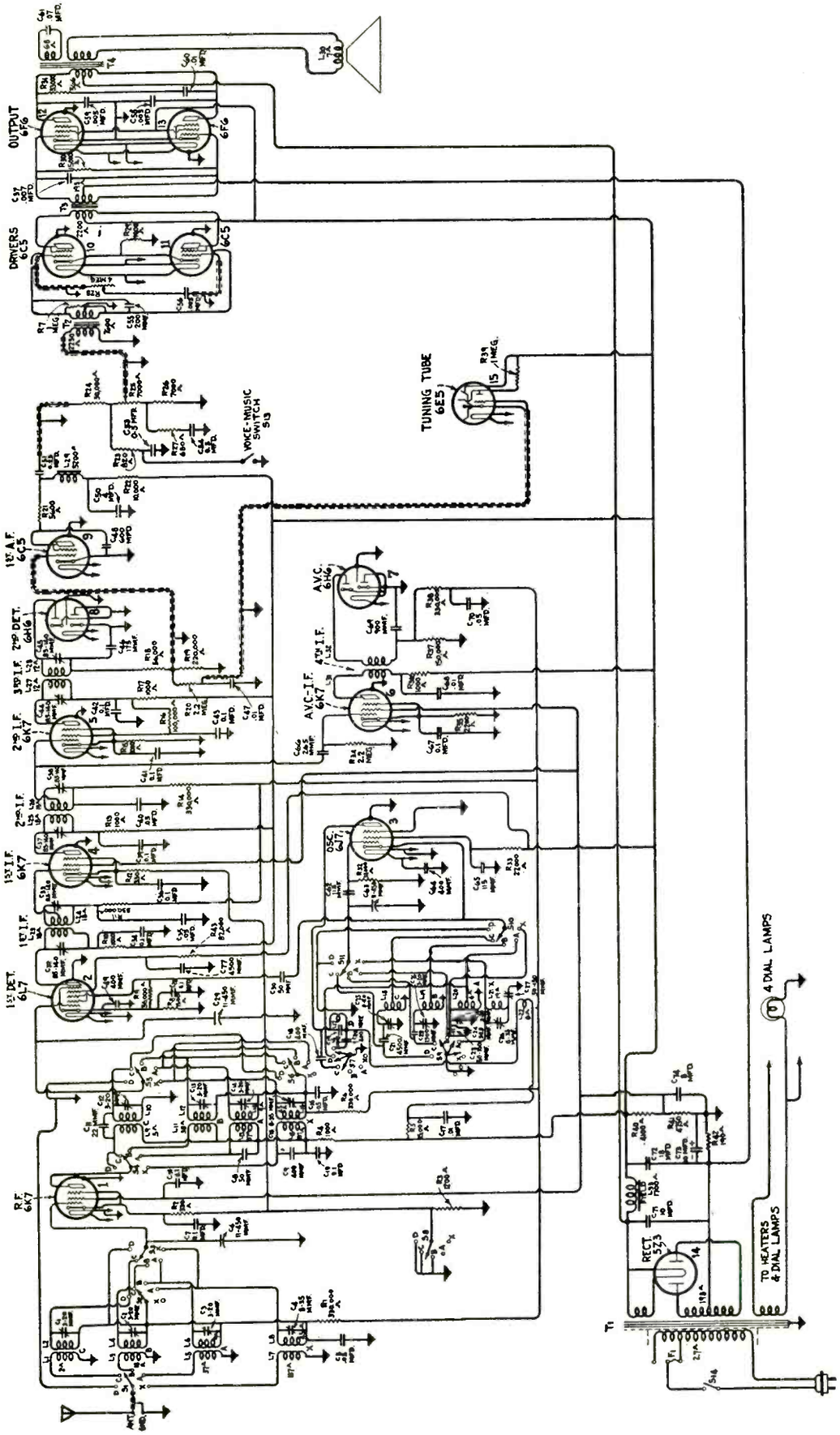
Signal detection is brought about by the rectifying action of the 6H6 double diode tube. Audio signal obtained from the voltage drop across resistor R-19 in the diode circuit, is transmitted to the first audio stage by direct coupling. The direct signal component across resistor R-19 is used for bias for the 6C5 first audio tube.

Automatic Volume Control

The avc operates as a parallel sys-



Showing the location of coils, transformers, and sockets with voltage values for RCA Victor Model C 15-3.



Complete schematic diagram of the RCA Victor "Magic Eye" Model C 15-3 Receiver. This job has a tuning range from 140 to 60,000 kc, and thus takes in the ultra-short-wave amateur and two-way police bands. The "coils" for the 60-mc band are straight lengths of bus bar wire—so don't let the straight wires for this band fool you. Voltages are given in the illustration on the opposite page.

tem, being fed from the first i-f output through an auxiliary amplifier tube, a 6K7. This stage has an untuned input and broadly resonated output, as accomplished in the natural period fourth i-f transformer. A double diode 6H6 receives the signal at i-f frequency from the No. 6 stage and rectifies it in order to obtain the d-c component required for avc. This component, which develops across resistor R-37, is applied to the control grids of the r-f, first detector and i-f tubes through resistor-condenser filter systems. The value of the bias obtained by this process varies with the intensity of the received signal and in turn governs the amplification of the receiver, thereby automatically regulating the output to the same level when there are fading tendencies and similarly when tuning from station to station.

Audio System

Several stages of audio amplification provide excellent fidelity and wide range of volume both for short-wave as well as on the standard and long-wave bands. The high gain of the system has necessitated thorough shielding and careful manufacture. All wiring, transformers, etc., should always be placed as originally installed if it has been necessary to remove such for service purposes. Hum difficulties are likely to occur if this caution is not observed. Manual volume control is by means of an acoustically tapered potentiometer which conveys the audio output of the first a-f stage to the interstage coupling transformer. This control has tone compensation produced by filters connected to two points thereon. This gives the correct aural balance at different volume settings. A music-speech switch is provided in one of the volume control filter circuits for use in obtaining good speech intelligibility. On the speech position, the low-frequency tones are reduced. A push-pull driver stage is used between the first a-f and the Class AB output amplifier. A continuously variable high-frequency tone control is shunted across the grids of the driver tubes. A sharp, high audio-frequency cut-off is obtained by a tertiary winding on the audio output transformer and by the correct design of the driver and interstage transformers. This cut-off feature results in quieter operation by the reduction of high frequency noise, especially on weaker stations.

Rectifier and Filter

A 5Z3 full-wave rectifier tube is employed in the high-voltage supply system. The loudspeaker field coil serves as a filter reactor in conjunction with high capacity, electrolytic condensers. Fixed bias voltages are made available at the filter output on a divider system, which is likewise well filtered with large capacitors.

Tuning Indicator

A 6E5 cathode-ray tube is used as a means of visually indicating when the receiver is accurately tuned to the incoming signal. This tube comprises an amplifier and cathode-ray section built in the same envelope. The cathode-ray section consists of a conically shaped luminescent screen upon which a pattern is formed by an effect of the detected signal after said effect has been amplified by the amplifier section which is fed from the second detector diode circuit. The size of the pattern is determined by the strength of the signal voltage, so that any change of tuning may be readily observed in order to facilitate tuning to exact resonance.

(*To be continued*)

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Stewart-Warner R-130 Chassis

This chassis is used in receiver Models 1301 to 1309. The circuit is similar to that of the R-125 Chassis which it supersedes. An insert in the accompanying diagram shows the tone-control circuit of the Model R-130-AT in which the tone control is continuously variable.

The Circuit

There are two wavelength ranges, selected by the tandem switch sections 30-A and 30-B. The antenna circuit has band-pass characteristics when the receiver is set for broadcast reception. The band-pass tuner is composed of variable condensers 34-A and 34-B and the coils 32. Coil 37 is for the short-wave band.

The 6A7 mixer-oscillator feeds a single stage of i-f using a 6D6 tube. Detection takes place in the diode circuit of the type 75 tube. The voltage developed in the diode load circuit also provides avc to the mixer of the 6A7 and to the 6D6 i-f tube.

Initial bias for the 6A7 mixer is supplied by cathode resistor 19-A, and for the 6D6 i-f tube by resistor 19-B. Bias for the control grid of the 75 triode is obtained from the voltage drop in resistor 19-C in the negative leg of the power supply. Bias for the 42 power pentode is provided by the total drop across resistors 19-C and 19-D.

Alignment

Preliminary to alignment, remove receiver chassis from cabinet, connect output meter across primary of output transformer on dynamic speaker (yellow and red wires) and turn volume control to maximum. The test oscillator must cover frequencies of 456, 600, 1400 and 4000 kc.

Aligning I-F Amplifier

Set test oscillator to 456 kc. Connect output leads to control grid of 6A7 and ground. Set receiver range switch to broadcast position and make certain no station is tuned in.

Then adjust the four i-f transformer trimmers for maximum, repeating each adjustment later, as there is a certain amount of interaction. Trimmer adjustors are reached through holes in the tops of the two i-f transformer shields (rear right of chassis).

Broadcast-Range Calibration

Check position of pointer on condenser shaft by turning the rotor plates to full mesh. The pointer should then coincide with the heavy horizontal line separating the broadcast and short-wave dial scales. If it does not, remove the dial glass and turn the pointer to the proper position, being careful not to break or bend the pointer.

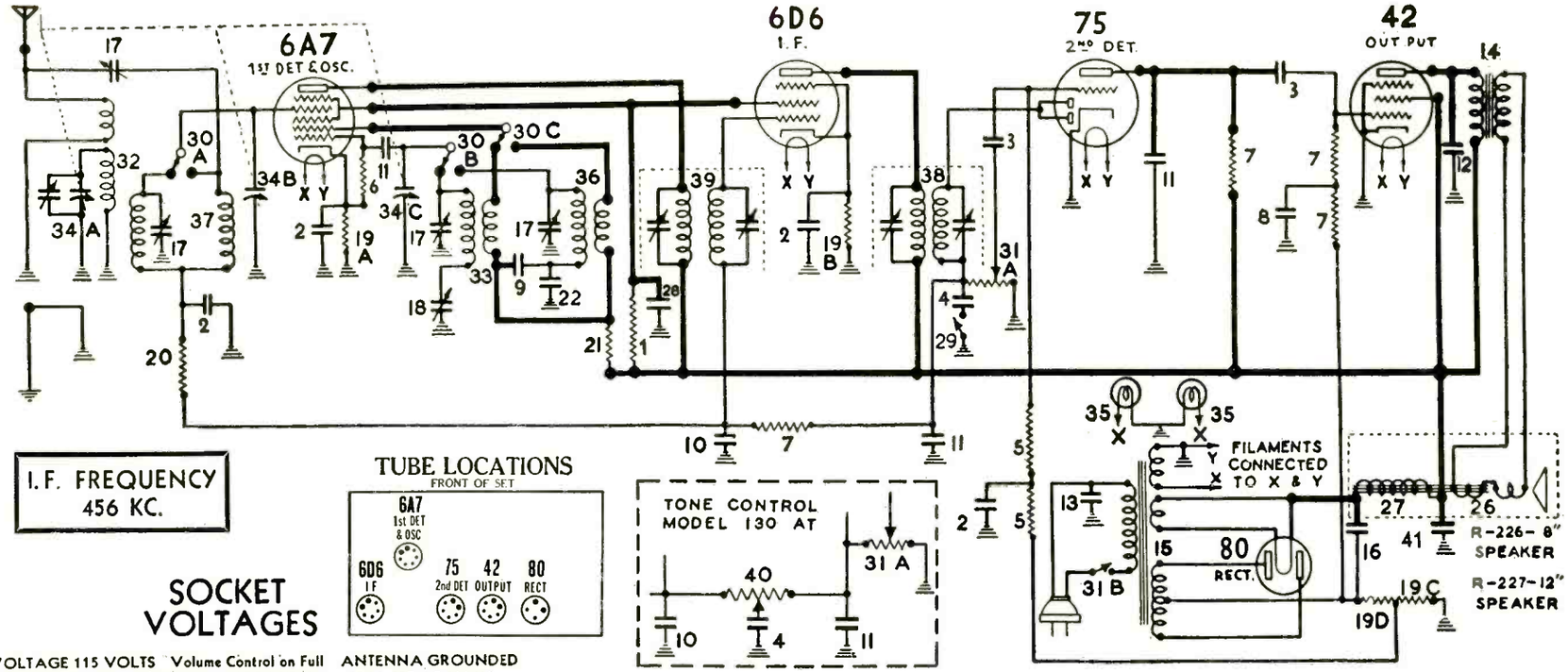
Turn range switch to maximum clockwise position (broadcast setting). To calibrate at the high-frequency end, use a broadcast station signal between 1300 and 1420 kc, or a 1400-kc signal from the test oscillator. Turn receiver dial to exact frequency of station or oscillator and carefully adjust the broadcast oscillator trimmer for maximum. This trimmer can be reached through a hole to the right and slightly above the range switch.

Broadcast-Range Alignment

Connect a .0001-mfd *mica condenser* in series with the test oscillator output and the receiver antenna lead (blue). *This condenser must remain connected for all broadcast and short-wave adjustments.* Do not connect any resistor in series with the condenser.

Proceed by grounding receiver chassis and connecting test oscillator ground lead to chassis. Set test oscillator to approximately 1400 kc and tune receiver to the signal. Then adjust the broadcast detector shunt trimmer and broadcast pre-selector shunt trimmer for maximum. The first mentioned trimmer is adjusted through a hole in the front of the chassis immediately to the right of the tuning dial scale. The latter trimmer is located on top of the middle gang condenser.

Retune receiver and check the adjustments of these two trimmers.



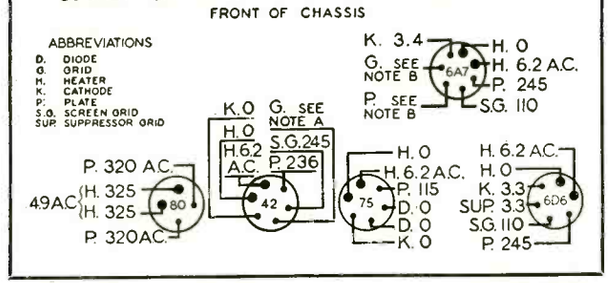
I. F. FREQUENCY
456 KC.

TUBE LOCATIONS
FRONT OF SET

SOCKET VOLTAGES

LINE VOLTAGE 115 VOLTS Volume Control on Full ANTENNA GROUNDED
RANGE SWITCH SET ON BROADCAST POSITION DIAL SET AT 530 KC.

VOLTAGES MEASURED BETWEEN CHASSIS AND SOCKET TERMINALS AS SEEN FROM THE BOTTOM
FRONT OF CHASSIS



IMPORTANT: Use a high resistance voltmeter of 1000 ohms per volt. Readings will vary depending upon voltage range of meter, being higher for higher range instruments. This variation is most marked for second detector plate voltage.

Speaker field voltage with coil warm is 70 volts D. C.

NOTE A: The bias on the 42 output tube is —17 volts measured across the metal-clad bias resistor 19C and 19D. The grid bias on the 75 second detector is —1.5 volts measured across the bias resistor 19C.

NOTE B: The oscillator plate voltage for the broadcast range setting with the dial set at 530 KC should be approximately 180 volts. The oscillator grid voltage under the same conditions should be about —18 volts.

R-130 PARTS LIST

Diag. No.	Part No.	Description
1	62183	30,000 ohm, 1 watt carbon resistor
2	81630	.1 mfd. 100 volt paper condenser
3	83007	.02 mfd. 600 volt paper condenser
4	83011	.004 mfd. 600 volt paper condenser
5	83072	510,000 ohm, ¼ watt carbon resistor
6	83080	51,000 ohm, ¼ watt carbon resistor
7	83082	260,000 ohm, ¼ watt carbon resistor
8	83219	.01 mfd. 600 volt paper condenser
9	83352	.015 mfd. 600 volt paper condenser
10	83353	.05 mfd. 100 volt paper condenser
11	83539	.00026 mfd. molded mica condenser
12	83706	.006 mfd. 600 volt paper condenser
13	83976	.012 mfd. 1000 volt shielded paper condenser
14	84153	Output transformer (for R-226-8 inch speaker) (See 84312 transformer for 12 inch speaker)
15	84189	Power transf. 115 volts, 60 cycles, R-130-A only (See 84408 for other voltages and frequencies)
16	84193	16 mfd. 350 volt wet electrolytic condenser
17	84194	R.F. trimmer condenser (3 to 30 mmfd.)
18	84195	Oscillator padding trimmer (300-600 mmfd.)
19A	84196	300 ohm resistor
19B	84196	300 ohm resistor
19C	84196	25 ohm resistor
19D	84196	275 ohm resistor
20	84198	110,000 ohm ¼ watt carbon resistor
21	84199	16,000 ohm ¼ watt carbon resistor
22	84200	.004 mfd. molded mica condenser
	84312	Output transformer (on R-227 12" speaker)
23	84404	Phonograph switch (D.P.D.T.) (R-130-X only)
24	84407	Phonograph terminal strip (R-130-X only)
25	84408	Power transformer (100 to 240 volts, 25 to 133 cycles) (R-130-X only)
26	84504	Diaphragm and shell assembly (For R-226 8" speaker) (Also see 84506)
27	84505	Field coil and housing (For R-226 8" speaker) (Also see 84507)
	84506	Diaph'm and shell as'mby (For R-227 12" spkr.)
	84507	Field coil and housing (For R-227 12" speaker)
28	84601	.25 mfd. 300 volt paper condenser
29	84737	Tone control switch
30	84738	Range switch
31A, 31B	84739	500,000 ohm volume control and line switch
32	84746	Broadcast preselector coil assembly
33	84749	Broadcast oscillator coil
34	84750	Three gang variable condenser
35	84759	6-8 volt dial light bulb
36	84763	Short wave oscillator coil
37	84765	Short wave antenna coil
38	84776	2nd I.F. transformer
39	84777	1st I.F. transformer
40	84942	300,000 ohm Tone Control (AT and XT models only)
41	85112	16 mfd. 300 volt wet electrolytic cond.

Circuit diagram, tube locations, socket voltages and parts values of Stewart-Warner R-130.

Follow by setting test oscillator to 600 kc, tune receiver to its signal, and adjust the broadcast oscillator padding trimmer. This is reached through a hole located at the extreme right of the chassis front. Retune receiver dial to a peak and readjust this trimmer. Continue this procedure until the reading of the output meter cannot be further increased.

Then repeat adjustments previously made at 1400 kc.

Short-Wave Range Calibration

Set receiver range switch to short-wave position and set test oscillator to exactly 16,000 kc. (If oscillator does not cover this frequency, use the second harmonic of 8000 kc or the fourth harmonic of 4000 kc).

Set receiver dial at 16 mc and adjust the short-wave oscillator calibration trimmer. This is located just to the right of the broadcast detector shunt trimmer on the chassis front. There will be two peaks in this adjustment. The correct one is that with the trimmer screw farthest out.

To make sure that you have not adjusted this trimmer to the image frequency, check this point by setting the receiver dial to the image frequency (approximately 15.1 mc) and determine if the image signal can be heard. (The image frequency is always the signal frequency minus twice the i-f frequency . . . in this case 16,000 — 912 = 15,088 kc). If no signal can be heard at 15.1 mc receiver dial setting, even with greatly increased test oscillator output, but can be heard at 16.9 mc, the short-wave oscillator calibration trimmer is undoubtedly improperly adjusted to the image frequency and so must be reset to the proper peak with the screw farther out. After readjusting this trimmer, again check to determine if the image comes in at 15.1 mc and not at 16.9 mc.

Short-Wave Range Alignment

Tune receiver very carefully to the 16-mc frequency of the test oscillator for maximum output reading. Then adjust the short-wave range detector shunt trimmer to a peak. This trimmer is located on the right side of the upright coil, near the front of the chassis. After this is done, try to increase the output meter reading by detuning the trimmer slightly and retuning the receiver dial. Continue detuning trimmer and retuning receiver dial until maximum output is obtained.

In some cases the receiver will oscillate when this short-wave detector shunt trimmer screw is set too far out. This oscillation, which can be eliminated by correct adjustment, is normal when the detector circuit is tuned to the receiver oscillator frequency instead of to the correct signal frequency.

If the set seems to motorboat when making the short-wave adjustments, reduce the output of the oscillator. This motorboating will cease when an antenna is connected to the set.

Proceed by checking the adjustment of the short-wave detector shunt trimmer by tuning the receiver to about 15.1 mc and noting if the image frequency at this point is much weaker than the 16-mc signal. If the signal at the 15.1-mc dial setting is equal to or stronger than the 16-mc signal, the trimmer is not properly adjusted and must be readjusted, with the screw *further in*.

Silvertone Models 1904, 1904A, 1906, 1914, 1954, 1964, 1964A

These Silvertone models are 6-tube, a-c operated superheterodynes, having two short-wave ranges in addition to the broadcast range. Models 1904A and 1964A use conventional glass tubes. The i-f, avc and output circuits of the other models use the "G" type tube, having a glass envelope, but the same kind of 8-prong base as metal tubes.

The tubes and their functions in Models 1904A and 1964 A are as follows:

6A7—oscillator—translator.
78—i-f.
75—detector, a-f.
76—avc.
42—output.
84—rectifier.

The tubes and their functions in Models 1904, 1906, 1914, 1954 and 1964 are as follows:

6A7—oscillator—translator.
6K7-G—i-f.
75—detector, a-f.
6C5-G—avc.
6F6-G—output.
84—rectifier.

In some of the sets, the 40-ohm resistor, R-14 (see Fig. 1) is omitted and a grounded center tap on the transformer used instead.

In earlier production, R-3 was a 20,000-ohm, ½-watt resistor. In later production, this was changed to a 5000-ohm, 1/3 watt resistor. In sets using a 20,000-ohm resistor, if trouble is experienced due to the set not operating at the low-frequency end of the C band, which will be due to the oscillator "stalling," replace the 20,000-ohm resistor with a 5000-ohm one.

The coupling between primary and secondary of the i-f output transformer is variable and serves as the volume control.

R-7 is the resistor which supplies avc voltage. Residual bias is furnished by R-13.

"Fluttering" on Short Waves

A "flutter" in short-wave reception on Band C may appear under the following conditions.

1. Volume control on full.
2. Station delivering a strong signal.

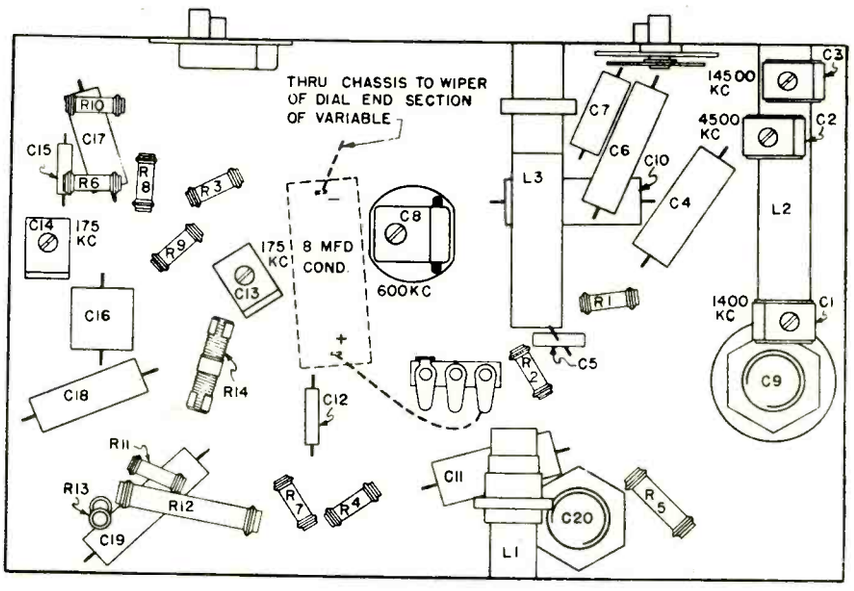


Fig. 2. Showing location of parts in Silvertone 1904 Series.

This flutter in no way indicates a defect in design or construction of the set. To completely eliminate it would require a more expensive circuit. It should not be a cause for complaint since it can be eliminated by reducing the volume control setting slightly. If an occasional customer is met who wants to pay the cost of making the necessary additions to the circuit, to prevent the flutter under any conditions, the following should be done:

Mount an 8-mfd. condenser as shown in dotted lines in Fig. 2. The lead from the positive terminal of the condenser should be connected to the terminal furthest removed from the condenser, on the triple terminal board. The negative lead from the condenser should be passed through the chassis and soldered to the wiper on the dial end section of the variable condenser. The leads should be made short and direct. Although this results in the 8-mfd. condenser being connected in parallel to C-10, it is important that the condenser be mounted as shown and the connections made as described (instead of directly across C-10).

Alignment

General:

During all of the alignment procedure, the volume control should be turned either all the way on, or else retarded slightly from the full "on" position, if retarding it is found to sharpen adjustments. The ground lead of the test oscillator should be connected to the chassis through a .1-mfd. condenser. The other lead of the test oscillator is to be connected in the manner described in the procedure. Where connection is made to a control-grid cap, it is important to leave the grid clip attached to the grid cap and to leave the tube shields in place. No attempt should be made to "kill" the oscillator section of the 6A7 during the alignment.

The output from the test oscillator always should be kept at the lowest possible value that will give a satisfactory output meter reading and the coupling between the test oscillator and the receiver should be made as loose as possible. In the case of r-f alignment on any of the bands, where the test oscillator is coupled to the antenna lead of the receiver with an antenna connected, alignment will be most accurate if the coupling to the antenna lead is made very loose. (The antenna lead and the oscillator lead separated.) If the test oscillator has a variable control for its power output, it is better to turn this control to its high position and then decrease the signal input to the receiver by decreasing the amount of coupling between the test oscillator and the receiver's antenna lead. If an actual antenna is not used and is replaced by a condenser or resistor, as described in the procedure, the input to the receiver should be kept low by decreasing the power output from the test oscillator.

When peaking the *antenna* and *translator* trimmers, for all wavebands, the variable condenser should be "rocked" back and forth a degree or two while the trimmer is being adjusted. This should *not* be done when peaking the *oscillator* trimmers; in this case, the variable condenser is turned so that the plates are completely out of mesh and left in this position during the adjustment. When adjusting the oscillator trimmers, if it is found that two peaks can be obtained, use the one in which the trimmer is

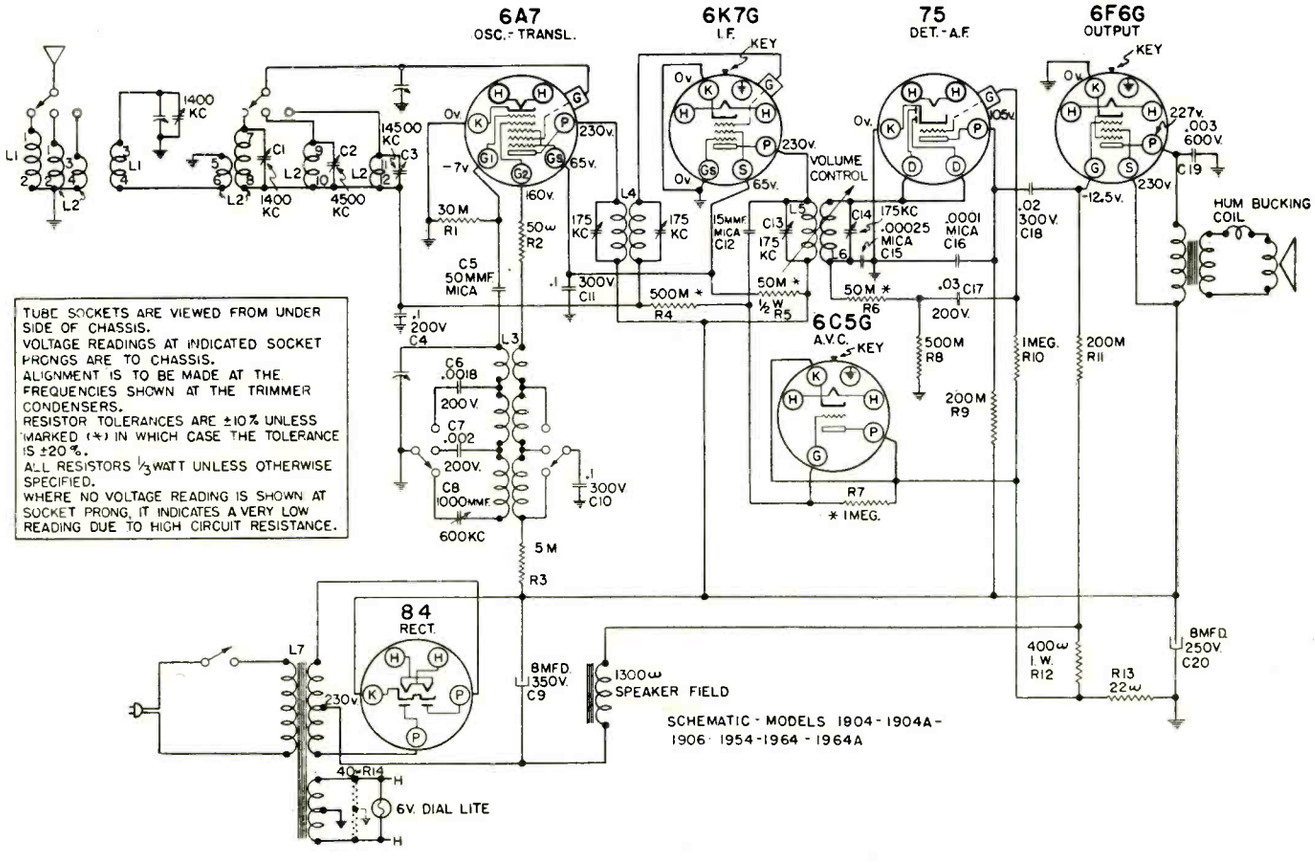


Fig. 1. Schematic diagram for Silvertone 1904 Series, giving voltages and parts values.

screwed further *out* (less capacity). When adjusting the antenna and translator trimmers, if two peaks are found, use the adjustment in which the trimmer is screwed *in* furthest. Note that this is exactly *opposite* to the procedure for the oscillator trimmers.

Sequence of Alignment:

Align i-f amplifier.
Align short wave, Band C.
Align short wave, Band B.
Align broadcast, Band A.

I-F Alignment

Set the test oscillator to 175 kc and connect its output lead to the control-grid cap of the 6A7 tube.

Peak the i-f output transformer tuning condensers, C-13 and C-14. These are mounted under the chassis, as shown in Fig. 2.

Peak the i-f input transformer, mounted on top of the chassis.

Repeat the adjustments to secure greater accuracy.

R-F Alignment; Band C:

Loosely couple the output of the test oscillator to the antenna lead of the receiver, leaving the antenna connected. If it is impractical to use an actual antenna, the test oscillator can be connected directly to the antenna lead of the receiver, in series with a 400-ohm resistor and with no antenna connected to the receiver.

Set the test oscillator to 14,500 kc and tune in its signal. Then adjust C-3 for maximum output.

R-F Alignment; Band B:

Loosely couple the output of the test oscillator to the antenna lead of the receiver, leaving the antenna connected. If it is impractical to use an actual antenna, the test oscillator can be connected directly to the antenna lead of the receiver, in series with a 400-ohm resistor and with no antenna connected to the receiver.

Set the test oscillator to 4500 kc and tune in its signal. Then adjust C-2 for maximum output.

R-F Alignment; Broadcast, Band A:

Couple the test oscillator to the antenna lead of the receiver, with the antenna connected; or connect the oscillator directly to the receiver antenna lead, in series with a .00025-mfd. condenser and with no antenna connected.

Set the test oscillator to 1400 kc and tune in its signal. Then adjust C-1 and the trimmer on the middle section of the variable condenser for maximum output.

Set the test oscillator to 600 kc and tune in its signal. Then adjust the padding condenser, C-8, for maximum output. The variable gang condenser should be "rocked" back and forth a degree or two while making this adjustment.

Repeat the 1400-kc adjustment and then the 600-kc adjustment.

Volume Control

The volume control in these models consists of variable coupling between the primary and secondary of the i-f output transformer. It sometimes happens that the movable coil slips on its shaft with the result that the volume cannot be reduced to zero, or else that it passes through zero and then begins to increase again as the volume-control knob is turned counter-clockwise. This condition can be corrected as follows:

Tune in a strong local station.

Slightly loosen the set screw that holds the movable coil bracket to the volume-control shaft, so that the coil can be slipped around the shaft.

Turn the volume-control shaft all the way counter-clockwise.

Leaving the shaft in this full counter-clockwise position, slip the movable coil around the shaft to the point of minimum volume.

Securely tighten the set screw.

If, with the coil turned to the point of minimum volume the volume still is too high, it can be reduced by rearranging the flexible leads. If improperly arranged, the capacity coupling of these leads may prevent a low enough minimum volume. However, it is a simple matter to shift the leads and so reduce the volume.

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Fada Model 160

The circuit of the Model 160 is shown in the diagram on page 449. A 6A8 is used as mixer and oscillator. This feeds a single stage of i-f using triple-tuned transformers in which is employed a 6K7 tube. The 456-kc output of this stage feeds the diode plates of a 6H6 tube. Diode P-1 is used for detection and diode P-2 for avc. Control bias is placed on both the mixer and i-f tubes.

The detector diode is not biased, as it is returned to its individual cathode through resistor (8). The avc diode is biased to provide delay action. This is accomplished by connecting the avc cathode K-2 to a point on the voltage divider which is positive 18 volts above ground. Initial bias for the 6A8 is supplied by cathode resistor (45), and initial bias for the 6K7 i-f tube by the cathode resistor (46).

The a-f component of the signal in the load circuit of the detector diode is impressed on the control grid of the 6F5 a-f tube through the volume-control potentiometer (44). The 6F5 tube is biased by cathode resistor (21). The output of this tube is resistance coupled to a type 6F6 power pentode. This tube is also cathode biased—by resistor (47).

All voltage and parts values are given in the diagram. The voltage readings are based on a line voltage of 118, and should be measured with no signal input and the waveband switch in the right-hand position. The reading on the anode of the 6A8 oscillator is 202 volts at 4.1 ma.

In order to adjust accurately the various trimmer condensers of the receiver in accordance with the following instructions, it is essential to use a shielded signal generator capable of giving a modulated carrier which can be attenuated at 456 kc, 600 kc, 1500 kc, 6 mc and 15 mc.

This receiver is equipped with an automatic volume control which necessitates setting the manual volume control of the receiver to its maximum position to insure accuracy in alignment. To control the signal output of the receiver it will be necessary to use the attenuator control of the signal generator.

Adjustment of I-F Condensers

The six intermediate-frequency condensers are located on the sides of the cans; with plate adjustment at bottom, link circuit in center and secondary at top, in each case.

1st—Disconnect the outside antenna system from the receiver.

2nd—Disconnect the control-grid lead from the 6A8 tube.

3rd—Connect the high-potential lead of the signal generator to the control grid of the 6A8 tube, and the low potential side to the receiver "ground" lead.

4th—Place an output meter (copper oxide type) across the speaker voice coil so that variations in signal output can be noted.

5th—Place the signal generator in operation and adjust the carrier frequency to 456 kc. Regulate the attenuator control of the signal generator so that the output signal is low enough to insure accuracy in adjusting the i-f condensers.

6th—With the aid of a bakelite type screw-driver, adjust the six i-f condensers to resonance; adjusting first the i-f condenser across the secondary wind-

(*Continued on page* 449)

- - SUCCESS - -

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2	.002	600	M	2@.18	.36
3	.005	600	M	5@.18	.54
5	.01	600	M	10@.18	.90
5	.02	600	M	20@.20	1.00
5	.05	400	M	50@.22	1.10
5	.10	400	410	T@.25	1.25
3	.25	400	425	T@.35	1.05
3	.50	400	450	T@.50	1.50

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ing of the 2nd i-f transformer and then each in turn, ending with the adjustment of the condenser across the primary winding of the 1st i-f transformer.

S. W. Shunt Compensators

The compensators are located within the coil shields.

1st—Remove the signal generator connection from the control-grid of the 6A8 tube and replace the control-grid lead.

2nd—Connect the antenna wire of the receiver chassis through a 400-ohm carbon resistor to the high potential side of the signal generator. The ground wire should remain connected to the signal generator.

3rd—Adjust the carrier frequency output of the signal generator to 15 mc.

4th—Turn the wave-band selector switch to the left—short-wave position. Set the calibrated dial of the receiver to read 15 mc.

5th—Adjust the S. W. oscillator shunt compensator through bottom hole in the right coil can, facing front of chassis, for maximum signal output. If two peaks are noted on this adjustment, the proper one is that with the compensator farthest "in." To determine that this compensator has not been adjusted to the image frequency, turn the receiver dial to approximately 15.9 mc. If no signal can be heard at this setting even with a greater signal generator output, the S. W. shunt compensator has been improperly adjusted and it will be necessary to re-adjust to the proper peak. After readjusting check to see that the image frequency comes in at 15.9 mc. It is well to bear in mind throughout these adjustments that with the same signal input to the receiver, the image response point should be weaker than the original signal frequency output reading.

6th—Having determined the correct peak, and maximum setting, for the S. W. oscillator shunt compensator adjust the S. W. detector shunt compensator for maximum output. This is reached through the bottom hole of the left coil can.

S. W. Oscillator Series Trimmer

1st—Adjust the carrier frequency output of the signal generator to 6 mc.

2nd—Turn the calibrated dial of the receiver to pick up this 6-mc signal.

3rd—With the aid of a bakelite type screw-driver, adjust the S. W. oscillator series trimmer until a maximum output signal is indicated on the output meter. To insure perfect alignment it is necessary to "rock" the ganged variable condenser in order to follow the maximum signal output. This trimmer is the second from the left on the front base plate of the chassis.

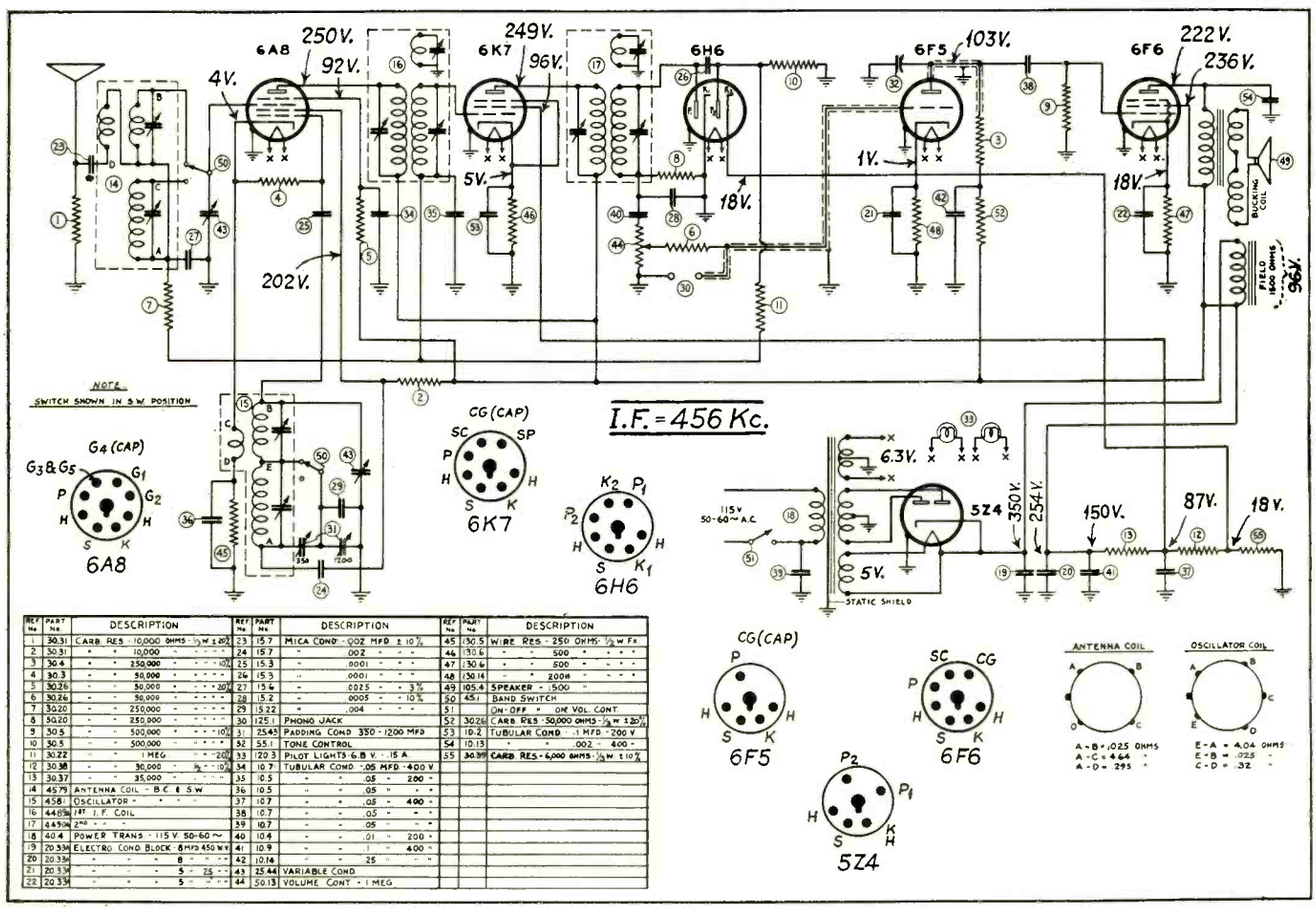
4th—Having determined the maximum peak of the S. W. oscillator series trimmer, re-adjust the carrier frequency of the signal generator to 15 mc. Turn the calibrated dial to 15 mc, and re-adjust S. W. oscillator shunt compensator, and then, S. W. detector shunt compensator for maximum signal output; checking for image point as outlined in the foregoing instructions.

BC. Shunt Compensators

The compensators are located in the two coil cans and are reached through the top holes.

1st—Remove the 400-ohm resistor from the high-potential side of the sig-

(*Continued on page* 454)



REF No.	PART No.	DESCRIPTION	REF No.	PART No.	DESCRIPTION	REF No.	PART No.	DESCRIPTION
1	30.31	CARB. RES. - 10,000 OHMS - ½ W ± 20%	23	15.7	MICA COND. - .002 MFD. ± 10%	45	30.5	WIRE RES. - 250 OHMS - ½ W FX
2	30.31	" " 10,000 " " " "	24	15.7	" .002 " " "	46	30.6	" " 500 " " " "
3	30.4	" " 250,000 " " " 10%	25	15.3	" .0001 " " "	47	30.6	" " 500 " " " "
4	30.3	" " 50,000 " " " "	26	15.5	" .0001 " " "	48	30.14	" " 2000 " " " "
5	30.26	" " 50,000 " " " 20%	27	15.6	" .0025 " " 3%	49	105.4	SPEAKER - 500 "
6	30.26	" " 50,000 " " " "	28	15.2	" .0005 " " 10%	50	45.1	BAND SWITCH
7	30.20	" " 250,000 " " " "	29	15.22	" .004 " " "	51		ON-OFF " ON VOL. CONT.
8	30.20	" " 250,000 " " " "	30	125.1	PHONO JACK	52	30.26	CARB. RES. - 50,000 OHMS - ½ W ± 20%
9	30.5	" " 500,000 " " " 10%	31	25.43	PADDING COND. 350 - 1200 MFD	53	10.2	TUBULAR COND. - .1 MFD - 200 V
10	30.5	" " 500,000 " " " "	32	55.1	TONE CONTROL	54	10.13	" " .002 " 600 "
11	30.22	" " 1 MEG " " " 20%	33	120.3	PILOT LIGHTS - 6.8 V. - .15 A.	55	30.39	CARB. RES. - 6,000 OHMS - ½ W ± 10%
12	30.38	" " 30,000 " ½ " 10%	34	10.7	TUBULAR COND. - .05 MFD. - 400 V.			
13	30.37	" " 35,000 " " " "	35	10.5	" " .05 " 200 "			
14	45.79	ANTENNA COIL - B.C. & S.W.	36	10.5	" " .05 " " "			
15	45.81	OSCILLATOR " " "	37	10.7	" " .05 " 400 "			
16	44.93	1st I.F. COIL	38	10.7	" " .05 " " "			
17	44.93	2nd " "	39	10.7	" " .05 " " "			
18	40.4	POWER TRANS. - 115 V. 50-60 ~	40	10.4	" " .01 " 200 "			
19	20.33	ELECTRO. COND. BLOCK - 8 MFD 450 W.V.	41	10.9	" " .1 " 400 "			
20	20.33	" " 8 " " "	42	10.14	" " .25 " "			
21	20.33	" " 5 - 25 " "	43	25.44	VARIABLE COND.			
22	20.33	" " 5 " " "	44	50.13	VOLUME CONT. - 1 MEG.			

Schematic diagram of Fada Model 160.

Auto-Radio . .

Atwater Kent Model 776

The complete circuit of this auto-radio receiver is shown in Fig. 1. The 6D6 r-f tube and 6D6 i-f tube are cathode biased, with the voltage on the r-f cathode being equal to the combined drop in resistors R-1 and R-9. The 6A7 mixer is biased by cathode resistor R-5. The output of i-f transformer feeds directly the diode D-2 which is used for detection. The voltage across R-11 regulates the "squelch" or minimum signal level at which the detector diode begins to function. The combined voltage across R-11 and R-12 acts as the delay bias on the avc diode, D-1, which is fed through condenser C-9. This combined voltage also biases the control grid of the 85 triode.

Circuit Changes

In early sets R-11 is 5000 ohms with a drop of 4 volts, and R-12 is 15,000 ohms with a drop of 10 volts. In late sets these two resistors are each 10,000 ohms and there is approximately 6 volts drop across each. At the same time this change was made, the first a-f plate resistor, R-14, was changed from 0.1 meg. to 0.25 meg. With the 0.1-meg. resistor, the drop across it is 55 volts and the plate voltage is 125. With the 0.25-meg. resistor, the plate voltage is lower.

Early models do not have tone control, and the "A" filter circuit is slightly different from that shown.

The condenser C-17 in the lower right-hand corner of the diagram of Fig. 1 is 0.2 mfd, not 2 mfd.

Adjustments

Equipment:

The oscillator should cover the i-f and r-f frequencies. It should be well shielded and have a good attenuator. If the oscillator is not well shielded, it may be difficult to peak the pre-selector trimmers, owing to pickup by the first detector grid circuit. In general, it is advisable to connect a .00025-mfd fixed condenser in series with the pick-up lead at the antenna terminal of the set.

Use a sensitive output meter and keep the receiver volume control turned on full volume, *and the tone control at high pitch.* This is necessary to minimize the effect of the automatic volume control action of the set which would otherwise prevent sharp peaking of the trimmers.

A special i-f coupling unit should be used (A. K. No. 42590). This is placed on the grid cap of the i-f or first detector tube, as specified, and the lead that normally connects to the grid cap is attached to the coupling unit.

Use a non-metallic screwdriver for adjustment of the trimmers.

General:

Do not adjust trimmers unless the necessity is clearly apparent.

On the oscillator trimmer there are

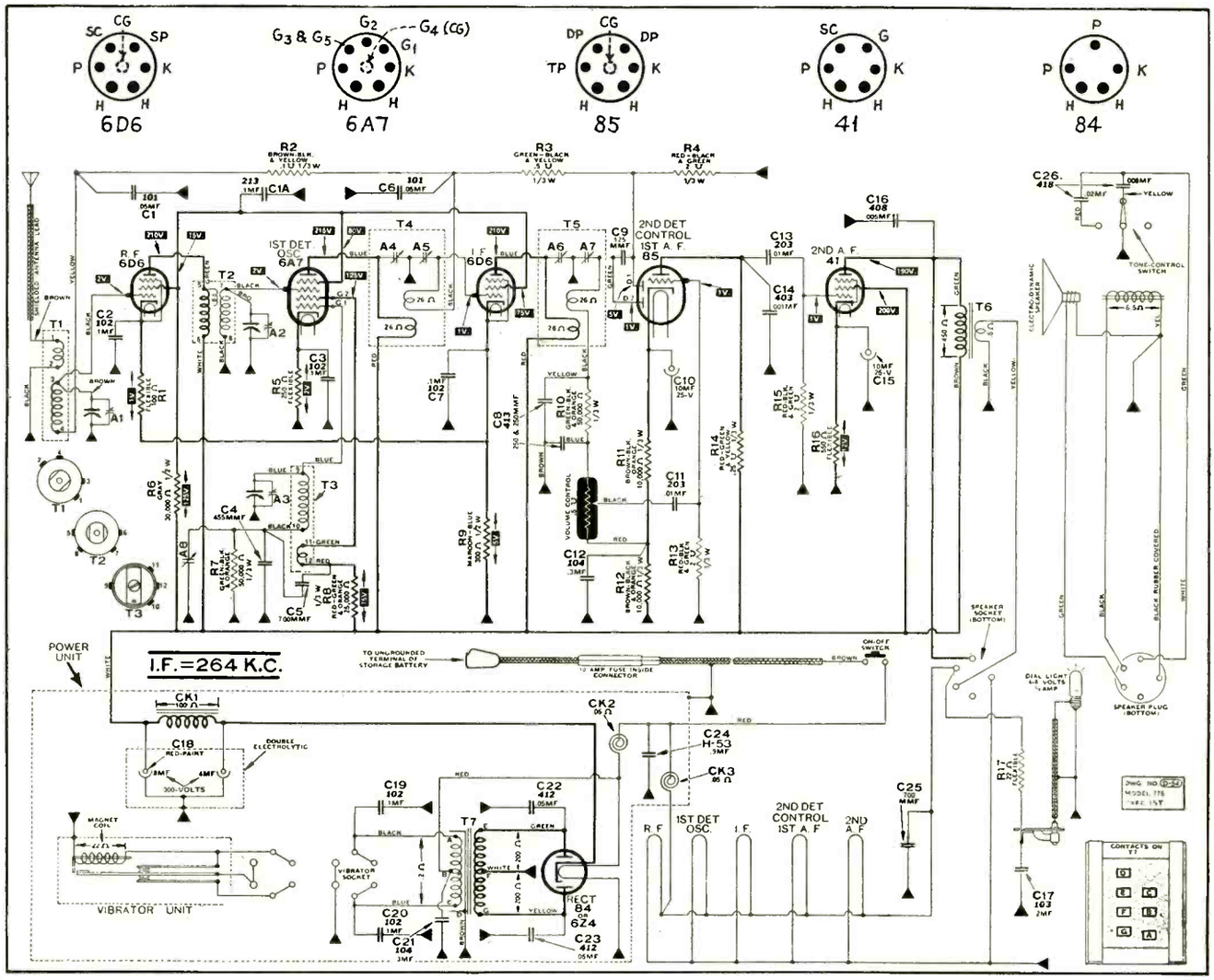
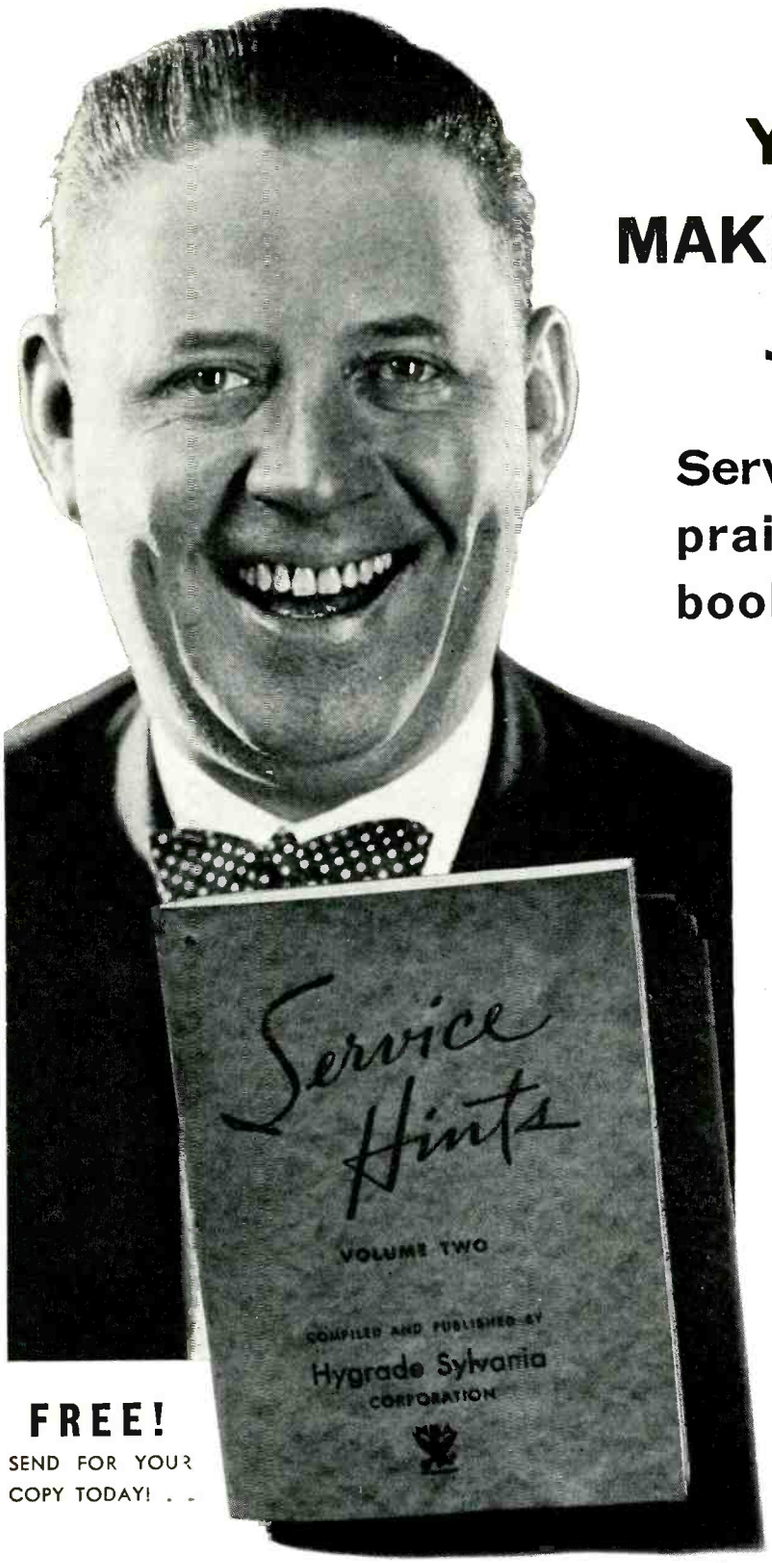


Fig. 1. Complete circuit diagram of the Atwater Kent Model 776 auto radio.



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two different settings at which the signal will be received. Always use the *first* of these two positions as you screw the trimmer in from a loose or minimum-capacity position. *This is important.*

Check the i-f trimmers first.

In checking the set, do not disturb the position of the wiring any more than necessary.

Dial Calibration:

The dial calibration depends on the oscillator circuit of the set, providing that the i-f trimmers are correctly aligned to their specified frequency. The pre-selector (r-f and first detector) trimmers do not affect the dial calibration, but simply affect sensitivity.

The oscillator *trimmer* is used to adjust the *high-frequency* end of the scale.

The oscillator *tracking* condenser adjusts the low-frequency end of the scale.

If adjustment of the oscillator trimmer and the oscillator tracking trimmer condenser does not correct the dial readings, it may be necessary to replace the fixed oscillator tracking condenser or the oscillator transformer.

Naturally the i-f trimmers should be checked and adjusted, if necessary, before any attempt is made to align the r-f oscillator trimmers.

Alignment

For location of trimmers, see Fig. 2.

I-F Trimmers:

Connect i-f test oscillator (264 kc) to i-f tube by means of the i-f coupling unit. Peak A6, A7. Connect i-f test oscillator to first detector tube and peak A4, A5.

Dial-Pointer Adjustment:

Connect oscillator (560 kc) to antenna and ground and peak A8 while rocking the variable condenser for maximum sensitivity. Then adjust dial pointer to 560-kc mark by turning the adjustment nut at rear of control unit.

R-F Trimmers:

Connect r-f test oscillator to antenna and ground of set.

With oscillator and dial at 1500 kc, peak A3, A2, A1. Check frequency alignment at 560 kc.

Motorola Magic Eliminode Notes

The Magic Eliminode in the 1935 Motorola consists of a combination of an extremely efficient high-frequency filter and balancing system.

In practically every car the Magic Eliminode will completely eliminate ignition interference when the installation of the set is made according to instructions and the intensity of the motor noise is not so great so as to be beyond the range of the Magic Eliminode.

The Magic Eliminode should not be expected to work miracles or to do the impossible, but after analyzing its operation you will find it works on good, sound and fundamental principles.

Eliminode Filter

The filter used in the Magic Eliminode operates most effectively at the lower broadcast frequencies; therefore, if when tuning the set from about 800 to 550 kc no motor noise is heard, it can be assumed that the noise level is within the range of the Magic Eliminode and the noise then heard when tuning toward 1500 kc may be easily balanced out with the movable eliminode coil and complete elimination of motor noise secured.

The Magic Eliminode will work in any car of welded steel body construction when the installation is made according to instructions and the accessories supplied with each set are properly used.

It is not guaranteed to work in extremely old cars in which the joints (not welded) between the various body sections have separated and rusted. It will not work when the interference level is so high as to be entirely beyond the range of the eliminode, but if by proper shielding and bonding the level is reduced sufficiently so that the filter will handle it at 600 kc, the balancer will take care of it over all other portions of the tuning range of the receiver.

In like manner there will be found many cars in which the filter is so effective that it alone completely eliminates all motor noise and balancing is not required. In that case *it is unnecessary to even connect the interference feeder to the Motorola.*

Ford V-8 Installation

To further acquaint yourself with the use and operation of the Magic Eliminode, let us follow a step-by-step procedure in the installation of a Motorola Model 100 in a 1934 V-8 Ford car.

The above combination is used because of the great sensitivity of the Model No. 100, and the fact that no distributor suppressor is used in the V-8 gives us a most extreme combination.

(1) Mount the set near the right center of the dash with the control head if preferred in the instrument panel.

(2) Mount the speaker near the steering column on the left side of the dash.

(3) Connect the "A" lead to a convenient point on the six-volt wiring as close to the starter switch as possible. Insert the speaker, dial light, tone control plugs in the receptacles at the right end of the receiver. Dress wires so that their position is remote to steering column and other wiring, control rods and pipes.

(4) Connect the two flexible control shafts to the radio by inserting them in their respective sockets and turning each approximately a quarter turn to the right.

(5) Take the small antenna lead-in junction box that has the short piece of shielded loom attached to it and fish the car antenna lead through this loom until the lead extends into the junction box. Now insert the set antenna lead-in through the ferrule in this box so that the two leads may be spliced together within the box and be totally shielded. *Spot the shield to the ferrule with solder to secure a good ground.* Next mount the junction box on left side of the cowl where paint has been removed and mount it up into the corner post. Bolt the box down firmly so as to secure a

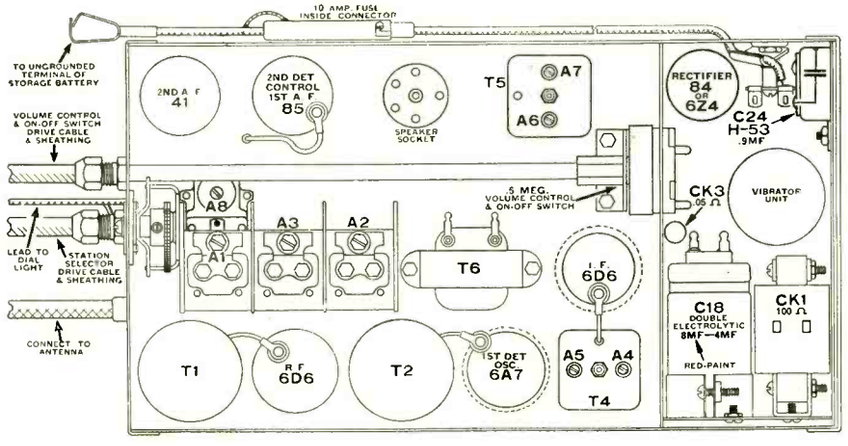

Fig. 2. Chassis of Atwater Kent Model 776.

perfect ground. (*This is extremely important.*)

(6) Connect the dome-light filter in the dome-light circuit and ground its case thoroughly to the car body. Connect the generator condenser to the generator cutout. Connect the other condenser supplied, to the primary post of the ignition coil and ground it under a *gear case cover stud* or connect the ammeter condenser to the ignition switch, ground it to the instrument panel and connect noise feeder to the point where condenser is grounded. Place the screen under the floor mat on the right side of the toe boards and ground it to car body. Ground both sides of the hood thoroughly at their rear edges.

(7) Turn on the radio and the car motor and tune the dial across its tuning range to check for interference. *If no interference is encountered,* the installation is complete and no further work is necessary. *Do not connect the interference feeder as it is not needed.*

ELIMINATING INTERFERENCE

If, however, there is no interference at 600 kc, but it appears when tuning toward 1500 kc it will be necessary to use the balancer.

Proceed as follows:

With the set turned on and tuned to about 1200 kc, remove the volume control shaft bushing from its socket and insert it in the Magic Eliminode socket (located a little to the rear and above volume control socket), and turn volume knob all the way to the left. Next attach the clamp on the free end of the interference feeder to the choke rod, throttle rod or instrument panel. Now turn the volume control knob to the right until the noise is balanced out.

If the balancing coil travels its full length before balance is reached, it will be necessary to move the feeder clamp to another spot on the choke or throttle rod or some other point on the car, such as instrument panel, dash, etc., until a point of balance is secured.

If, when the set was first checked for motor noise, it was found that the noise could be heard at 600 kc, it indicates that its level is too high for the filter and it will be necessary to reduce its intensity by better grounding of all parts of the radio installation, *changing position of lead-in loom,* bonding instrument panel to dash, etc., or changing the mounting position of the antenna lead junction box to secure a better ground. *This is extremely important* and should be determined by trial. As soon as the interference level is brought down within the range of the filter at 600 kc, the balancer may be employed to eliminate all interference over the rest of the tuning range of the receiver.

IMPORTANT POINTS

When making an installation with the Magic Eliminode be sure to remember the following:

(1) *That a good mechanical installation and perfect grounding of every part of the set is very important.* Do not expect a slipshod installation to give good results.

(2) The Magic Eliminode will eliminate interference within reasonable limits only, as encountered in any standard automobile. It cannot be expected to work in cases when, special high-voltage ignition coils, spark intensifier, ignition boosters, or ignition wiring changes have been made. *Remember it does not work miracles.*

(3) Use all accessories as supplied with each set and follow instructions carefully.

(4) When balancing out interference keep the hood down and grounded and have the car doors closed.

(5) Do not connect the interference feeder clamp to its point of interference pickup until after checking the filter only. If the filter is found to be sufficiently effective *do not use the interference feeder.*

In some cars there may exist a slight trace of interference when accelerating the engine. This may be overcome by connecting a Motorola dome light filter in series with the primary breaker point wire between the coil and distributor and ground it to the engine block.

•

Locating Motorola Interference Feeder

With regard to the installation of Motorola receivers, the guesswork can be taken out of properly locating the interference feeder during installation in the following manner:

(1) Complete the installation except the balancing.

(2) Screw the movable eliminode coil to the position of maximum coupling (clockwise direction).

(3) Closely study and remember the approximate amount of interference being picked up by the receiver.

(4) Disconnect the antenna lead at the junction box.

You can now apply the clamp on the interference feeder to any part of the motor, choke rod, throttle rod, oil pipe, ignition system, instrument panel, electric lock, cable, etc., that will produce a level of interference in the set slightly greater than the amount that you previously heard coming in over the aerial, and this may be done with the hood of the car up it working in the motor compartment. After securing the proper point of hook-up, reconnect the antenna lead and turn the balancer in the counter-clockwise direction until balance is produced.

L. C. DITTMAR. *Courtesy Motorola*

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Installing Motorola GM Model Sets on Roof Aerial

When installing GM model sets on roof aerial, always connect a .00015 mica condenser in series with the aerial lead. This condenser may be conveniently mounted in the antenna junction box. Its use is necessary because this set is designed to operate on the GM 47 under-car aerial, having a capacity of approximately 150 mmfd, and if used on a roof aerial without a series condenser you will be unable to properly track the antenna trimmer of the first tuning condenser.

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GENERAL DATA

(*Continued from page* 449)

nal generator and insert a 250-mmfd mica condenser in its place.

2nd—Turn the wave-band selector switch to the right—broadcast position.

3rd—Adjust the carrier frequency to 1500 kc.

4th—Set the calibrated dial of the receiver to read 1500 kc.

5th—Adjust the BC. oscillator shunt compensator in the right coil can for maximum signal output.

6th—Adjust the BC. detector shunt compensator in the left coil can for maximum signal output.

BC. OSCILLATOR SERIES TRIMMER

1st—Adjust the carrier frequency output of the signal generator to 600 kc.

2nd—Turn the calibrated dial of the receiver to pick up this 600-kc signal.

3rd—With the aid of a bakelite type screwdriver, adjust the BC. oscillator series trimmer until a maximum signal is indicated on the output meter. To insure perfect alignment it is necessary to "rock" the ganged variable condenser in order to follow the maximum signal output. This trimmer is on the extreme left of the front base plate of the chassis.

4th—Having determined the maximum peak of the BC. oscillator series trimmer, re-adjust the carrier frequency of the signal generator to 1500 kc. Turn the calibrated dial to 1500 kc and re-adjust BC. oscillator shunt compensator and BC. detector shunt compensator for maximum signal output as outlined in the foregoing instructions.

ON THE JOB . . .

A VERSATILE TESTER FOR VIBRATORS

By A. R. MOSELEY

THE unsung part of an automobile radio that comes in for much verbal abuse, because it refuses to operate after an uncomplaining life of service, is really a remarkable device and is responsible for the compact, efficient auto radios that are available today. This device is the vibrator and it is called on to run on low voltage from a run-down battery with the car lights on and the engine off, or on high voltage when the generator is feeding current to a well-charged battery and none of it being taken by the lights. Furthermore, the vibrator must operate on a high voltage under a "no load" condition until the tubes heat up.

The tester described in this article has proven its worth many times when adjusting points and in deciding whether the vibrator is or is not the cause of failure of the radio. It is not designed with the idea of making comparisons with the manufacturer's values, but to furnish the Service Man with a means of determining the worth of a vibrator. He can set his own standard for comparison.

Vibrator Types

In general, vibrators fall into two classes: Full-wave non-synchronous, sometimes called inverters; and full-wave synchronous, or self-rectifiers. As each Service Man is called on to service only a small group of the many vibrators now made, he can adapt this tester to his own business.

Tester Details

The fundamentals around which this tester is built are: A transformer, tube, meter and load, with suitable condensers and resistors to make the conditions under which the test is made as near as possible to actual operating conditions. In Fig. 1 the fundamental circuit is shown above the dotted line.

The Transformer

Almost any auto-radio transformer can be used, but a Majestic transformer, if used, affords a place to mount Majestic vibrator units and makes possible the testing of a unit which otherwise could not be tested. The single-pole, double-throw switch S-3 makes the center tap of the transformer secondary high or low depending on whether a full-wave non-synchronous vibrator with a rectifying tube, or a full-wave synchronous vibrator, is being tested. Of course, when the latter type is being tested no tube should be in the socket.

The Load

The load is shown as a variable resistor, R-3, but it may be a tapped voltage divider; in fact, two resistances are enough, a low of 2000 or 2500 ohms and a high of 5000 or 6000 ohms. With these two values of load it is possible to set current and voltage standards which the vibrator on test must meet before it is OK'd. Two meters are shown, but the cost may be reduced by the use of either one, if fixed loads are used.

To further simulate actual operating conditions a resistance, R-1, and shorting switch, S-2, have been put in the battery circuit. The rating of this resistance will be determined by the transformer used and should be such as to reduce the voltage on the vibrator to about three volts. Three volts is the low limit used by manufacturers in designing their vibrators. The high limit of eight volts can be reached by using four cells of two six-volt batteries, or it can be approximated by using a battery with a high voltage and a charger.

The Sockets

To this nucleus may be connected sockets for plug-in vibrators. In the lower part of the diagram are shown three sockets, two for inverters and one for full-wave self-rectifiers. These sockets are suitable for many of the most popular makes of vibrators and other sockets may be added for almost any type plug-in vibrator, some of which take special sockets. Plugs with leads and clips can be made up for vibrators that do not plug in, but are connected by leads. When socket A or B is being used, the switch S-3 is in the lower position, while with socket C and no tube the switch is in the upper position.

A means for reversing the battery polarity adds to the versatility of this tester and a double-pole double-throw knife switch mounted on the test bench panel would not only be useful for this purpose, but for testing auto radios as well.

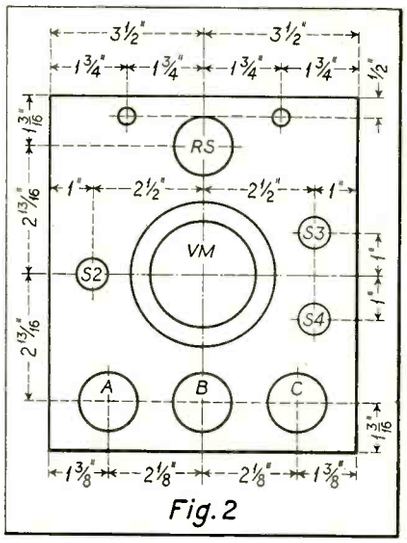


Fig. 2

A suggested layout for the vibrator tester.

Construction

As there are no radio-frequency currents to be concerned with, this outfit may be built very compact. A suggested layout is shown in Fig. 2. The panel is 7" x 8" in size with holes for the four sockets, meter, three switches and bind-

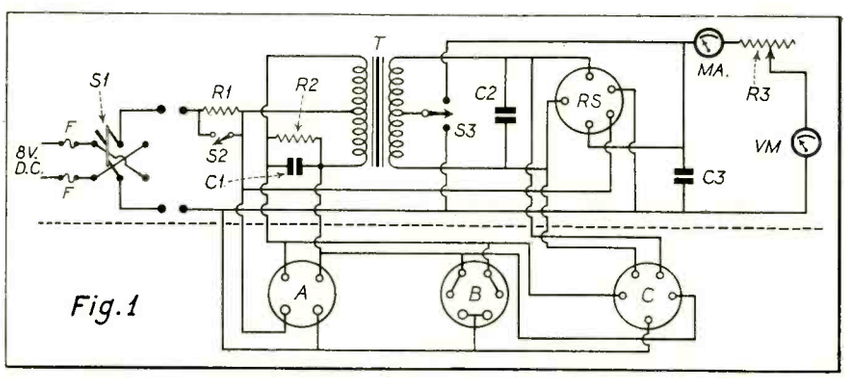


Fig. 1

Circuit diagram of the auto-radio vibrator tester described in the accompanying text.

ing posts. Underneath can be mounted the rest of the parts and all will fit into a box 7" x 8" x 6". Switch S-4 takes the place of rheostat R-3, for the load must be fixed as only one meter is used. S-4 is a single-pole double-throw toggle switch and changes the load from 2500 ohms to 5000 ohms.

The construction of this tester presents no difficulties in layout or wiring. However, it is advisable to use a good rubber-covered wire as the voltages in some of the circuits are quite high.

•

Auto-Radio Vibrators

In the manufacture of vibrators elaborate precautions are taken to prevent entrance of any minute particles of dirt, etc. Due to the small tolerances allowed in the construction of such units, small particles of foreign matter are liable to cause serious trouble by getting between the points on the vibrator reed. As a result, some manufacturers even wrap their vibrators in cellophane.

It might also be well to state that the largest percentage of the auto-radio trouble is due to improper sealing of repaired vibrators or to worn-out units. Probably it would be well to consider the useful life of a vibrator to be in the vicinity of 1000 hours.

Service Men will do well to handle vibrators with as much care as they do their own watches.

George F. Baptiste.

•

Remote Speakers

The difficulty of proper impedance matching in remote-speaker installations is greatly exaggerated. However, it is not a job for the "penny-pincher" and, if done at all, should be done well.

Magnetic speakers and blocking condensers are out. To satisfy the modern consumer, nothing less than a good dynamic will do. And, your modern customer isn't going to tolerate a drop in volume or tone quality when using the remote speaker. For these reasons tell the prospect that the job cannot be done with second-hand material or bargain parts that he may have on hand . . . this would constitute an actual waste in time and head-work. Make it clear that the installation must be a special one, custom-built to his individual requirements, if it is to be a credit to both of you.

The Speaker

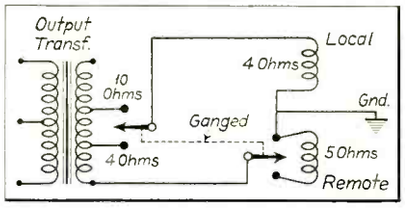
First of all let us consider the speaker. My first choice is a good permanent-magnet dynamic with an a-c operated dynamic second. Find out what sort of set it is to be connected to and determine approximately the voice-coil impedance of its speaker and the amount of power it will handle. Then select a remote speaker which will approximate these characteristics.

Conductor to Speaker

Do not try to feed any remote speaker direct from the plates of the tubes either with or without blocking condensers . . . it's rotten engineering and a sure way to get in wrong with the Underwriters. The line to the speaker should be of low impedance with one side grounded. Up to distances of 50 feet or so, feed direct to the voice coil; for distances over 50 feet, use a 200- or 500-ohm line with matching transformers. Durable, rubber-covered lamp cord makes a good conductor. High-priced jobs may use built-in wiring.

Output Transformer

Discard the output transformer used with the set and install a good universal



one. There are many of these units on the market that are designed to mount anywhere and to match anything into anything in two-ohm steps. For long-distance jobs, get a transformer to work into a 200- or 500-ohm line and a couple of transformers to match the speakers to the line.

The Switching System

The switching system does not need to be complicated. For the majority of cases, a double-pole, double-throw switch will serve the purpose.

A Typical Installation

The accompanying illustration shows a typical installation using two speakers, each speaker having approximately 4.5 ohms voice-coil impedance. The output transformer gave either 4 ohms or 10 ohms impedance when working out of push-pull 42's. When the remote speaker was not in use it was shorted out, while the other side of the switch changed to the 4-ohm tap; when the remote speaker was used the short was removed and the impedance raised to 10 ohms. This was desirable since it compensated for the resistance losses in the line.

In actual test, although the two speakers were dissimilar and slightly different in sensitivity and tone quality, it was impossible to detect any change in tone of the local speaker when the remote speaker was cut in; and unless one listened very closely at the exact instant the change was made, it was impossible to detect any change in volume. Also, equal volume could be obtained from the speakers by means of a little adjusting.

Feeding the "high" speaker through a 100-ohm potentiometer arrangement will give surprisingly good results but should not be used for a volume control or for too great a degree of attenuation, as it will affect the tone and volume of the other speaker . . . and it wastes power. I prefer to shunt the voice coil of the "high" speaker. This automatically raises the output of the other speaker with little change in tone, and allows one to alter the tone quality of the "high" unit. If lower volume and less high notes are required, use a simple rheostat. If lower volume with retention of high notes is desired, use the rheostat with a choke wound with No. 20 wire on an old audio-transformer core. Slide the core in and out of the coil and adjust the rheostat until best results are obtained.

It is well to remember that when a rheostat is used to cut volume and high notes, the other speaker may sound too high-pitched. This may be remedied by using a fixed condenser of 0.02, 0.05, or 0.1 mfd. Proper choke-condenser combinations will permit the accentuation or elimination of any band of frequencies, but the need for these is seldom met in the realm of remote-speaker installations.

Several types of universal output transformers should be stocked. All will probably use different systems of tapping, and from these a tap system may be selected that will give the proper impedance change with the greatest possible convenience in switching. While mismatches of 10 to 20 percent may look bad on paper, it takes a good ear to detect them in the field.

Caution

Tell the customer not to operate the change-over switch with the set operating at moderate to high volume. This takes most of the load off the output tube or tubes and the voltage developed across the primary of the output transformer will go up to 1500 or 2000 volts . . . and more in many cases. Broken-down insulation and a burned-out transformer will result. Pentode sets are by far the worst offenders.

F. C. Wolven.

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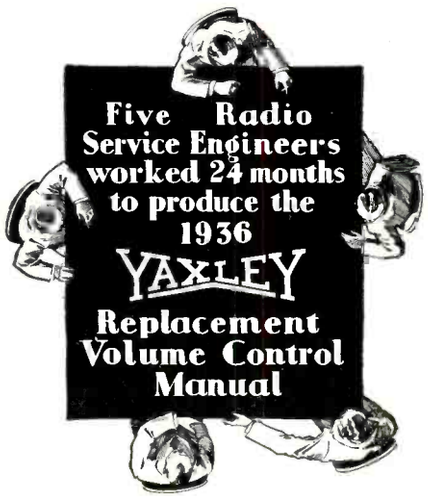

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RECEIVER CASE HISTORIES

Atwater Kent 708, 711

No signal; noisy operation on short waves: May be caused by defective tubes, silencing adjustment resistor, or wave-change switch. When checking wave-change switch resolder all connections to switch and realign set (resoldering will nearly always throw set out of adjustment).

George F. Baptiste.

•

Belmont 420

Whistle: Caused by oscillation in 38 power pentode amplifier. Replacing tube will correct oscillation, but trouble will again develop. Check control-grid and cathode-grid resistors for their proper value. Also check plate resistor of 76 r-f amplifier. *George F. Baptiste.*

•

Crosley 137

Local reception, no distant reception: Caused by defective oscillator coil. Replacement necessary.

George F. Baptiste.

•

Emerson V4, LA, 415, 416

Lacking in pep; good local reception on higher frequencies, but low volume on lower frequencies: If voltage and tubes are okay, check antenna pickup coil. Move coil either up or down over secondary of first tuned r-f stage and realign antenna and interstage trimmer condensers. When output is satisfactory, cement antenna pickup coil in new position. *George F. Baptiste.*

•

Ford Receivers

Noise: Ford cars equipped with the Ford and similar receivers may develop noise. This can usually be remedied by changing the ground of the shielded lead-in to the lower dashboard bolt.

Sometimes it is necessary to install a dome-light condenser. Ford patent No. 48-18823 is easy to use on all cars, and should be fastened to a convenient bolt at the dome-light center post.

L. Taeschner.

•

Grunow Chassis 7B, 11A

Dual-ratio drive will not stay in low-ratio position: Loosen two small screw-head bolts on drive sleeve assembly and push drive sleeve back slightly; retighten screws. If shaft will still not stay in low-ratio position repeat procedure until it will. Be sure the small bolts are screwed down tight.

Microphonic noises: Generally caused by chassis bolts being too tight. In replacing chassis after servicing do not let any of the shafts touch the wood of the cabinet.

Balancing all-wave receivers: These sets cannot be balanced with metal screwdriver. A small round piece of fibre rod filed down to a screwdriver point is the best. *Keith F. Martin.*

•

Grunow 660, 662, 650

Bad tone: Change coupling condenser between 75 and 42 tube, using 0.01-mfd 600-volt unit. This condenser is located on left side of chassis, mounted behind short resistor strip (chassis turned upside-down, front towards repairer). These condensers should be changed in all of these models as soon as they come into the shop. *Keith F. Martin.*

•

Kadette ES-19, ES-20

No operation: The 0.05-mfd bypass condenser in tone-control circuit may be shorted out. This will burn up the 50,000-ohm tone control. Replace both units.

This set also shorts out in the electrolytic condenser block. The red lead to this block is the plus of the 8-mfd and the 16-mfd units. The black lead is the negative of the 8-mfd condenser, while the yellow is the negative for the 16-mfd unit. *Keith F. Martin.*

•

Karadio

Distant reception; no local reception: Condenser X in accompanying illustration partially shorted. This reduces

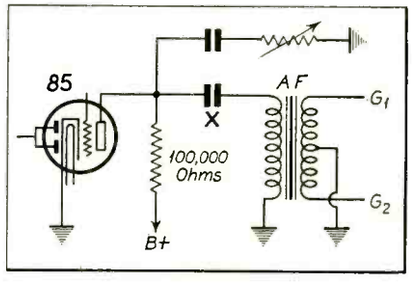

plate current. Also, for strong signal developed bias will be high enough to cause complete cut-off. This source of trouble is misleading, giving every indication of being a faulty oscillator circuit using a 36 tube. *A. A. Laramy.*

•

Kolster K-60, K-62, K-100

High noise level and intermittent rasping noises which seem to be caused by a very critical r-f or first detector circuit: Voltage and current OK in these circuits and throughout set. No noisy or changed-value resistors.

Replace all noisy condensers. If trouble persists, remove r-f input coil. Take coil out of shield, and remove lead to control grid, replacing it with waxed cotton-covered wire (rubber-covered wire is not satisfactory). Drill out hole in top of coil shield where control-grid lead comes through and insert rubber bushing or grommet as an insulator. Thoroughly clean bottom of coil shield and its bottom plate—also chassis—with sandpaper or carbon tetrachloride; then reassemble coil in shield and fasten solidly to chassis with screws. Discard old grid-cap clip and use "National Grid Grip" clip bent to solidly grip cap on tube. Next replace control-grid lead to first detector with one of same units used for the r-f tube. (The grid clip must be so solidly fastened to cap that tube can be moved around in socket by pulling and pushing on lead without clip rocking or slipping on cap.)

A. E. Lindner.

•

Kolster K-130, 132

Oscillator tube (56) *stops functioning:* If tube tests okay, check grid condenser and grid resistor for change in value. Also check oscillator plate resistor. Replacement of defective unit will put receiver back in operation. If the volume is now low it is probably caused by first audio-frequency transformer not supplying sufficient power for 47 power pentode tubes. This is a push-pull stage and the trouble is caused by the first audio (type 56) tube plate resistor increasing in value, thus resulting in a drop in plate voltage.

Tuning indicator failure: Caused by 10,000-ohm resistor connecting the neon tuning indicator to ground changing in value. *George F. Baptiste.*

•

Lyric SA-120 Chassis

Failure to track on low frequencies: Caused by wearing of variable condenser gang bushing. This causes the rotary section to push backward, throwing the variable condenser gang out of proper position. Remedy by placing a thin washer between the bushing on the variable condenser gang (rotary section) and the frame of the condenser.

Defective resistor, condensers: The 20,000-ohm screen-grid resistor often opens. Replace with 10-watt, 20,000-ohm unit.

The 5-mfd tubular condenser in the screen of the second i-f tube is often the cause of bad tone. Also, 5-mfd tubular condenser in cathode of suppressor tube shorts out. Both of these condensers should be replaced as they do not have the proper peak voltages.

Keith F. Martin.

Philco 38-B

No operation on high frequencies: Remove oscillator coil and dip several times in cup of hot paraffin, being sure to leave a good coat of paraffin on the coil. Change 6000-ohm resistor in cathode of type 15 tube to a 4000-ohm unit.

Oscillation: If set oscillates all over dial, replace 0.5-meg resistor in screen circuit of second detector with 1-watt, 0.4- or 0.35-meg unit.

Keith F. Martin.

•

Philco 66

Set dead: Check for shorted bypass condenser (No. 27) in plate of 75 tube. This unit is tied between two 70,000-ohm, 0.5-watt resistors. Replace with 0.1-mfd, 600-volt condenser.

Keith F. Martin.

•

Philco 80

Set dead, no plate voltage on 36 second detector: Look for open 1-meg resistor.

Keith F. Martin.

•

Philco Shadow-Tuning Unit

Difficulty in aligning shadow-tuning unit: Bend shadow-lamp bracket to position giving proper shadow indication. If this causes shadow to be off center on screen, reverse leads from shadow-unit coil and readjust shadow-lamp bracket. Care should be taken when working on chassis or adjusting i-f trimmers not to short i-f plate circuit to ground. This forces shadow-tuning vane to revolve violently back and forth and is often cause of trouble.

W. B. Styles, Jr.

•

Pilot 31-81 Rainbow Super

Improperly rated resistor: Trouble with 10,000-ohm, half-watt resistor between first detector-oscillator screen and second detector screen. Replace with 1-watt unit.

Cut-off: Try a 6,000-ohm resistor as replacement for 10,000-ohm, half-watt unit in cathode circuit of detector-oscillator. This resistor is shown as 6,000 ohms in Rider's 4-6, but many sets of an earlier run used 10,000 ohms. Also circuit in Rider's shows a 2A5 in output, but earlier sets used a 47.

F. C. Wolven.

•

Radiola R-4

Ineffective volume control: Set blasts at full volume with volume control completely ineffective. Test r-f and i-f tubes for cathode-to-heater short or leakage. This effect may be intermittent. In case volume control replacement is necessary improvement may be made by using a 7,500- or 10,000-ohm unit (depending upon signal strength in locality). The 8,000-ohm screen-to-cathode bleeder may then be changed to 12,500 ohms and returned to ground. The volume control should be set for a 500-ohm minimum. The chief advantage lies in smoother control due to excellent taper of replacement-type units.

F. C. Wolven.

•

Sparton 930-931 Models

Voltages O.K., bypass condensers O.K., tubes O.K.; still the set would only play from 1500 to 850 kc. . . . no stations above 850 kc. Thought at first might be condenser gang shorted at low-frequency end. Tested and found them O.K. Put my finger on stator of 4th section of variable condenser and I could receive low-frequency stations along with local stations, knowing thereby that oscillation was taking place and therefore no reception above 850 kc.

Took out the r-f section (not the bandpass section) and after prodding around and unsoldering several leads found the r-f plate choke of 1st 484 to be cold soldered and the plate of this 484 was getting plate voltage through the r-f coupling coil. (In these models there is an r-f coupling coil and a plate choke coil in parallel with the coupling coil.) Made a good soldered connection and the set played all over the dial.

Also watch out for the 15,000-ohm bleeder resistor in these models increasing in age. The writer took one out that read 15,000 ohms when cold and 67,000 ohms when warmed up.

E. Tuchlu

•

Wells-Gardner Peaks

I-F Peaks: The following is a complete list of the i-f peaks for the Wells-Gardner receivers produced in 1933, 1934 and first half of 1935:

Series	*I-F Peak*
00A	175
00B	175
0C	456
02A	175
02AA	175
05A	262
05AA	262
05BA	262
06A	175
07A	175
2B	456
5B	262
5D	456
5E	175
5Y (auto)	175
6B	175
6S (auto)	175
6U (auto)	262.5
7C	175
7D	456
9B	456
Z6Z1 (auto)	262

Series 7C are of the 6-volt "B Batteryless" type, while Series 6B are operated from 32 volts d-c.

•

Zenith I-F Peaks

In the following table are given the i-f peaks for the latest Zenith glass- and metal-tube receivers:

Chassis	*I-F Peaks*
5401	456.0
5405	456.0
5513	252.5
5513-A	252.5
5619	252.5
5621	456.0
5704	456.0
5903	456.0

And here is a list of the chassis models and the receiver models in which they are used:

Chassis	*Receivers*
5401	4-P-26; 4-T-26; 4-P-51; 4-T-51
5405	4-V-31; 4-V-59
5513*	5-S-29; 5-S-56
5513-A*	5-S-29; 5-S-56
5619*	6S-27; 6-S-52
5621	6-V-27; 6-V-62
5704*	7-S-28; 7-S-53
5903*	9-S-54; 9-S-55

The chassis models followed by asterisks are metal-tube receivers.

•

Zenith MH

Oscillator weak and cutting out, even after resoldering coil connections: If capacitors are good, put in new oscillator coil.

Earle J. Bancroft

•

Unstable AVC

In servicing any receiver in which the avc has become unstable, it is a good idea to look for slight leaks between the grid windings and the high-voltage circuits. I have found that a slight leakage will defeat the voltage supplied from the avc without showing up in any other voltage or resistance reading taken with ordinary meters. This trouble occurs in sets having a loop of wire for coupling on the r-f coils and moisture or a break in the wire covering. This permits a megohm or so of leakage under high-voltage, which is just enough so that the positive voltage working into the grid winding will cancel the negative voltage from the avc tube. Under this condition strong signals can not be handled. If the no-signal bias is also decreased the set will squeal and distortion will occur.

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ASSOCIATION NEWS . . .

THIRD ANNUAL NEW YORK IRSM CONVENTION

The Sales Managers' Club will fire the opening gun at the Third Annual New York Convention of the IRSM to be held at the Hotel Pennsylvania in New York City with a meeting at 3:00 P.M. on Friday, October 25. Charles Golenpaul, Chairman of the New York division, will officiate. Leading Chicago manufacturers will be in attendance.

The Convention proper will start at 8:00 P.M., with President Edgar C. Arnold presiding in collaboration with Fred L. Horman, Chairman of the Second Region. The evening session will be given over to technical discussions with the possibility of at least one man high up in the affairs of the radio industry appearing.

The Service Section of the Radio Manufacturers Association will meet at 10:00 A.M., Saturday, October 26, F. B. Ostman, Chairman, officiating.

The Saturday and Sunday afternoon sessions will be used for symposiums covering timely subjects of interest to the technical branches of the industry. Then on Saturday night the Committee reports the possibility of another radio personality together with two lecturers, one of which had been definitely decided upon—Walter Jones of Hygrade-Sylvania Corp.

The Parts Distributors have scheduled a meeting for 8:30 P.M. on Saturday, October 26. Maurice Despres will preside. All parts distributors are urged to be present.

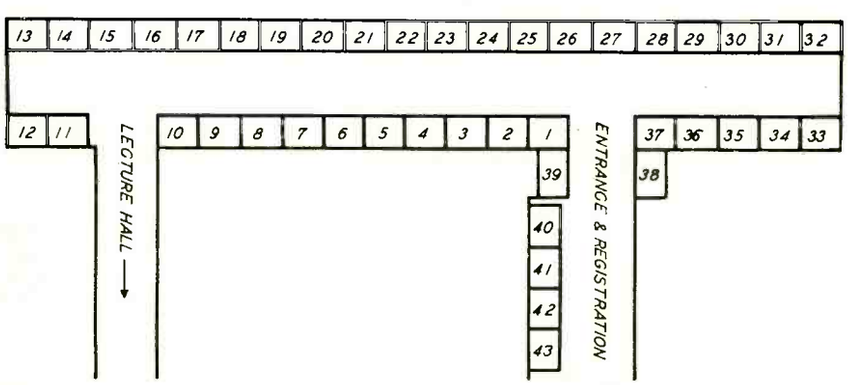
On Sunday morning at 10:00 o'clock there will be an IRSM membership meeting to which only members of the Institute who are in good standing will be admitted. President Arnold will preside.

The Manufacturers' Representatives will go into a huddle at 2:30 P.M., Sunday. This meeting, while for manufacturers representatives solely, will be opened by one of the officers of the IRSM at the special request of the representatives themselves. However, the representatives will choose their own Chairman who will take charge of the meeting.

The Sunday night session will wind up the Convention. Arrangements have been made for Dr. O. H. Caldwell, a well-known figure in the radio industry, to deliver a brief talk, which will be followed by the technical lectures to close the meeting.

The following companies have reserved exhibit space at the Third Annual Convention and Trade Show of the Institute of Radio Service Men, October 25-27, 1935, Hotel Pennsylvania, New York City. See accompanying floor plan.

Aerovox Corporation 22
American Phenolic Corporation .... 6 R
Arcturus Radio Tube Company 43
Astatic Microphone Laboratory, Inc. 31 R
Atlas Resistor Company ..... 6 L
D. R. Bittan Sales Co. 6R, 7, 8
The Brush Development Co. ..... 31 L
Bruce O. Burlingame 1
Caldwell-Clement, Inc. 39
Carron Manufacturing Co ..... 7 L
Central Radio Laboratories 26
The Clough-Brengle Co 20
Cornell-Dubilier Corp 9
Dale Parts, Inc. .....28 and 29
BRYAN DAVIS PUBLISHING CO. 12
Tobe Deutschmann Corp 2
Electrad, Inc. 35
Electronic Laboratories, Inc. 44
Federated Purchaser, Inc. 4
John M. Forshay 20, 21
Harry W. Gebhard 18, 19
General Transformer Corp. ..... 7 R
Hickok Electrical Instrument Co... 21
Hygrade Sylvania Corp 27
International Resistance Co. 19
Jefferson Electric Co 3
P. R. Mallory & Co 37
National Union Radio Corp. 45
Ohmite Manufacturing Co 8
Operadio Manufacturing Co 16
Philco Radio and Television Corp. 33, 34
The Radiart Corp. 13
Radio City Products Co. 42
Radio Instrument Co. ..... 46 R
RADIO RETAILING 38
RADIO TODAY 39
Raytheon Production Corp 36
RCA Manufacturing Co. 23, 24, 25
John F. Rider, Publisher 11
Wesley W. S. Scharp 31
F. E. Schmitt 5
SERVICE 12
Shure Brothers Co. ..... 5 L
Paul Smalley 37
Solar Manufacturing Corp. 17
Standard Transformer Corp. 32
Supreme Instruments Corp. 1
Technical Appliance Corp. ..... 5 R
Thordarson Electric Mfg. Co. 18
Triplett Electrical Instrument Co... 41
United Transformer Co. 40
Ward Leonard Electric Co 14
The Webster Company 30
Weston Electrical Instrument Corp. 15
Wholesale Radio Service Co. 10
Yaxley Manufacturing Co 37



The booth layout of the IRSM convention exhibition space. See above listing for company names.

CLEVELAND IRSM SHOW

On Saturday evening, Nov. 9th, there will be held a conference of radio Service Men from points within a radius of 300 miles of Cleveland; at the same time there will be a Soharsm meeting. This conference and the Trade Show following on Sunday and Monday will be held in the Grand Ballroom and in the Red Room of the Hotel Cleveland. An attendance of over 1000 is anticipated. A number of the exhibitors at the New York Show have arranged to move their complete exhibits to the Cleveland Show, which will be just two weeks later.

The program this year will follow along nearly the same lines as last year. In addition to the usual exhibits, there will be a large number of demonstrations of unusual radio and electronic phenomena. Several nationally prominent radio engineers will be in attendance and will present interesting papers during the lecture periods.

In order to be certain that all Service Men in this area are able to take advantage of the many educational features offered at this Exposition, a movement has been started to arrange for the radio service departments of all stores and for all independent service shops to be closed at 12 o'clock noon on Monday, November 11th.

NEAL BEAR, *Trade Show Committee.*

NEW YORK CHAPTER, IRSM

Under the auspices of the New York Chapter of the IRSM, RCA gave the first of a series of lectures which over a thousand enthusiastic members attended.

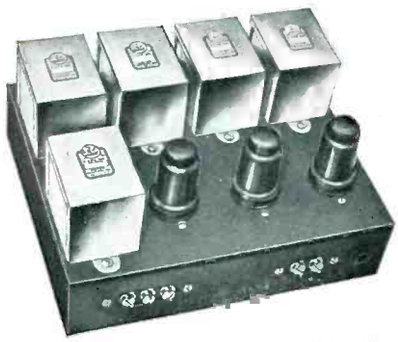
RCA presented a bang-up program of lectures which consisted of a lecture by M. M. Brisbin, who went thoroughly into the design of the 1935 RCA receivers and told us that he would be back again later in the season with two more lectures. About half-way through his lecture there was an intermission and time out for some entertainment and the presentation of the door prizes.

Mr. Morrisey of New York won first prize, which was an RCA oscillator; the five RCA manuals were won by Mr. R. Lasarouse of Brooklyn, and the RCA out-

(*Continued on page* 467)

CHROMSHIELD
AMPLIFIER KITS

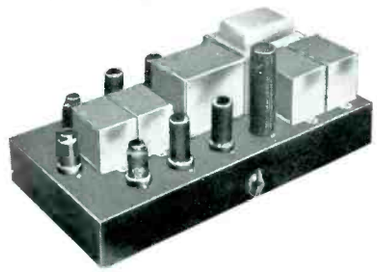
Another source of revenue for the enterprising service dealer. Schematic and point-to-point layouts furnished with each amplifier kit.



CK-7 METAL TUBE PREAMPLIFIER KIT

The CK-7 preamplified kit uses two metal 6C5 tubes in cascade amplification. A 6C5 is used as a rectifier. Careful placement of parts and shielded components is responsible for the extremely low hum and noise level in the CK-7 preamplifier. The overall gain is 55 DB.

		List	Net
CK-7	transformer kit mounted on chassis	$16.00	$9.60
AK-7	accessories includes all necessary resistors, condensers, sockets, AC cord and plug, hardware, wire	6.00	3.60



CK-8 METAL TUBE SUPER POWER AMPLIFIER

35 watts undistorted output; will handle up to 20 dynamic speakers. 8 tubes used: 3-6C5 triodes, 4-6F6's in Pentode A prime connection. 1-5Z4 rectifier. 95 DB gain. Input of amplifier will match crystal or ribbon mike outputs, also adapted for carbon or dynamic mikes through external transformer input.

		List	Net
CK-8	transformer kit mounted on chassis	$34.00	$20.10
AK-8	accessory kit for above—includes all necessary resistors, condensers, sockets, terminal strips, AC cord and plug, hardware, wire	11.00	6.60

UTC VARITAP UNIVERSAL DUPLICATE TRANSFORMERS

UTC is first to introduce a truly workable, non-complicated, highly desirable VARITAP arrangement on filament and plate windings of Universal Duplicate Transformers.

UTC VARITAP Universal Duplicate Transformers are adapted to fit more than 4000 types of sets with a minimum of chassis alterations. The SR types are provided with removable slotted brackets which permit a wide degree of flexibility in meeting mounting centers and overall chassis dimensions on any radio receiver. The VR types permit of vertical mounting with leads through bottom of chassis. However, the same degree of flexibility is permitted as to mounting centers. The mounting holes on the VR types are slotted to fit the majority of receiver mounting hole dimensions.

Thus the SR-2, VR-2, SR-3, VR-3 units will not only fit receivers requiring two separate 2½-volt windings, but also on all the new 6.3-volt receivers requiring two separate 6.3 windings.

The SR-6, VR-6 units will not only fit a great many receivers which cannot operate unless 3 separate 2½-volt windings are available—indeed these units are arranged so that they can be used in new receivers using three separate 6.3-volt windings.

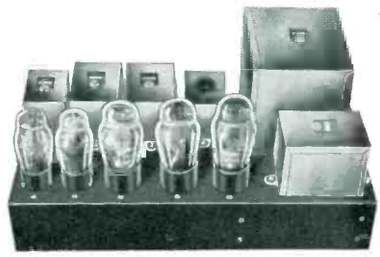
The SR-5 is arranged so that it can be used on receivers using 210, 250 tubes or on Class B sets using 46 and 59 tubes at plate voltages of 425 or over.

The SR-1 is arranged so that it can be used either with 2A3 or 42A prime tubes in 10- to 15-tube sets. Either 2½- or 6.3-volt tubes can be accommodated.

The SR-4 may be used in sets using 1½- and 2½- and 5-volt tubes or 2½- and 5-volt tubes.

The VARITAP units fulfill all the requirements of universality in the radio service replacement field. These are just the units the serviceman will recommend for that replacement job.

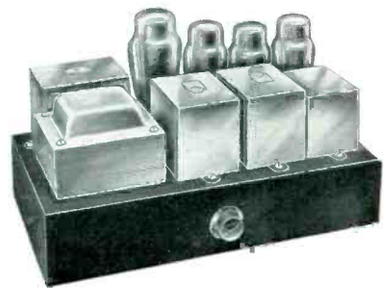
For further details on seven types of UTC CHROMSHIELD Power Amplifier Kits write for CS-1 Bulletin. Write for VR-1 Bulletin covering VARITAP and universal audio input and output transformers.



CK-1 AMPLIFIER KIT

The CK-1 amplifier has a power output of 10 watts normal—14 watts peak using 2A3 or 45 tubes in A prime operation. The overall gain is 48 DB. Two push pull stage using 56's into 45's or 2A3's makes possible a humfree high quality amplifier.

		List	Net
CK-1	transformer kit mounted on chassis	$27.00	$16.70
AK-1	accessory kit includes all necessary resistors, condensers, sockets, terminal strips, hardware, AC cord and plug, ready to wire	5.75	3.45



CK-2 AMPLIFIER KIT

The CK-2 amplifier kit is designed for use with crystal microphones. The gain is in excess of 100 DB and the power output is 10 watts. Only four tubes are used, including the rectifier. The plates of the first 6A6 tube are cascaded to permit very high amplification and stable voltage transfer to the second 6A6 driver tube. The final 6A6 is arranged in push pull class B operation.

		List	Net
CK-2	transformer kit with CS-35 output, including chassis	$19.50	$11.70
AK-2	accessory kit includes all necessary resistors, condensers, sockets, terminal strips, hardware, AC cord and plug, ready to wire	10.50	6.30

Left
SR type in horizontal mounting with removable slotted brackets.

Right
SR type for bottom chassis mounting, slotted brackets removed.

Left
SR type vertically mounted with removable slotted brackets.

Right
VR type with slotted holes for mounting with leads through chassis.

UNITED TRANSFORMER CORP.

72-78 Spring Street :: New York, N. Y.

EXPORT DIVISION: 15-19 LAIGHT ST., N. Y. C.

THE FORUM . . .

HOBBIES

Editor, SERVICE:

I think it would be interesting to learn about the hobbies of other radio Service Men. I do not believe that there are very many who are spending an appreciable amount of time building sets, experimenting with the short waves, etc., as a hobby. Personally, I like an occasional game of golf, fishing (any kind, salt or fresh water) and association meetings. Recently I started a stamp collection and find it quite interesting.

Also, I am fond of SERVICE. I read it thoroughly and receive plenty for my money.

A. S. MAGEE,
Bethesda, Md.

(*Do any of you fellows go in for boondoggling?*—EDITOR.)

•

LIKES SERVICE

Editor, SERVICE:

I have just purchased SERVICE (August) for the first time in five years of radio servicing. I am more than pleased to read such an "Engineering Knowledge Book." Talk about highlights! SERVICE is better than all the other radio magazines put together.

WALTER C. MATHEWS,
Philadelphia, Pa.

(*Thanks for the blushes.*—EDITOR.)

•

SERVICE IN BOOK FORM

Editor, SERVICE:

After reading "The Forum" for several issues, I am prompted to write this letter.

SERVICE is all right. I have copies of all but a few early issues and my system is to get them bound in book form (every two years) at our local book bindery.

There are many things of value in SERVICE, and they overbalance the unused information for any Service Man no matter how well "he knows his stuff." For example, consider the write ups on new sets. These sets are usually not in our shops until after they appear in SERVICE, so that when my RCA dealer asks me what his latest set is all about I can tell him by just looking at the chassis. To know what systems are used in a receiver saves plenty of time when the customer is waiting for you to produce results.

Let any good Service Man tell the truth, and he will inform you that he is always studying, that he wants more mathematics, that he wants more everything . . . he knows that he needs it. So, lets have all the dope in SERVICE. It's been a good investment for me. I have been in the radio service business for 15 years and I still have a lot to learn.

C. L. FAIRCHILD,
Elgin, Illinois.

(*The right dope. Why cut up magazines, only to find later that some valuable data was not kept.*—EDITOR.)

•

ANSWERING MR. LOVELL

Editor, SERVICE:

I wrote a letter (published in May) in answer to the question concerning what the readers of SERVICE would like to have published. What I intended to convey was not understood by some of the readers, and I would like to correct these misunderstandings.

Mr. W. A. Lovell believes that I am a newcomer, and that I don't know Ohm's law; he feels sorry for me and is willing to help me and other poor fellows who are trying to learn. Mr. Lovell's spirit is fine and deserves commendation, but I want to inform him that I have known Ohm's law for a good many years. While I have several little books explaining the theory, I only use Ohm's law in an emergency. I would rather have a schematic giving the values of the different parts and substitute for the defective ones exactly what the engineers put in the receiver in the beginning. Mr. Lovell, if you are the busy Service Man that you say you are, you should know that there is a great deal of difference between practice and theory. And, speaking of cigar-box receivers, you can set down with your pencil and figure out the line resistance, but if you will check against the manufacturer's specifications, you will find your calculations to be off by 20 to 50 ohms . . . and this same variation applies to any receiver or any circuit in a receiver using resistance. No doubt you can make the receiver perform, but when I service a receiver I try to bring back original performance.

In my letter I asked for fundamental theory. However, I really should have asked for fundamental theory pertaining to new developments. I don't care for a statement of Ohm's law, or "if the receiver is noisy, clean the condenser plates with a pipe cleaner, or file your ground connection with a piece of sandpaper." What I do want is information that will keep me abreast of the times and SERVICE is doing that very nicely. If I was a "smarty" I wouldn't need to read SERVICE or any other magazine, but I always have room for knowledge.

I also notice you took a slap at the fellows who use Rider's Bibles. I, for one, appreciate what Mr. Rider has done and is doing to help the Service Man. For your information, Mr. John F. Rider was the original editor of SERVICE, and I happened to be a subscriber at that time. I also would like to say that the Philco RMS is a wonderful help to the Service Man.

In closing I would like to suggest that Mr. Lovell get himself an RMA Resistor Color Code, an IRC Resistance Indicator and a few of Rider's Bibles. I think he will be able to do better service work in less time and he will not wear out so many pencils working with Ohm's law.

F. B. GUTHRIE,
Philadelphia, Pa.

•

ASSOCIATION NEWS

(*Continued from page* 464)

put meter was won by Mr. Steinhurst, also of Brooklyn.

Some of the well known entertainers present were: Dolly Dawn, usually heard with George Hall and Orchestra; Miss Durrell Alexander, often heard with Paul Whiteman's Orchestra; Smiling Jimmy Ray, one of Fats Waller's proteges; Sonny Schuyler, often heard on the air with George Hall; and finally, to top off the program, Mr. Tony "Cabootch" Gruber, who gave a monologue that had the boys rolling in the aisles.

BROOKLYN NEWS

Brooklyn is still looking for a meeting place and hopes to start an extensive Fall program with a series of lectures, and is trying to get the members interested in giving their own lectures. Service Forums will definitely be held at every meeting.

Joseph Flaum.

•

SET ANALYZER MODERNIZING SERVICE

The Precision Apparatus Corporation, 821 East New York Avenue, Brooklyn, N. Y., are now featuring a modernizing service for obsolete set analyzers. This service is available at a standard price for the following models: Jewell Model Nos. 198, 199, 408, and 409; and Weston Model Nos. 537, 547, 565, and 566. For other models, modernization costs may be obtained upon application, it being necessary, however, to supply the following information: Manufacturer's name and model number of the complete instrument; also manufacturer and pattern number of the meters employed.

The modernized instrument allows for speedy voltage, resistance and current readings at all socket positions by the use of rotary switches. A master range selector makes possible the use of only two pin jacks, all ranges being available. Positive and negative selectors are used for obtaining socket analyses at various position pins. A current switch allows d-c current readings to be taken at any position, while an ohmmeter adjuster employs twin compensators, permitting the adjustment of all ohmmeter ranges

The following voltage ranges are available: 0-4, 0-8, 0-16, 0-160, 0-800, a-c; 0-5, 0-10, 0-100, 0-500, 0-1000, d-c. The d-c current ranges provided are: 0-10, 0-100, and 0-500 mils; if desired, external shunts to 10 amps can be furnished for use in connection with auto-radio current tests. Resistance ranges and capacity ranges are also incorporated.

Literature may be obtained from the Modernization Division of the Precision Apparatus Corp.

•

NEW ARCTURUS WINDOW DISPLAY

A new and unique type of window display has just been issued by the Arcturus Radio Tube Company, Newark, N. J., for the use of its dealers and Service Men. Lithographed in 7 attractive colors, the display is a two-plane effect and carries three dynamic illustrations drawn by the country's leading artists, it is stated.

A special patented feature is employed whereby the dealer can change this new Arcturus display giving him a totally new display from day to day.

Display experts who have viewed this display in advance proclaim it as one of the outstanding pieces that has ever been produced, it is said. This display is available to Arcturus dealers and Service Men upon request to their Arcturus distributor.

HIGHLIGHTS . . .

GRAHAM RECEIVES APPOINTMENT

Hygrade Sylvania Corporation announces the appointment of Virgil M. Graham as head of the Sylvania Application Laboratory at Emporium, Pa. He will act as consultant to radio manufacturers and engineers, a position for which he is eminently fitted both through his radio engineering experience and his wide acquaintance in the industry. Mr. Graham will be assisted by Dr. Ben Kievit, Jr., who will continue in his present capacity as direct supervisor of the work conducted in the laboratory.

Since 1923, and until his acceptance of the Sylvania appointment, Mr. Graham has been Radio Engineer for Stromberg-Carlson, and assisted in the development of the first Stromberg-Carlson radio receiver to be put on the market.

He is also well known through his active leadership in technical committee work, having made important contributions to the improvement and advancement of radio standards. He edited the early NEMA handbooks of Radio Standards. Since 1931, he has been Chairman of the Standards Section of the RMA Engineering Division, was Chairman of the joint SEA-RMA Committee on Automotive Radio, 1932-34, and RMA Chairman of the Joint Coordination Committee of EEI, NEMA, and RMA on Radio Reception since 1933.

He is Fellow of the Institute of Radio Engineers, and a member of the IRE Board of Directors, and has been very active in IRE affairs in the Rochester Section.

Before leaving to take up his duties at the Sylvania plant, his associates at Stromberg-Carlson gave a farewell dinner in his honor, at which he was presented with a Ciné kodak and projector in appreciation of his long service and as a token of personal friendship.

•

WESSNER RECEIVES APPOINTMENT

S. W. Muldowny, Chairman of the Board of National Union Radio Corporation of New York, announced this week, the appointment of Mr. F. J. Wessner as General Sales Manager to succeed H. A. Hutchins, who has resigned to enter the advertising field.

Mr. Wessner has been engaged in sales promotional work with National Union since the formation of the company in 1929. As Assistant General Sales Manager, for the past five years, he has played a prominent part in the development of the National Union Service-Dealer Selling Program.

Prior to the time he became associated with National Union, he had gained a broad experience in sale direction and promotional work in his previous posts as Eastern Sales Manager of Ypsilanti Furniture Company and General Sales Manager of one of the country's outstanding textile houses.

•

OHMITE MOVES TO LARGER PLANT

D. T. Siegel, General Manager, Ohmite Manufacturing Company, Chicago, Illinois, announced that this company would be located in its new and larger plant at 4835 Flournoy Street after October first. The need for additional factory space became increasingly necessary during the past year, and the new building was started the first of August. The new factory, which has more than twice the area of the old one, has been designed to furnish the utmost in shop convenience for the production of quality resistors and rheostats.

•

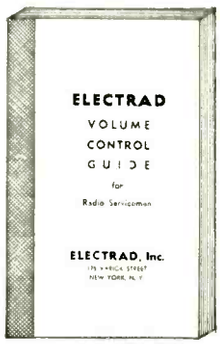
GROSS ADDS NEW DEPARTMENT

Gross Radio, Inc., 51 Vesey St., New York City, who carry a large stock of amateur equipment, have now put in a new department exclusively for the Service Man.

Their trained sales force will gladly explain the deferred payment plan on Supreme Test Equipment, it is stated.

ELECTRAD VOLUME CONTROL

Electrad, Inc., 175 Varick St., New York, N. Y., has published a 100-page Volume Control Guide just about as complete as it could be. It is a finely printed book measuring 6¼" by 9¼", and has a



looped cord—like a telephone directory—so that it may be hung by the side of the service bench, if desired, for instant use.

Replacement volume controls for practically every radio receiver built since the inception of broadcasting are clearly and accurately listed. Each model number is on a separate line, so that you can run through the listings of any one manufacturer and quickly find the set you want. For every set model number the listing includes the specification number of the proper Electrad control, its resistance in ohms, and its list price.

And here's the best part of all . . . these Volume Control Guides are free; a copy will be sent to any accredited Service Man for the asking.

•

SAYRE APPOINTED ASS'T. TO CUNNINGHAM

E. T. Cunningham, President of the RCA Manufacturing Company, announced the appointment of Judson S. Sayre as Assistant to the President.

Mr. Sayre, who brings many years of broad merchandising experience to his new duties, was formerly Manager of the electrical appliance and refrigeration division of the Montgomery Ward Company. Prior to that he was General Sales Manager of the Kelvinator Corporation, with whom he had started nine years previously as Branch Manager, and held progressive positions as District Supervisor and New England Manager.

Mr. Sayre received his Bachelor of Arts degree from Ohio Weslyan University, in 1919, and a year later his Master's degree from Columbia University. He then joined the Alexander Hamilton Institute as salesman for its famous business training courses, and remained with them for five years training new salesmen.

•

MODERN RADIO SERVICING, by Alfred A. Ghirardi, published by the Radio and Technical Publishing Co., 45 Astor Place, New York City, N. Y., 1300 pages, 706 illustrations, price $4.00.

Modern Radio Servicing is really a second edition of *Radio Servicing Course*, but a rather large one, for the new edition contains 1300 pages in comparison to 182 pages for the preceding book. In planning this new volume the general style of the first issue was retained, and many additional chapters covering new topics were added.

This book has been divided into four parts. Part I has seventeen chapters devoted to the theory and construction of modern radio test equipment. The nine chapters of the second part are given over to the practical servicing of radio receivers. The third section of the book contains six chapters on specialized servicing problems, while the last part deals with vacuum-tube charts.

Part I begins with a four-page introduction and follows it with chapters on the theory of "Milliammeters, Ammeters, and Voltmeters" and "Methods and Instruments for Measuring Resistance." The remaining pages of this section are concerned with ohmmeters, condenser testers, capacity meters, output meters, vacuum-tube voltmeters, tube checkers, voltage-current set analyzers, point-to-point testing, and test oscillators. Data is included on commercial types as well as the types which may be built up by the Service Man.

Chapter titles of Part II are as follows: "Preliminary Tests for Trouble," "Peculiarities of AVC and QAVC Circuits," "Receiver Analysis by Voltage-Current Tests," "Receiver Analysis by Resistance Tests," "Testing Individual Radio Components," "Obscure Troubles Not Revealed by Analyzers," "Aligning and Neutralizing T-R-F Receivers," "Aligning and Neutralizing Superheterodyne Receivers," and "Repairing Individual Radio Components."

The third section covers the installation and servicing of auto-radio and marine receivers, and the servicing of all-wave receivers. The remaining chapters are entitled: "Reducing Electrical Interference," "High-Fidelity Receiver Problems," and "How to Sell Your Service."

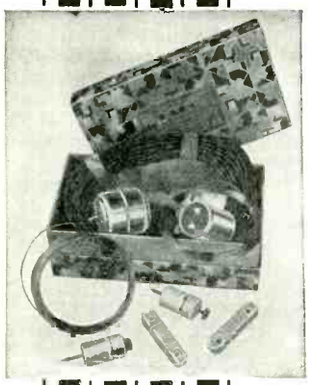
Review questions are given at the end of nearly all the chapters, the total number being 723. Also, a complete, cross-referenced index has been included.

Modern Radio Servicing is a practical text on the theory, construction, and use of modern radio service equipment, and the rapid and systematic methods of radio servicing.

For More Business and Profits, Here's

An All-Wave Knockout!

TACO NOISELESS ANTENNA



- Improves broadcast, police, amateur and short-wave reception.
- Permits aerial high above roof for maximum signal pickup.
- Non-pickup downlead transmission line blocks all man-made static.
- Kit form . . . factory assembled, wired, soldered . . . ready to string up.
- Sells over counter and through service calls. Lists at $6.75. Nice profit maker.
- Best by test. Based on years of antenna specialization. We invite comparisons.

DATA Send for technical and sales facts. Order a kit from local jobber. And by all means try all systems before you decide which to handle.

TACO

TECHNICAL APPLIANCE CORPORATION
17 East 16th Street
NEW YORK CITY

"I'd Pay a Few Cents More for a

SPRAGUE ANY DAY!"

"Remember," writes a successful serviceman, "if filter condensers fail to supply the proper voltage (as many 'bargain' condensers do) nothing about a radio can be wholly right. Other essential parts will work far below their standard of efficiency. The set might play, but never with its greatest volume or best tonal quality.

"I was surprised to find what a whale of a difference Sprague Condensers actually made in pepping up 'sick' sets. That's why I use 'em on every job.

They're cheaper in the long run—and they've helped me build a real reputation for getting *better than average results* from the average radio set."

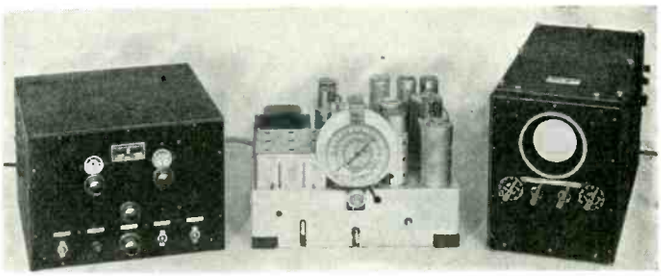
Made in a complete line for every radio need. Sold by leading jobbers. Write for catalog.

SPRAGUE PRODUCTS CO.
North Adams, Mass.

SPRAGUE CONDENSERS

Made Right — SPRAGUE 600 LINE — Priced Right

Cathode-Ray Servicer



—now used by every leading set manufacturer!

Grunow	Bosch	Stromberg-Carlson
Case	Stewart-Warner	Rodgers-Majestic
Mid-West	Crosley	Wells-Gardner
Zenith	Gilfillan	Horn

—and many other prominent radio set and part manufacturers use CLOUGH-BRENGLE Cathode-Ray Equipment in production, laboratory, and service departments.

No other group of instruments has so completely met the need for new and better methods with which to service modern radio receivers.

MODEL OM Frequency Modulated R. F. Signal Generator is used as an ordinary test oscillator for output meter work, but also has built-in fixed sweep frequency modulator for producing CALIBRATED receiver selectivity curves when used with any standard oscilloscope. Net $57.75

MODEL 81 Frequency Modulator is used with any oscillator to produce the exclusive C-B CALIBRATED selectivity curve. Does not destroy oscillator calibration. Direct connection to oscillator output—no plug-in jacks to oscillator tuning circuit. Net $34.25

MODEL CRA Cathode-Ray Oscilloscope provides every facility needed in modern analysis of receiver, amplifier, transmitter, and industrial voltage problems. Has horizontal and vertical amplifiers, linear sweep, and complete power supply. Net complete with Cathode-ray tube $84.50

More "FIRSTS" for C-B

First to recognize the serviceman's needs in a day of ever-growing circuit and performance complications, CLOUGH-BRENGLE now brings a complete new line of instruments for 1936. Here are two that have won instant popularity:

MODEL 82 Direct-Reading All-Wave R. F. Signal Generator—90 k.c. to 20 m.c. continuously variable, all on fundamentals. Large 8½" scale. Battery operated. Complete with tubes less batteries. Net..... $19.90

MODEL 79 Beat-Note Audio Oscillator—develops a uniform (within 2 Db.), pure sine wave voltage from 50 to 10,000 cycles. Operated from self-contained power supply. A necessary instrument for precision servicing of high-fidelity receivers. Complete with tubes. Net $51.90

Write for New 1936 Catalog

The CLOUGH-BRENGLE Co.
1138 W. AUSTIN AVE. CHICAGO, ILL.

Send complete literature on the new C-B 1936 Line of Professional Service Instruments.

Name .....

Address .....

THE MANUFACTURERS . . .

NEW IRC INSULATED METALLIZED RESISTORS

Unique modern resistors specifically designed for exacting radio requirements of the present day and known as IRC Type "B" Metallized Resistors, have just been

announced by the International Resistance Company.

Retaining all advantages of the familiar Type "F" Metallized Resistors, these new units have complete high-voltage insulation protection and are constructed without metal ends. They can contact other parts without danger of shorting. Utilizing an improved metallized resistance element, they have an extremely low noise level and represent a distinct improvement in essential resistor characteristics such as accuracy, permanency of resistance value and durability under all operating conditions, it is said.

In the new Type "B" Insulated Resistors a sturdy casing of insulating compound is moulded completely around the Metallized resistance element, sealing it against moisture and protecting it from shorting on other parts. Like bakelite, this insulating material will not crack or deteriorate. Permanent contact between element and wire leads is obtained by a special bonding process which, after the insulation is moulded solidly around the assembly, cannot break or develop poor contact. Noise level is said to be unusually low, making these new resistors ideally suited for amplifier circuits and for critical television requirements.

IRC Insulated Resistors are both color coded and individually marked with resistance value and wattage rating. Identification is quick and easy. They are available in ½-watt and 1-watt ratings which will suffice for practically every installation however crowded it may be. Not only is the ½-watt (Type B-½) resistor as small as the usual ¼-watt resistor, but it may be used universally for any rating up to and including ½-watt with greater efficiency and a higher factor of safety.

Flexible wire leads extend straight out from the ends giving a more effective lead length and avoiding danger of breakage when installing. They are tinned for easy soldering.

The 1-watt (Type B-1) IRC Insulated Resistor is made in all ranges from 300 ohms to 10 megohms. The ½-watt unit (Type B-½) is made in all ranges from 100 ohms to 5 megohms.

A new catalog containing full details will be sent on request to International Resistance Co., 2100 Arch St., Philadelphia, Pa.

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TECH LABS PRODUCTS

Tech Laboratories, with a factory located at 703 Newark Avenue, Jersey City, N. J., is now engaged in manufacturing a line of standard and special precision resistance instruments and allied products, for industrial and laboratory use.

The standard line includes—Attenuators, Potentiometers, L- Pads, T- Pads, H- Pads and other impedance-matching networks, Line Equalizers, Sound Level Indicators, Tap Switches, Precision Wire-Wound Resistors and Geophysical Instruments.

For attenuators and potentiometers impedance values range from one to a million ohms. Standard accuracies: two percent. Special accuracies: down to one-tenth of one percent. Steps: from one to sixty, any circuit, any loss per step.

These units are compact in mechanical design. They are entirely noiseless, and frequency characteristics are flat from zero to 50,000 cycles, it is said.

The first of a series of bulletins on this type of equipment and its application is now available.

•

"NOISE-MASTER" NOW AUTOMATIC

"Noise-Master" antenna, which was successfully introduced by Cornish Wire Co., several months ago, now features

automatic operation. Quoting from the latest literature of this manufacturer, "after 'Noise-Master' is properly installed . . . no adjustment is necessary and no manual operation is required, because this antenna is fully automatic electrically."

The literature referred to above is understood to contain schematic and construction details of the "Noise-Master" unit, also of other Corwico kits.

This manufacturer is also distributing a treatise on "All-wave Antenna," and folders in color for the set-owner may be had without charge by dealers for distribution to their prospects. Address the Cornish Wire Co., 30 Church Street, New York City.

•

NEW HYGRADE SYLVANIA TYPE 5Z4

A new type 5Z4 metal tube, directly interchangeable with the original "bird cage" 5Z4 metal rectifier, has been developed by Hygrade Sylvania tube engineers. The outstanding feature of the new Sylvania 5Z4 is the reduction in size, which was accomplished without loss in any of the electrical characteristics. Several constructional features have improved the physical structure of the tube.

The internal elements of the new Sylvania 5Z4 are similar to those used in the construction of the 83V glass rectifier. The complete assembly is enclosed in a metal shell of the same size as used for the 6F6 power amplifier tube. This reduces the height to 3¼ inches and the diameter to 1 5/16 inches.

The newly constructed 5Z4 insures more perfect shielding, compactness, ruggedness, uniform characteristics and efficiency during life. The filament current drain is now 1.5 amperes as compared to the 2.0 amperes drain of the original 5Z4. The decreased filament wattage results in lower operating temperatures, comparable with the operating temperatures of other types of metal tubes.

The maximum d-c output current rating was maintained at 125 milliamperes for operation at 400 a-c volts (rms) per plate. This feature makes it possible to directly replace the original 5Z4 tubes now in use with the new Sylvania 5Z4. The new tube will also replace type 5Y3, the glass rectifier tube incorporating the octal-type base.

•

"NOISE-ELIDERS"

A. M. Flechtheim and Co., Inc., 136 Liberty Street, New York City, is introducing a new group of line-noise filters known as Noise-Eliders.

The Flechtheim Noise-Eliders are said to be effective in removing interference being conducted into the radio receiver through the power supply.

Full data on these units may be had by contacting A. M. Flechtheim and Co., Inc.

•

NEW HIGH-LEVEL VELOCITY MIKE

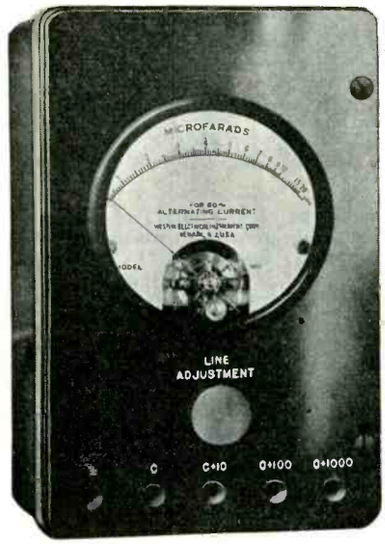
Amperite announces a new high-level velocity microphone with an unusual brilliancy on the higher frequencies. It is not boomy on close talking, it is said. Its output impedance of 2000 ohms permits operating directly into the grid—eliminating the input transformer. Requires 15 db less amplification than the lower impedance velocities, making it possible to build simple and compact amplifiers. Excellent for both studio and remote work.

The only limitation of the 2000-ohm impedance velocity is the limitation of cable

length. With 60′ of ordinary ⅜″ cable, the high-frequency response is still superior to the low-impedance velocity. For longer cable lengths, low capacity r-f cable can be used.

NEW WESTON CAPACITY METER

A new multi-range capacity meter designed to meet requirements for a small, reasonably-priced unit, has recently been placed on the market by the Weston



Electrical Instrument Corporation, Newark, N. J. The new meter, known as Model 780, provides full-scale ranges of 10/1/0.1/0.01 microfarads, covering all capacity ranges in common use in radio receivers, since readings can be made down to as low as 100 micromicrofarads. It operates directly from any 115-volt, 60-cycle a-c outlet.

A convenient voltage adjuster compensates for small variations in line voltage, and an internal transformer insulates the device from the line. A pair of long test prod leads is provided with each instrument.

The meter has exterior dimensions of 5½ in x 3¾ in x 2½ in and weighs approximately 1¾ pounds.

•

SUPREME 189 SIGNAL GENERATOR

The Supreme Instruments Corporation, Greenwood, Mississippi, are offering a completely shielded all-wave signal generator, Model 189, using an electron-coupled circuit. This unit is said to provide unusual frequency stability over all ordinary variations in power-supply potentials or load conditions.

Carrier frequencies are calibrated directly on oversize airplane dial from 90 kilocycles to 30 megacycles. Calibration for each individual generator is effected by means of trimmer adjustments. The Model 189 is provided with self-contained audio oscillator for approximately 50 percent 400-cycle modulation note, and provisions are included for applying external modulation with microphone or phonograph pickup.

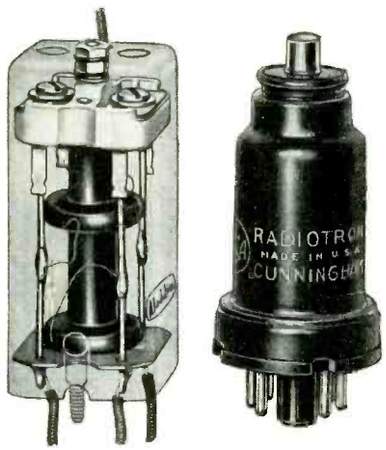
•

POLYIRON CORE I-F TRANSFORMERS

Polyiron, the interesting development of the Johnson Laboratories, is used in the Aladdin Radio Industries I-F Transformers now being manufactured in their new plant at 466 West Superior Street, Chicago.

Polyiron is a compound made of extremely small iron particles treated with an insulating material and molded into suitable forms which closely resemble solid metal.

The principal advantages of patented polyiron in the cores of the new high-frequency transformers are to concentrate the magnetic field, permitting much smaller size transformers, and to increase the "Q" ratio of inductance to resistance by



virtue of less copper being required for a given inductance, it is stated. The distributed capacity is also reduced by virtue of less wire being used.

This small size, 1⅛-inch square by 2½-inch high, including this dual mica insulated trimmer, makes these transformers suitable companions for the new iron tubes.

•

NEW TRIUMPH TUBE TESTER

The Triumph Manufacturing Co., 4017 West Lake St., Chicago, have introduced the Model 420 Triumph Tube Tester.

The Model 420 is mounted in a solid walnut cabinet styled for display on the counter and fitted with a dust-proof cover. A selective test of each element for open, short, leakage and load is provided. All elements in the tube are brought to separate switches which may be connected or disconnected in the circuit as is required for a complete test.

A line control is provided to permit setting the tester for the supply voltage. The instrument is adjusted by the meter on the panel, as shown in the accompanying illustration.

Sufficient leakage sensitivity is provided so that true leakage conditions in a tube

are shown. The shells of metal tubes are not tied to the filament in this test. All elements are separate so that leakage tests in and between any two or more elements can be made.

The Model 420 will test all types of tubes—glass, metal, and metal-glass. The power-supply line is completely isolated from the test circuits.

It is stated that the Model 420 employs a circuit proposed by the Tube Standards Committee of the RMA. All tubes are classified on a rated load by class of service that the tube is intended for. This embraces general purpose tubes, diodes and battery types in metal or glass.

•

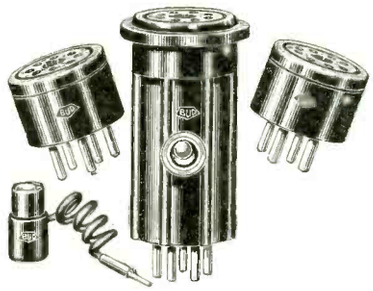
NEW 30-WATT P-A SYSTEM

Bell Sound Systems, Inc., of Columbus, Ohio, has announced the addition of a 30-watt p-a system, known as the Model P-A 5C, to their already extensive line of public-address systems. The new model is said to be a powerful, easily operated, complete system, arranged for transporting in three compact, Kerotal covered carrying cases. Though standard equipment includes two high-fidelity G-12 speakers, the unit has facilities for utilizing six speakers. By a series arrangement of transmission lines, it is possible to use as many as 12 to 15 speakers, it is stated.

The microphone is of the new crystal type, affording freedom from frequent repacking and overhauling, and eliminating "hiss" and "background noise" when the instrument is jarred or moved, it is said. Two separate input channels permit the simultaneous use of two microphones or a microphone and phono pickup. Controls consist of two volume controls, tone control, selector switches and a-c on-off switch.

The Model P-A 5C is said to have frequency response uniform within plus or minus 2 db from 35 to 10,000 cycles. The circuit is the 5 stage, Class A type, resistance and impedance coupled, with all filter components built into the chassis.

NEWEST BUD TEST ADAPTER KIT



for testing ALL METAL TUBES in your PRESENT TUBE TESTER

This Kit consists of three adapters as illustrated and a double grid clip suitable for All Metal Octal tubes and standard tubes.

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STATEMENT OF THE OWNERSHIP, MANAGEMENT, CIRCULATION, ETC., REQUIRED BY THE ACT OF CONGRESS OF MARCH 3, 1933

Of SERVICE—A Monthly Digest of Radio and Allied maintenance published monthly at New York, N. Y., for Oct. 1, 1935.

State of New York, } ss.:
County of New York, }

Before me, a Notary Public, in and for the State and County aforesaid, personally appeared Bryan S. Davis, who, having been duly sworn according to law, deposes and says that he is the Business Manager of the SERVICE—A Monthly Digest of Radio and Allied Maintenance, and that the following is, to the best of his knowledge and belief, a true statement of the ownership, management, (and if a daily paper, the circulation), etc., of the aforesaid publication for the date shown in the above caption, required by the Act of March 3, 1933, embodied in section 537, Postal Laws and Regulations, printed on the reverse of this form, to wit:

1. That the names and addresses of the publisher, editor, managing editor, and business manager are: Publisher, Bryan Davis Publishing Co., Inc., 19 East 47th Street, New York, N. Y.; Editor, M. L. Muhleman, Mt. Vernon, N. Y.; Managing Editor, Ray D. Rettenmeyer, Madison, N. J.; Business Manager, Bryan S. Davis, Scarsdale, N. Y.

2. That the owners are: Bryan Davis Publishing Co., Inc., 19 E. 47th St., New York; B. S. Davis, Scarsdale, N. Y.; Roy T. Atwood, Albany, N. Y.; G. R. Bacon, Douglaston, N. Y.; J. C. Munn, Union City, Pa.; J. A. Walker, Richmond Hill, L. I., N. Y.; A. B. Goodenough, New Rochelle, N. Y.

3. That the known bondholders, mortgagees, and other security holders owning or holding 1 per cent or more of total amount of bonds, mortgages, or other securities are: None.

4. That the two paragraphs next above, giving the names of the owners, stockholders and security holders, if any, contain not only the list of stockholders and security holders as they appear upon the books of the company but also, in cases where the stockholder or security holder appears upon the books of the company as trustee or in any other fiduciary relation, the name of the person or corporation for whom such trustee is acting, is given; also that the said two paragraphs contain statements embracing affiant's full knowledge and belief as to the circumstances and conditions under which stockholders and security holders who do not appear upon the books of the company as trustees, hold stock, and securities in a capacity other than that of a bona fide owner; and this affiant has no reason to believe that any other person, association, or corporation has any interest direct or indirect in the said stock, bonds, or other securities than as so stated by him.

5. That the average number of copies of each issue of this publication sold or distributed, through the mails or otherwise, to paid subscribers during the.....months preceding the date shown above is.....(This information is required from daily publications only.) BRYAN S. DAVIS, Business Manager.

Sworn to and subscribed before me, this 25th day of September, 1935. (SEAL) J. A. WALKER, Notary Public.

Queens Co. Clk's No. 3149, Reg. No. 7476. New York Co. Clk's No. 831, Reg. No. 7-W-514. My commission expires March 30, 1937.

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What if you DO save a few cents on low wattage resistors? Does that pay for your time and trouble if the resistor goes bad just after you've installed it? Does it make up for the fact that your customer probably thinks you don't know your business?

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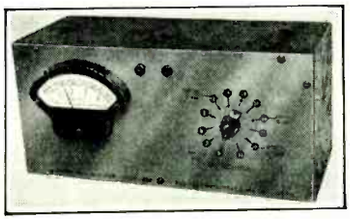
Includes completely wired attenuator — less case and panel.



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Unique 10,000 Ohm constant impedance L type attenuator assures high accuracy and sensitivity. May be used as direct reading 4 range A.C. voltmeter for all frequencies.

Splendid instrument for gain measurements and as an output meter for all circuits from voice coil impedance up to input impedance of push-pull output transformers. Has 5" Fan Type Meter with knife edge pointer—500 microampere movement.

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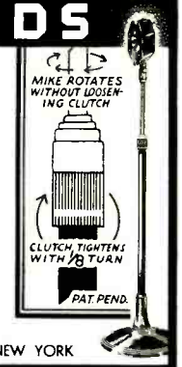

Featuring positive, NON-SLIDING, ball-bearing clutch. Will never wear out . . . never require adjustment. WILL NOT "CREEP." Tightens with only 1/8 turn of clutch. Mike can be ROTATED WITHOUT LOOSENING CLUTCH. Smooth, PNEUMATIC-LIKE ACTION up and down. A model for every purpose.

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No matter what the scheme or the device, there are many Service Men who would like to know the how's and why's —just as you would like to know about the schemes and devices employed by others.

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According to conservative estimates, one out of four servicemen fail or go out of business EVERY YEAR!

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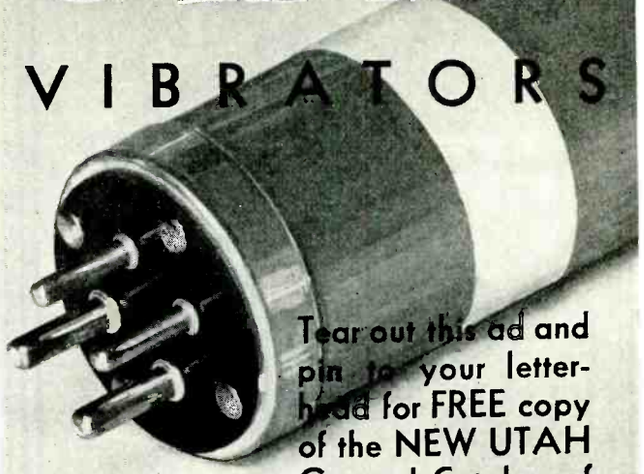

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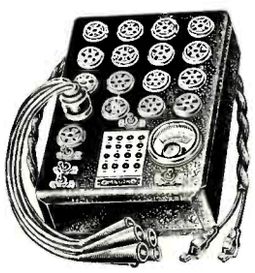
Tests all tubes, metal or glass, for emissions, shorts, leakages, using a new NEON METER principle. It also tests continuity and leakage of bypass and electrolytic condensers. Reads resistance directly up to 10,000 ohms. Leakage up to 6 megohms can be detected. Can be used as a NEON resonance indicator for set alignment. Tests both plates and diodes. Line voltage adjustment. Operates on 110 A.C. 60 cycles. The most complete and practical tester ever offered servicemen at anywhere near this price.

Dealers net cost Model CT
$8.45



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Tests all types of vibrators with sockets for more plug in types than most testers and spares for future use. Tests rectifier tubes of the new gaseous type as well as 84's. Octal socket provided for new metal auto set rectifier. Polarity reversing switch, tube or synchronous switch, on-off switch and a fused battery cable with clips. Buffer capacity is variable and meter reads exact condition of vibrator on POOR-GOOD scale. Separate scale is provided for reading primary current and for use as a 0-10 D.C. ammeter. A plug with handy insulated clips is provided for lead type vibrators.

Dealers net cost Model DV
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If your local jobber cannot supply you order direct 20% deposit on C. O. D. shipments.

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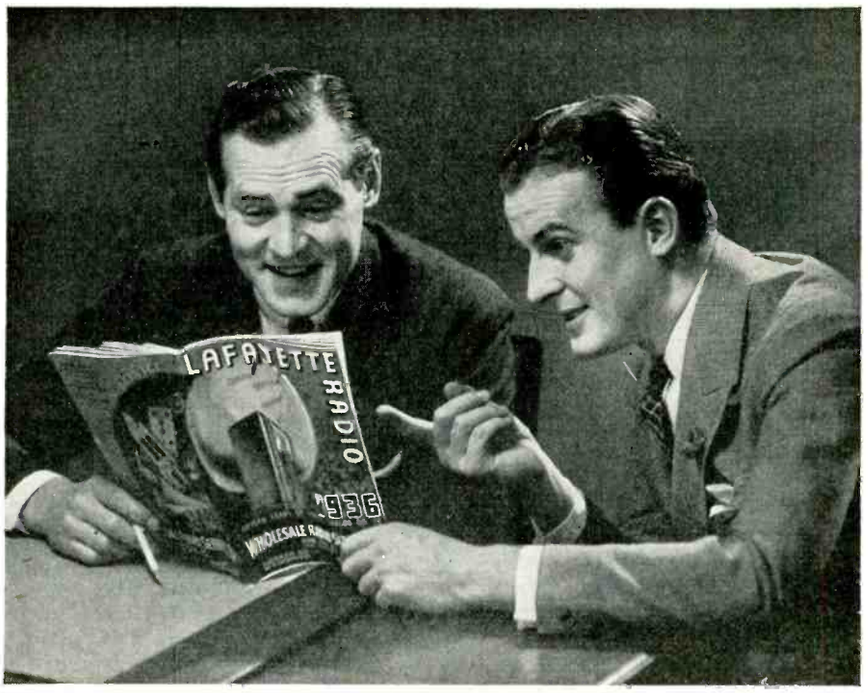

This Catalog Can SAVE YOU MONEY - but It CAN Do Even MORE

THE "Largest Radio Catalog Ever Issued" *can* save you money, yes. You will find thousands of items—*nationally known and nationally advertised merchandise*—at money-saving prices! But you will also find other things equally important to you!

For example, this catalog has been called a Guide Book for the radio service man, buyer and "ham." Whatever you need in the field of radio is listed—whether it be a new, year-ahead 24-tube radio receiver with metal tubes or a 5c binding post. Tubes, kits, replacement parts, P.A. and ham equipment, receivers, accessories, tools—*anything and everything.*

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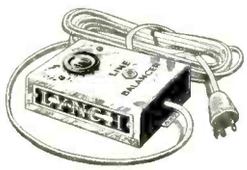

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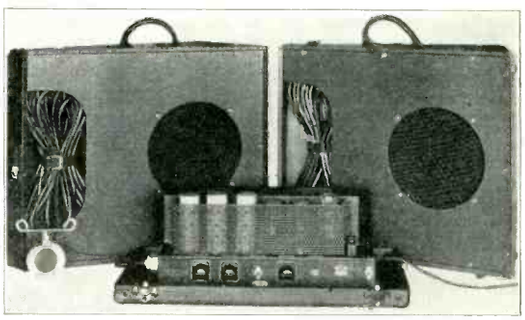

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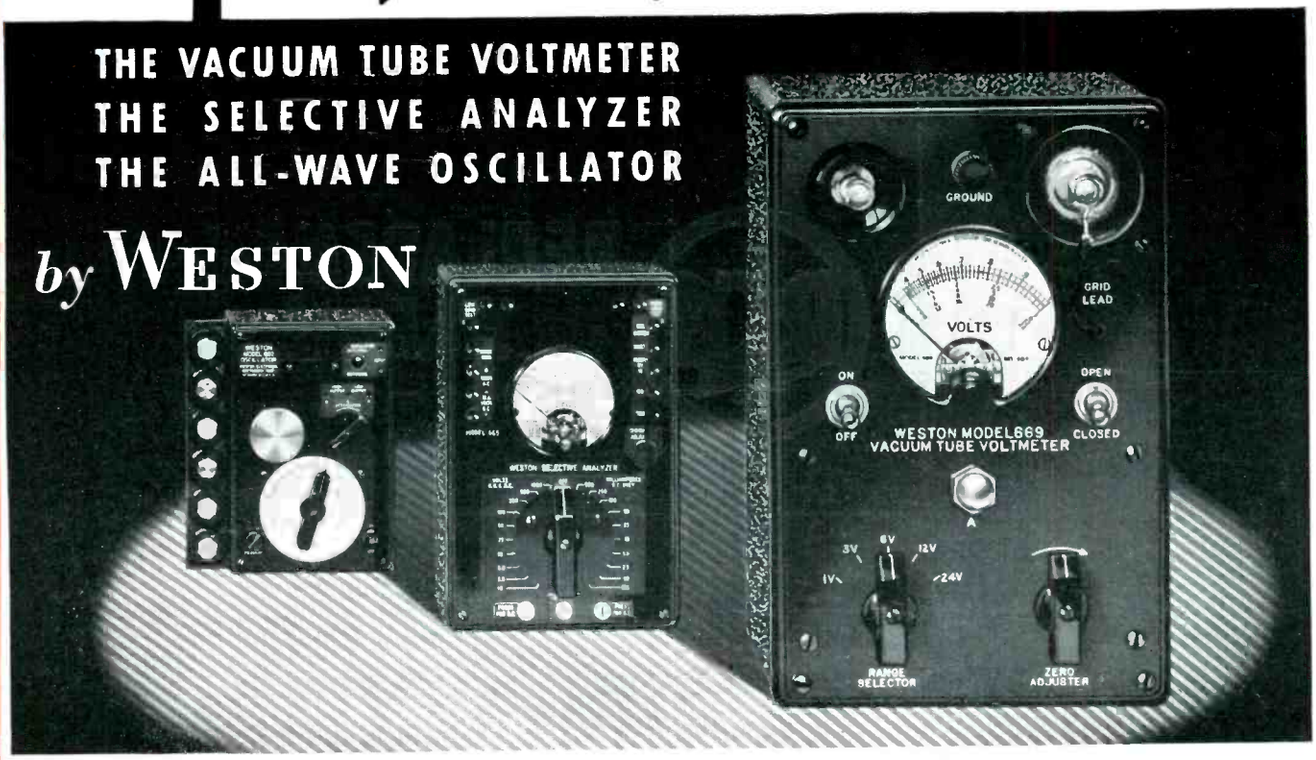

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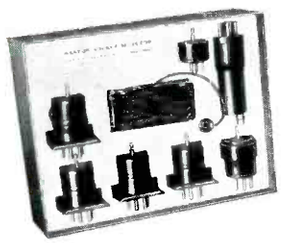

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