RCA Victor

SERVICE NOTES

for

1934

Broadcast Radio Receivers

All-Wave Radio Receivers

Phonograph Combination Instruments

Miscellaneous Service Information

Service Division

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

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INTRODUCTION

The Instruction Books and Service Notes contained herein are for the radio receiver and phonograph combination models sold by the RCA Victor Co., Inc., during the year 1934. This information has been compiled for RCA Victor Distributors and Dealers for use by their personnel in conjunction with the servicing and replacing of parts in the instruments listed.

Proper operation of any radio receiver is dependent upon correct service methods and replacement of defective parts. We earnestly recommend that you follow the instructions given, use the equipment recommended and replace defective parts with genuine RCA Victor Factory Tested Replacement Parts. Your Distributor will be glad to obtain any part or service equipment mentioned in this book and give you every possible assistance in the performance of your work.

CONTENTS

The Booklets and Data Sheets Listed are Contained in this Volume in the Order Indicated

Why RCA Victor Instruments Are Easily Serviced

The Model Shop

OF VITAL interest to every RCA Victor Dealer and Service Engineer is the RCA Victor Model Shop. It is pictorially presented here for the first time.

There are two primary functions of the Model Shop. Here every new RCA Victor receiver, every new test instrument is born. Drawings for new merchandise come from the Engineering Staff and, after careful study, the first 100 units are turned out by hand. If there is anything in the blue printed specifications that proves impractical under actual shop conditions, it is quickly disclosed and the Engineering Staff is called for consultation and necessary change.

But the actual construction of new circuits, new or improved use of tubes, new merchandise, is only the beginning of the activities of the Model Shop. When the hand-made sets are completed, they are housed in dull, drab-looking cabinets having the exact acoustical properties of the cabinets designed for the receivers —"Greys," they are called—and are shipped to all points of the compass, to every section of the United States, but only to RCA Victor Field Engineers. These men put the new receivers through their paces in every conceivable way.

In the very shadow of the most powerful broadcasting stations, all new receivers are given the acid test for performance. On the burning plains of Texas, they must perform with the

same fidelity of tone that characterizes their performance in the highest points of the Rockies. Each RCA Victor Field Engineer virtually lives with the new instrument while it is in his possession, and finally returns it with his report and recommendations. Again the Model Shop tests the returned receivers; gives careful consideration to every recommended change. Then when the Engineers are satisfied that the receiver is the finest that can be produced, blueprints and hand-made, field-tested sets are turned over to the production department, and a new RCA Victor is on its way to hundreds of thousands of homes.

Practically every operation in the manufacture of a radio set is performed in the Model Shop, and all of them by hand. Semi-automatic machinery is used in coil-winding, braiding, etc., but for the most part, every operation is a hand operation. And yet the Model Shop occupies only a small section of one floor in one of the many RCA Victor buildings.

The construction of new receivers from blueprints is but one of the two major functions of the Model Shop. Indeed, it is the primary function. But no less important to the RCA Dealer and Service Engineer is the fact that in this shop the work of the Service Engineer is constantly being simplified. Behind all this there is but one objective—to make the work of the Service Engineer less complicated, to make it easier for the Engineer to make repairs and replacements on RCA Victor sets.

Here our own staff of Field

Engineers comes frequently, and from every quarter of the globe. With them, they bring the ideas they have personally developed while making field tests of the Grey-housed models. And with these ideas they go to work. Every facility of the shop is at their command. The Engineering Laboratory, with its costly, modern, scientific equipment, is open to the visiting Field Engineer. A work bench is assigned, tools are provided and here the RCA Field Engineer proceeds to build into the set personally the changes that he believes will prove most helpful to the army of Service Engineers. But that does not mean always that the recommended changes will be made. It develops sometimes that what might be gained by such changes is more than lost in other ways. But conferences of engineers and countless tests demonstrate the practicability of any suggested plan. Every suggested change or improvement is given careful consideration. That improvements are constantly being made is attested by photographs on the following page, which illustrate the ease with which all parts of the typical RCA Victor chassis may be reached by the Service Engineer, as compared with the intricate job of getting at the older models.

KEY TO ADJACENT VIEWS

Upper Left: Aligning Gang Tuning Capacitators

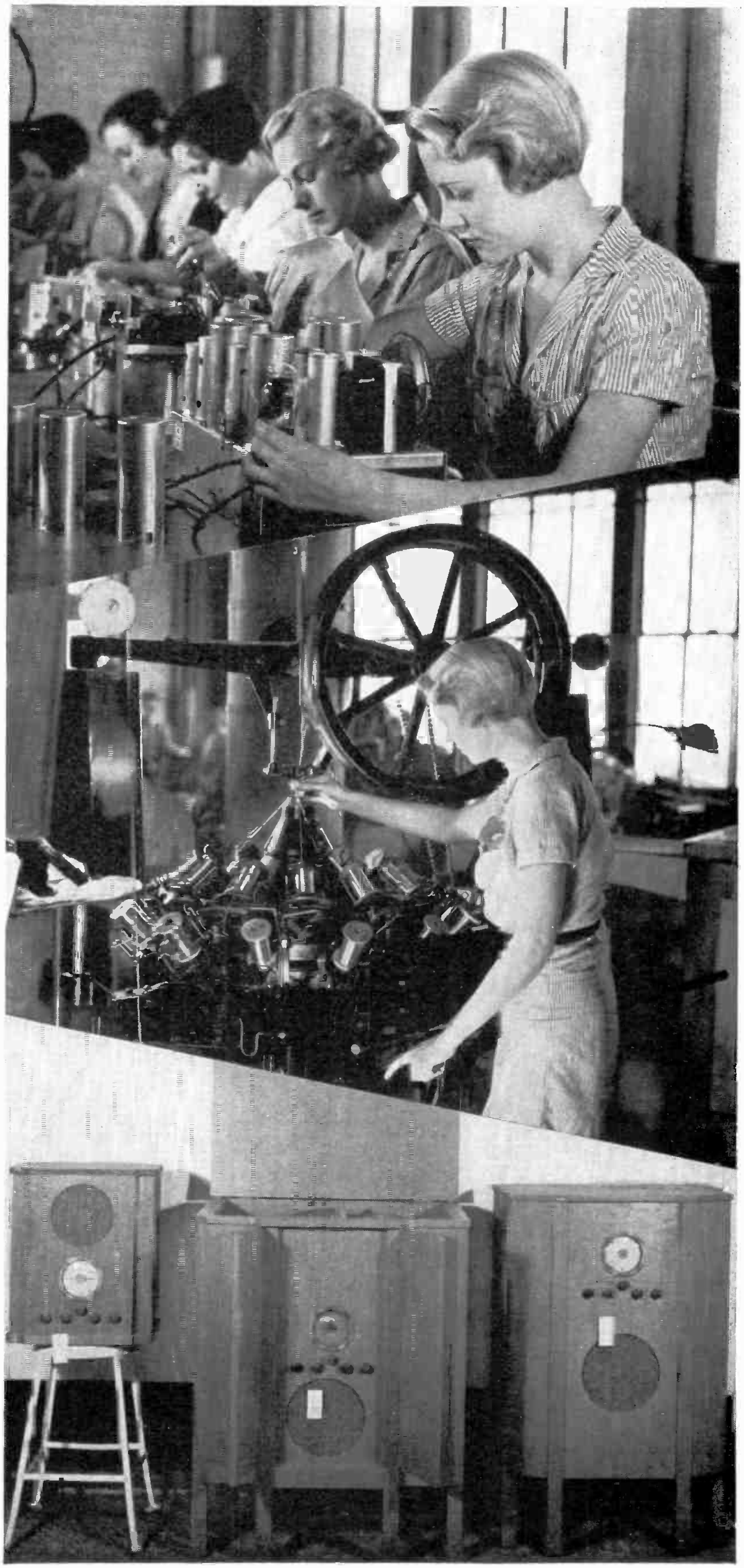
Center Left: General View of Electrical Laboratory

Bottom Left: Impregnating R F Coil Assemblies

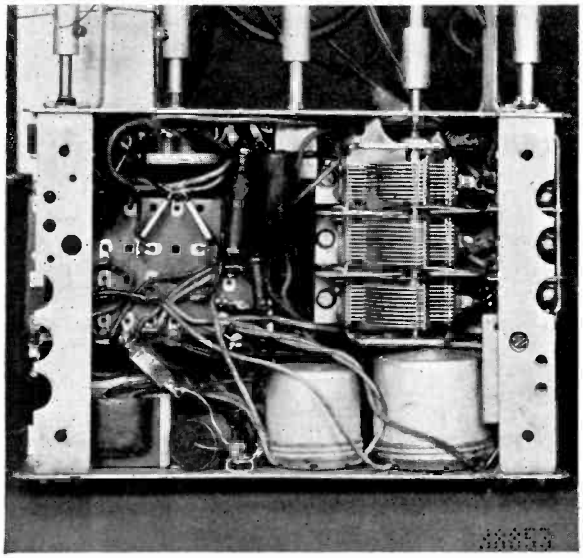
Upper Right: Model Shop. Main Production Line

Center Right: Shielding a Braided Cable

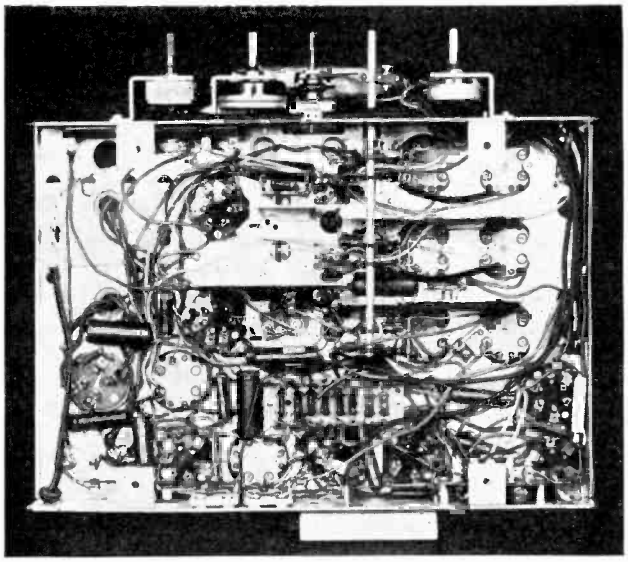
Bottom Right: Grey Cabinets, housing hand-made chassis for field tests



These pictures show how the RCA Model Shop simplifies the Radio Service Engineer's problems



Chassis Model 331 of 1934, built in layers



Chassis Model 143 of 1935, all parts accessible

Year after year RCA Victor simplifies and makes easier the sale and servicing of RCA Victor instruments, attachments and parts . . . Daily, the Model Shop is striving to make easier and more profitable the work of the Service Engineer.

RCA Victor

LABORATORY APPARATUS

In conjunction with the design and manufacture of Radio Receivers, RCA Victor Engineers have felt the need for certain types of Laboratory Apparatus not generally available. This equipment may take the form of entirely new apparatus or it may be refinements to existing equipment.

The following pages describe several pieces of apparatus which are used by the Engineering Organization of the RCA Victor Company and which are available for separate sale. In the manufacture of this equipment, the Engineers responsible for its design have had but one consideration to be met in its design. That consideration is to produce the very highest quality in respect to both electrical and mechanical design.

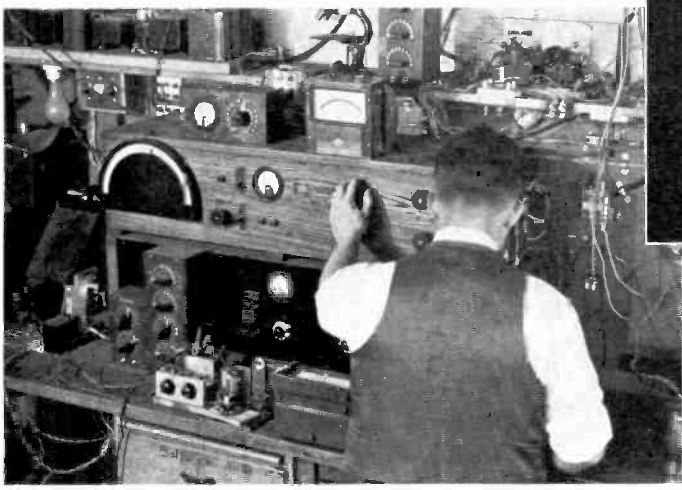
The following items are typical of the equipment manufactured under these considerations. We solicit your inquiries pertaining to them or to any other apparatus of special design and manufacture.

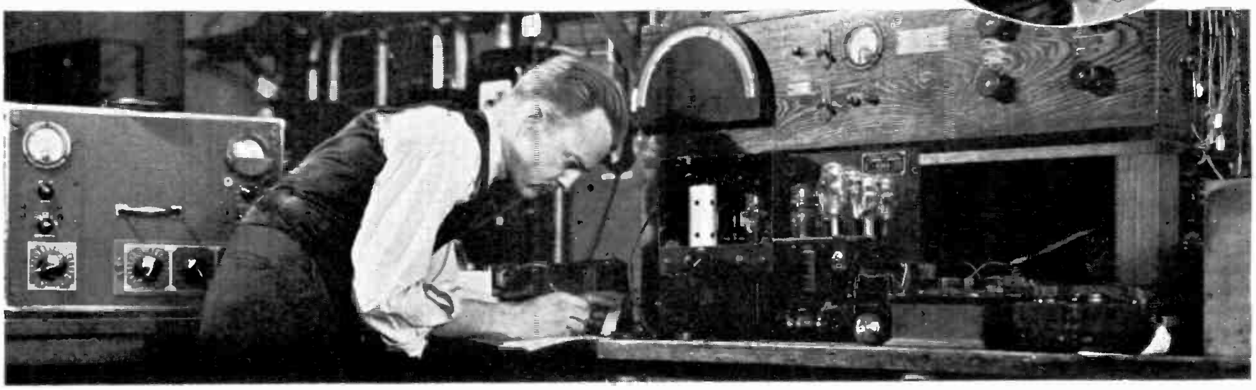
RCA PARTS DIVISION

RCA Victor Company, Inc.

CAMDEN, N. J., U. S. A.

WHERE RCA LABORATORY EQUIPMENT IS DESIGNED AND USED





RCA STANDARD SIGNAL GENERATOR

TYPE TMV-18-D

FEATURES

WIDE FREQUENCY RANGE	Standard coils from 100 kc to 10,000 kc Extra coils for 25 kc to 25,000 kc.
CONVENIENT OPERATION	Coils Plug in from Panel Front. Simplified Controls.
LARGE SCALE PRECISION METER	Knife Edge Pointer and Mirror.
MINIMUM STRAY FIELD	Double Shielding and Heavy Aluminum Castings.
MINIMUM FREQUENCY MODULATION	Special Compensated Circuit.
IMPROVED PRECISION DIAL	Scale with 3750 Divisions. Capacitor with 270° rotation. Worm Driven Vernier.

ELECTRICAL DESIGN

The standard signal generator Type TMV-18-D is an instrument for obtaining accurate quantitative data for the rating of radio receivers on a basis of performance standards. It permits all the standardized tests for broadcast receivers, and, in addition, permits tests and measurements of superheterodynes, intermediate frequencies and also in the major portion of the present high frequency band.

The voltage range is sufficient to meet all requirements of over-all receiver characteristics and, also, stage-by-stage radio amplifier and detector characteristics and other high frequency measurements.

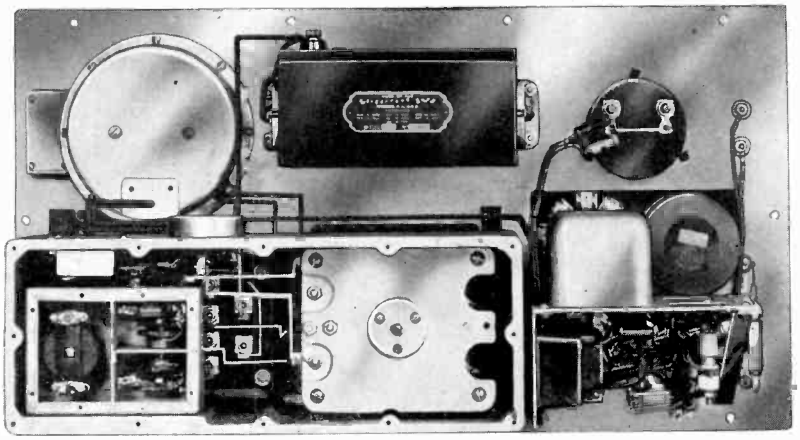
The generator consists essentially of a 400 cycle modulating oscillator, a modulation meter, a radio frequency oscillator, a thermocouple meter for reading the attenuator input voltage, and a resistance network attenuator.

The instrument employs a tuned plate type radio frequency oscillator using an impedance stabilized circuit which gives substantially constant output over the entire frequency range. The output of the oscillator is controlled from the front of the panel. This control is a carefully selected r-f pad network of such design that a constant load is maintained on the oscillator for all values of output. The frequency range of 100 kc to 10,000 kc is covered by means of a variable capacitor and six plug-in coils (additional coils are available as accessory equipment to extend the frequency range down to 25 kc and up to 25,000 kc). The capacitor has a split stator so arranged that the capacitance for tuning the low frequency coils is approximately three times greater than that used for tuning the high frequency. All switching is accomplished automatically by changing coils, eliminating panel switches and dead-end defects in the coils. The capacitor is driven by a single precision dial.

A self contained vacuum tube oscillator furnished a modulating voltage at a frequency of 400 cycles. Terminals are provided so that an external modulating voltage may be used for modulating at frequencies from 30 to 7,000 cycles, if desired. A switch with knob on the front of the panels provides for changing from internal to external modulation. The modulation meter is so designed that variations in the battery voltage do not introduce any error into the readings obtained with this meter.

A thermocouple meter with a long horizontal scale, mirror, and knife-edged pointer is provided for the reading of the r-f input voltage to the attenuator. The measurement of the r-f attenuator input voltage rather than current, eliminates errors due to reactive components of current in shunt with the attenuator and errors due to any small inductances in the attenuator network, which are particularly objectionable at the higher frequencies. The meter design and calibration contribute greatly to the ease and accuracy of reading. The meter scale is marked directly in microvolts from 0.25 to 5.0.

A tapped resistance network is used for attenuating the voltage output of the oscillator to the desired level. The attenuator control is marked in steps with multiplication factors for the output voltmeter. The steps are 0; 1; 3; 10; 30; 100; 300; 1000; 3000; 10,000; 30,000; 100,000 and 400,000. The output is obtained by simply multiplying the output voltmeter reading by the attenuator multiplying factor. The attenuator steps facilitate the taking of band width selectivity measurements are 10, 100, 1000, and 10,000 times the input at resonance. Change of the attenuator dial position does not shift the frequency of the oscillator.



PERFORMANCE

R-F VOLTAGE OUTPUT

The output is continuously variable from 0.25 microvolts to 2 volts at any carrier frequency. The r-f output voltage varies less than 12 percent with change of the frequency over the range of any coil.

MODULATION CHARACTERISTICS

The internal 400 cycle oscillator is capable of modulating the output up to 80 percent in 10 percent steps. The instrument employs a self-calibrating modulation meter accurate to within 10 percent at any carrier frequency. With the modulation meter held at a constant setting, the percentage modulation of the r-f output will not vary more than 5 percent over the range of 30 to 7000 cycles for carrier frequencies above 215 kc. For carrier frequencies from 150 to 215 kc this variation is not over 10 percent and from 90 to 150 kc, not over 10 percent for audio frequencies from 30 to 5000 cycles.

OUTPUT SYSTEM

The resistor attenuator is a specially designed combination series and ladder network and is accurate to within 2.5 percent between 100 kc and 1,650 kc and to within 10 percent between 1,650 and 10,000 kc. The precision thermo-voltmeter used to measure the input to the attenuator is accurate to within 0.5 percent at 20° C. Errors due to temperature variations from this value are approximately 0.25 percent per degree Centigrade.

FREQUENCY MODULATION

The shift of the carrier frequency, for oscillator plate voltage changes equivalent to 50 percent modulation is not greater than 200 cycles total shift for carrier frequencies below 5,100 kc. For higher frequencies up to 10,000 kc the shift will not be greater than 0.03 percent of the carrier frequency plus 500 cycles times the percentage modulation.

HARMONIC CONTENT

The harmonic content of the 400 cycle internal oscillator is less than 5 percent. Tests made in the range of 215 to 750 kc. show a total r-f harmonic content of less than 2.5 percent

FREQUENCY CALIBRATION

The accuracy of the frequency calibration is plus or minus 0.5 percent. The condenser can be set to an accuracy of 0.05 percent. Calibration curves together with calibration data for expanding the curves to any desired degree are furnished with each individual equipment.

LEAKAGE

Grounds, filters and shields are arranged to reduce stray r-f voltages to a minimum. Battery leads, meters and controls are so filtered, shielded and insulated that no appreciable r-f voltage can be picked up by actually touching the control frames and binding posts (except output binding posts) with the antenna lead of a sensitive receiver. The plug-in coils are designed to reduce stray fields to a minimum and in addition are enclosed in individual cans. Potential differences between any external grounded point, meters or controls, are less than 0.1 microvolt. The stray field is not sufficient to affect the accuracy of measurements within the range of the instrument.

MECHANICAL DESIGN

The complete signal generator is contained in a rugged aluminum case and is provided with a neatly engraved panel. The case is approximately 21″ long, 12″ high and 9″ deep. The signal generator, exclusive of batteries, weighs approximately 40 pounds. The finish of the cabinet and panel exterior is baked black crystalline varnish.

The internal shields, including the attenuator case, are heavy aluminum castings. This type of shielding eliminates voltage in the attenuator due to ground currents and thereby insures greater attenuator accuracy, especially at the high frequencies.

The various manual controls operate smoothly. The frequency control dial has a 50 to 1 worm gear reducing mechanism with spring pressed gears having 3750 divisions for a full 270 degree rotation.

All controls are marked with words or phrases descriptive of their functions. A clockwise rotation of the controls increases their effect.

The equipment is furnished with a substantial carrying case of wood to protect the signal generator and its coil systems from mechanical injury during transportation. The case is carefully padded with felt and is provided with spring clips on the inside of the lid to hold the five spare coils while not in use. The overall dimensions are approximately 23⅝ inches long by 11½ inches wide by 18½ inches high.

TUBES SUPPLIED WITH GENERATOR

Modulating Oscillator	One UX-112A
Modulation Meter	One RCA-230
R-F Oscillator	One RCA-56

Batteries Required

One 135 Volt Plate Battery Tapped at 90 Volts

One 6 Volt Filament Battery

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RCA PARTS DIVISION

RCA Victor Company, Inc.

Camden, N. J.

RCA UNIVERSAL CURVE RECORDER

Type TMV-36B

In the laboratories of—Radio and Sound Equipment Manufacturers—Technical Schools and Universities—Consulting Engineers and Experimenters—there is very often required some form of Curve Recorder which will enable the engineer to obtain, rapidly, an accurate record of his measurements in the form of a permanent graph or curve.

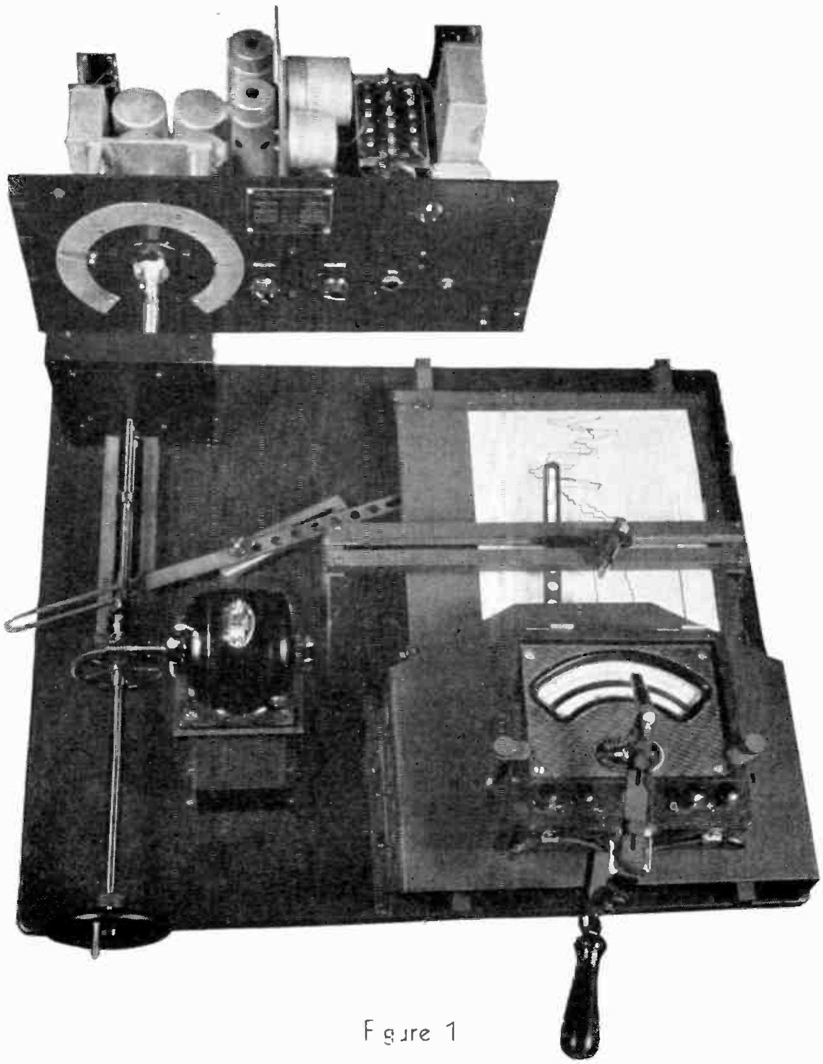

Figure 1

While some engineers still continue to record measurements in tabulated form, or from such tabulations obtain an approximate curve, accurate only at the points taken,—the majority have come to realize the economy and advantages of a Curve Recorder and have therefore adapted this instrument to a variety of equipment in order to solve the many development and manufacturing problems which daily confront them.

For several years the RCA Victor Company has designed and built various types of curve recorders for use in the laboratories and factories. The result of this experience has led to the development and design of a universal instrument which has been used by our engineers for the past two years and is designated the TMV-36B.

Applications of the Curve Recorder to Loudspeaker Measurements

Figure 2 shows the Universal Curve Recorder as used with other standard RCA Victor instruments, for taking the characteristics of loudspeakers. The Curve Recorder is coupled to the TMV-52-E Beat Frequency Oscillator which is fed into the Type AA-4194-B amplifier and both instruments are compensated so that the total overall response of the two units is linear to within plus or minus 0.5 db over the frequency range of 30 cycles to 10,000 cycles. The power applied to the input of the device under test is therefore substantially constant, so that a measurement of the non-linearity of the device under test is possible. The loudspeaker is then placed a given distance from the 44-A velocity microphone* which picks up the sound waves and amplifies them through the 41-B Pre-Amplifier and 40-C High Gain Amplifier, across which is connected the TMV-119-A linear rectifier VT Volt Meter. The overall response from the microphone up to and including the Volt Meter over the frequency range of 30 to 10,000 cycles is linear within plus or minus 2 db, and the gain control may be adjusted in steps of 2 db so as to make possible a sound pressure range from 1 millibar to 400 bars. Once the equipment is set up, loudspeaker curves can be obtained in as short a time as three minutes.

The Curve Recorder may also be used with the TMV-18-D Signal Generator to measure the overall fidelity of a radio receiver by connecting the output of the 4194-B amplifier (See Fig. 4) to the input of a TMV-18-D Signal Generator, which is then modulated over the frequency range of 30 to 10,000 cycles. The output of the TMV-18-D is connected to the input of the receiver under test, and the meter of the Curve Recorder connected to a suitable vacuum tube Volt Meter in parallel to a resistance which is equivalent to the speaker voice coil impedance.

It is further possible to modify this arrangement somewhat so as to measure the overall fidelity from radio frequency input to sound pressure output. In making this measurement, the radio receiver and TMV-18-D Signal Generator are connected between the 4194-B amplifier and the loudspeaker.

This recorder may also be used to plot the variation of resistance with angular rotation of—rheostats, potentiometers, volume controls, etc. When used with the RCA Victor Signal Generator, type TMV-18-D, performance curves of intermediate frequency transformers and amplifiers may be obtained. When used with the RCA Victor Beat Frequency Oscillator, type TMV-52-E, curves of audio frequency filters and networks may be plotted.

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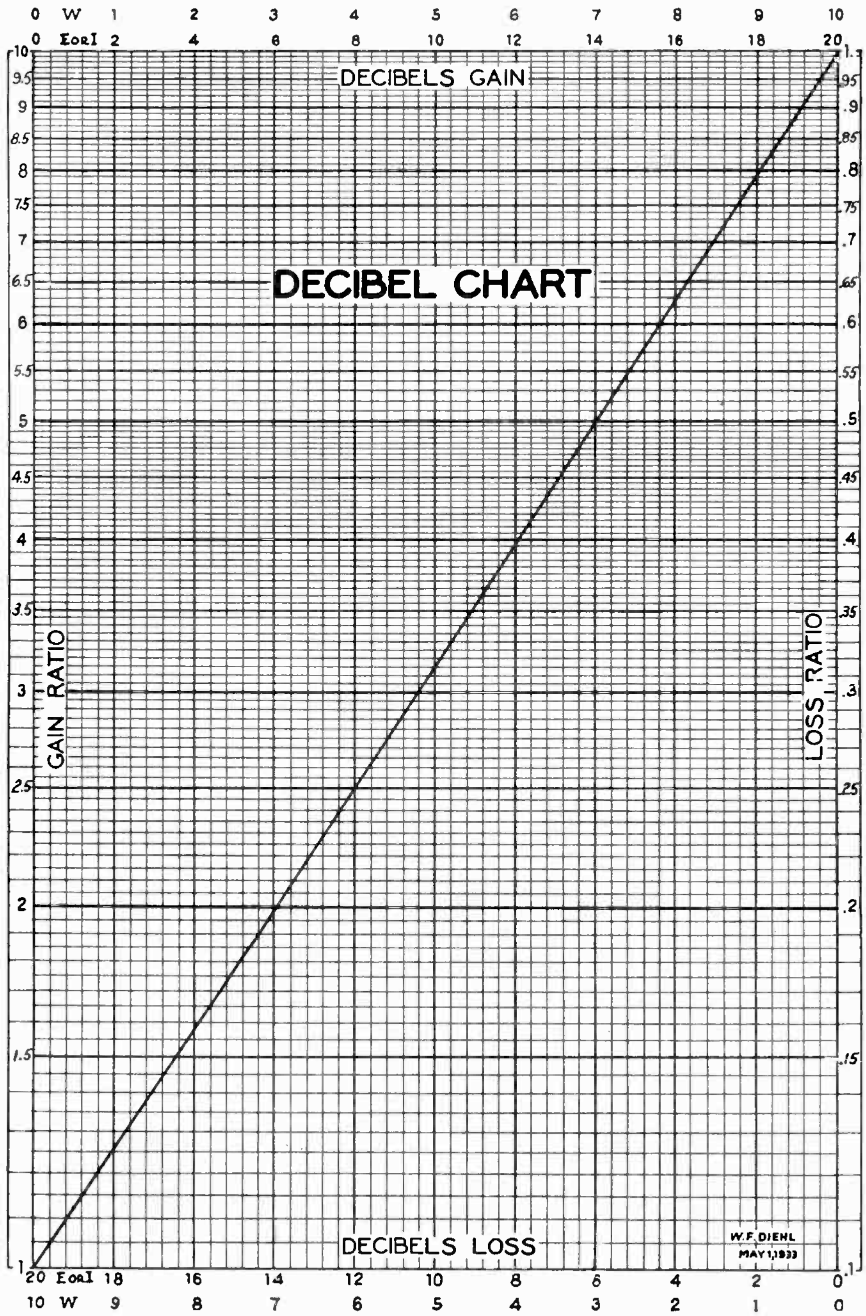
*"Mass Controlled Electrodynamic Microphones, The Ribbon Microphone," by Harry F. Olson, Journal Acoustical Society of America, No. 1, P. 56, Vol. III.

"The Ribbon Microphone," Journal of the Society of Motion Picture Engineers, Vol. XVI, No. 6, 1931, P. 695.

"On the Collection of Sound in Reverberant Rooms with Special Reference to the Application of the Ribbon Microphone," Vol. 21, No. 5, 1933, P. 655, Proceedings I.R.E.

"Use of Pressure Gradient Microphones for Acoustical Measurements," by Irving Wolf and Frank Massa, Journal of the Acoustical Society of America, Jan. 1933, Vol. IV, No. 3.



The Decibel

The decibel (db) 1/10 of the "bel" is a logarithmic unit which may be properly used to express power ratios and power levels only. It is the exact equivalent of the term "Transmission Unit" (TU) which is now obsolete, and is most useful for expressing the relation of the power output to the power input of devices in a communication system, since the overall power gain of the system may be readily obtained by adding algebraically the db gain of the individual devices comprising the entire network or system. When the power output is greater than the power input, the device acts as a repeater or amplifier and there results a transmission gain. When the power output is less than the power input, the device acts as an attenuator and there results a transmission loss.

The number of decibels (N db) by which two amounts of power differ may be expressed as follows:

$N\,db = 10 \log_{10} \frac{P_0}{P_i}$ where P_0 = power output and P_i = power input. If voltage instead of power is used, then

$$N\,db = 20 \log_{10} \frac{E_0}{E_i} + 10 \log_{10} \frac{Z_i}{Z_0} + 10 \log_{10} \frac{\cos_0 \Theta}{\cos_i \Theta}$$

For current instead of voltage

$$N\,db = 20 \log_{10} \frac{I_0}{I_i} + 10 \log_{10} \frac{Z_0}{Z_i} + 10 \log_{10} \frac{\cos_0 \Theta}{\cos_i \Theta}$$

Where I_0, E_0, Z_0, $\cos_0 \Theta$ = the output, current, voltage, impedance and power factor respectively and I_i, E_i, Z_i, $\cos_i \Theta$ = the input current, voltage, impedance, and power factor respectively.

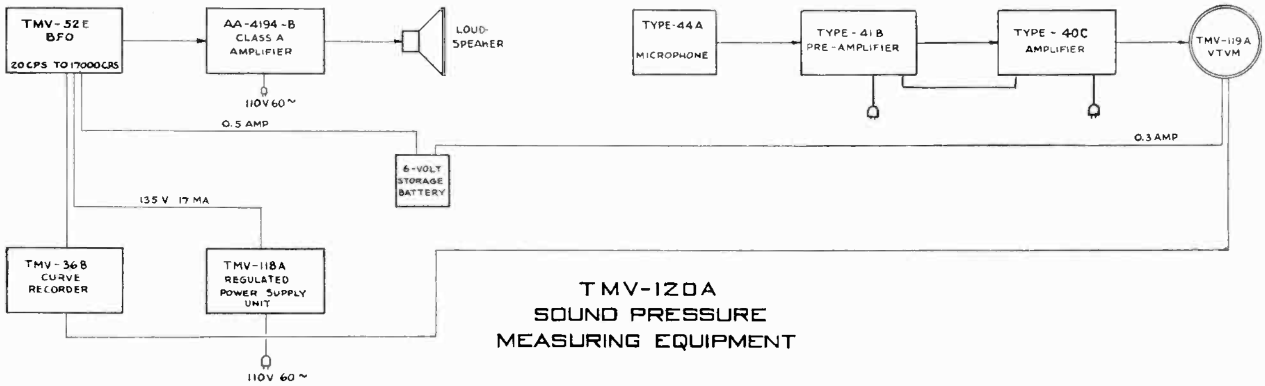
In order to save considerable time in solving the equations the chart shown herewith has been prepared.

Instructions for Using the Decibel Chart

Assume the power output of a device is twice the power input. The power output being greater than the power input, the quantity 2 is located on the left of the chart, on the "Gain Ratio" Scale. Where the horizontal 2 line joins the diagonal line, the gain in dbs is located at the top of the chart opposite the column marked "W." In this example the gain is found to be 3 db. If the ratio were 20 instead of 2, then 10 db would be added, making a total of 13 db. If the power output were less than the input, the ratio would be found on the scale marked "Loss Ratio" and the number of dbs (negative) would be located at the bottom of the chart as indicated on the "DECIBELS LOSS" scale opposite the column marked "W." For example, a loss ratio of 0.50 corresponds to a loss of 3 dbs. A loss ratio of .050 would correspond to a loss of 13 dbs.

When voltage or current is used instead of power, the chart is used in a similar manner with the exception that the scales marked "E or I" are used instead of the scale "W." In this case, when the gain or loss ratio is outside the range of the chart, it is necessary to add 20 db for each power of 10 for power gains, and add minus 20 db for each negative power of 10 for power loss. In using the final complete formula, the number of decibels should first be determined for the voltage or current ratio, then the correction for the impedance mismatch determined from the chart by assuming the impedance ratio to be a power ratio. If a correction is still required for power factor, this can also be obtained from the chart by assuming the power factor ratio to be a power ratio.

NOTE: As the ear is a non-linear device the minimum change in intensity perceptible by the average human ear is not a constant, three (3) db as is generally stated, but varies from one-half (.50) db to eight (8) db depending on the intensity, the frequency and the waveform of the sound. I fthe sound is very loud, eighty (80) db above threshold, then the ear is approximately uniformly sensitive to a change in intensity as small as one-half (.50) db over the entire frequency range of 30 cycles to 10,000 cycles. However, if the sound is of very low intensity, five (5) db above threshold, then the ear is only sensitive to a minimum change of eight (8) db at low frequencies, three (3) db at medium frequencies and eight (8) db at high frequencies.



Complete Sound Pressure Measuring Equipment TMV-120 A

comprises the following instruments

Velocity Microphone	Type 44-A
Pre-Amplifier	Type 41-B
Program Amplifier	Type 40-C
Linear Voltmeter	Type 119-A
Beat Frequency Oscillator	Type TMV-52-E
Universal Curve Recorder	Type TMV-36-B
Regulated SPU	Type TMV-118-A
Class A Amplifier	Type AA-4194-B

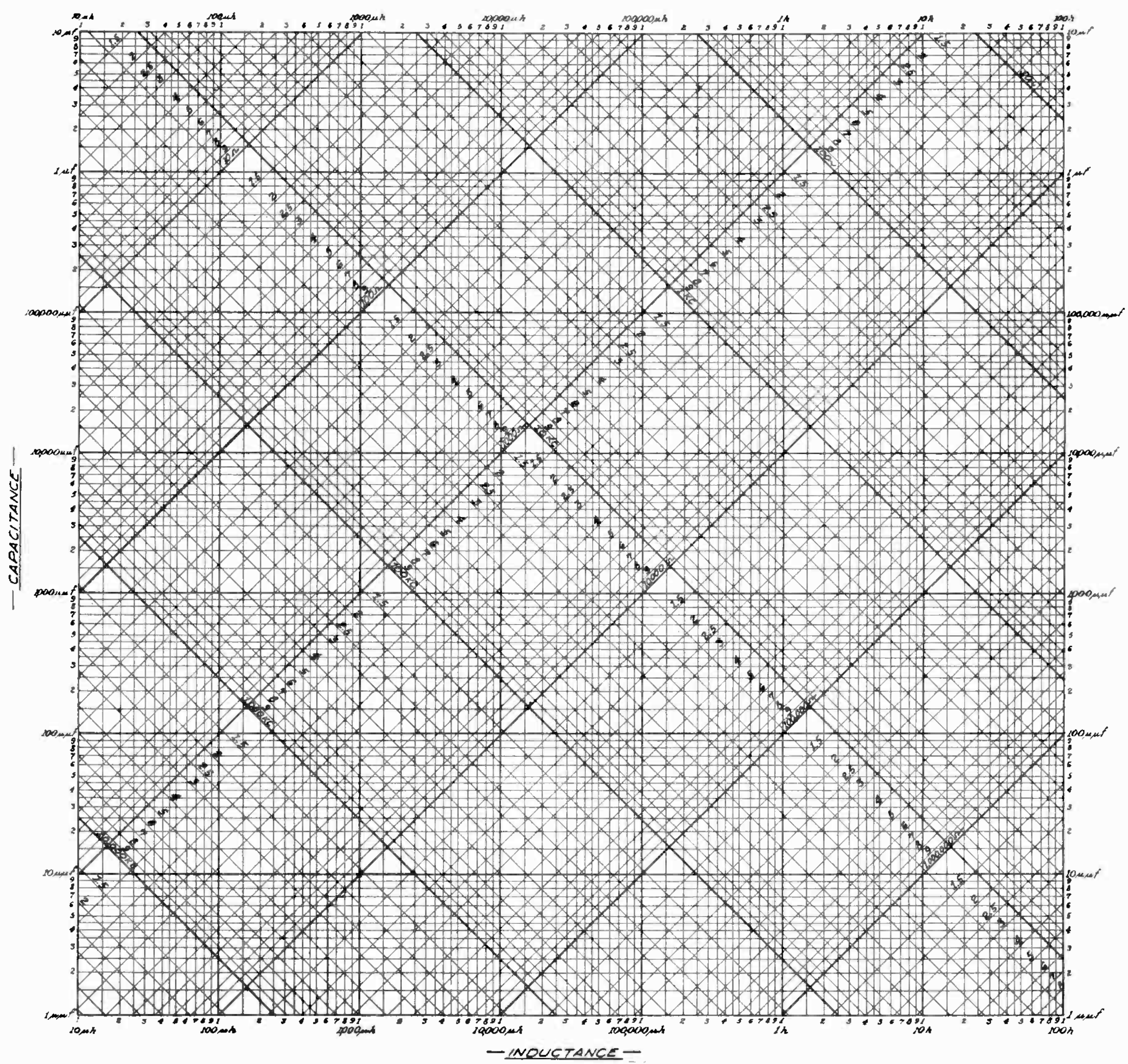
RCA PARTS DIVISION

RCA VICTOR COMPANY, INC.

CAMDEN, N. J.

CHART OF FREQUENCY OR IMPEDANCE VS. INDUCTANCE AND CAPACITY

The Chart shown below provides a quick method of determining several unknown factors when one or more are known. The Chart covers a very wide range, namely, from 10 micro-henries to 100 henries inductance, 10 cycles to 50.000 kilocycles, 1 ohm to 10 megohms and 1 micro-microfarad to 10 microfarads. If, for example, one wishes to know the capacitance to use with a 10 henry inductor to have it resonate at 50 cycles, it can be readily seen that it would be a 1 mfd. capacitor. This is determined by finding the intersection of the vertical line representing 10 henries and the oblique line representing 50 cycles. The intersection occurs at the horizontal line representing 1 mfd. The other oblique line at this intersection represents the impedance at this frequency. This is approximately 3000 ohms.



RCA
BEAT FREQUENCY OSCILLATOR
Type TMV-52-E

RANGE 20 TO 17,000 CYCLES

MARKED STABILITY ELECTRON-COUPLED OSCILLATORS REDUCE REACTION TO A MINIMUM

WIDE FREQUENCY RANGE LABORATORY CALIBRATED FROM 20 CYCLES TO 17,000 CYCLES

CONSTANT OUTPUT VARIES LESS THAN 10% (± 0.5 DB.) OVER ENTIRE FREQUENCY RANGE

GOOD WAVE-SHAPE PROPER TUBE COMPENSATION REDUCES HARMONIC CONTENT TO LESS THAN 2%

HIGH OUTPUT LEVEL OPEN-CIRCUIT OUTPUT 25 VOLTS, LOAD OUTPUT 40 MILLIWATTS (+ 5 DB.)

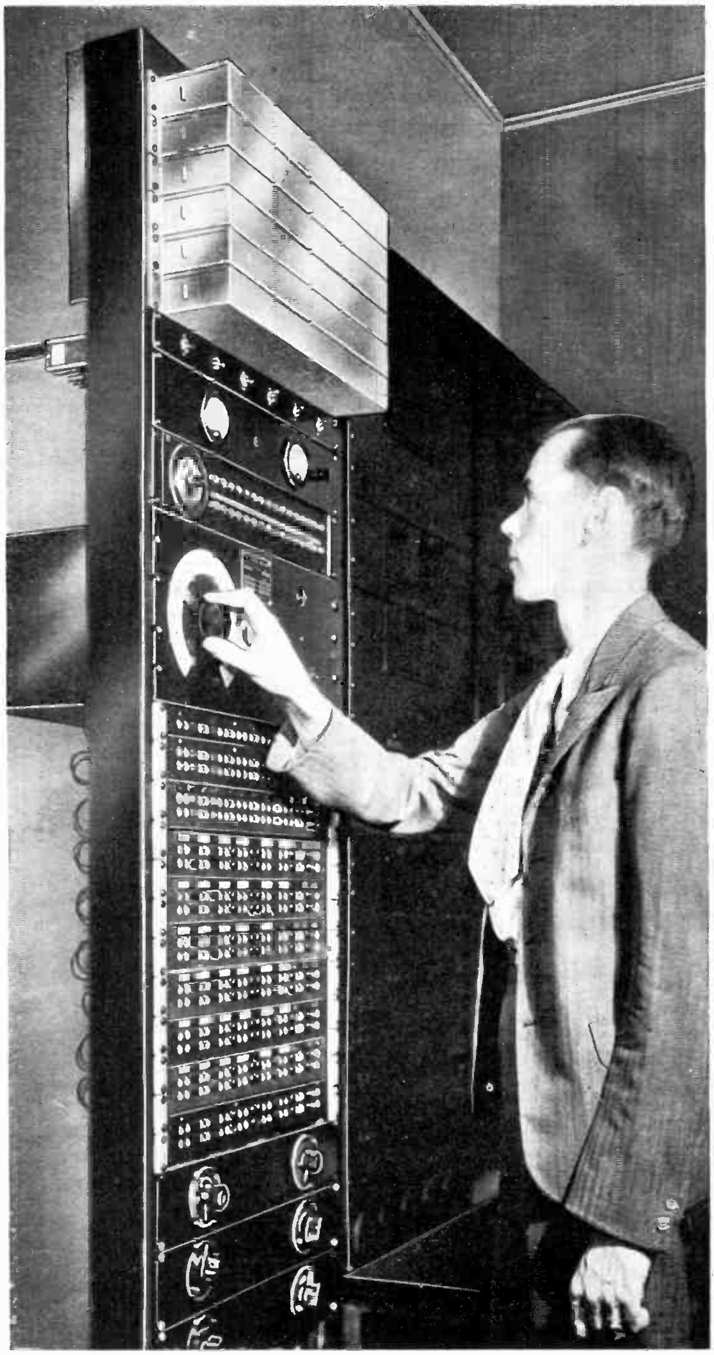
CALIBRATION ADJUSTMENT INGENIOUS REED INDICATOR, QUICK, ACCURATE ADJUSTMENT

UNIVERSAL DESIGN BALANCED OUTPUT TRANSFORMER, 250, 500 AND 5,000 OHM IMPEDANCES

THE TYPE "TMV-52-E" OSCILLATOR

DESIGN THAT DEMANDS ATTENTION — PERFORMANCE THAT PROVES SUPERIORITY

THE RACK MOUNTING MODEL IN THE MASTER CONTROL ROOM OF THE AMALGAMATED BROADCASTING SYSTEM'S NEW YORK STUDIOS



Most beat frequency oscillators have had a certain sameness. The Type TMV-52-E Oscillator is wholly different. At every point it has either entirely new features, or such features as have been available before only in much more expensive equipments. It is much like earlier beat frequency oscillators in that the audio frequency is obtained by beating two radio frequency oscillators, rectified by a detector, and amplified before being fed to the output. It is very different in the manner of accomplishing each step.

Type RCA-840 Radiotrons are employed as radio frequency oscillators. They are connected in electron-coupled circuits of the tuned plate type. The two oscillators are made as nearly symmetrical as possible in order to reduce temperature effect to a minimum. The fixed frequency oscillator is coupled to the detector through a sharply tuned intermediate-frequency transformer, while the voltage from the variable frequency oscillator is fed through a broadly tuned resistance-capacitance circuit. This arrangement tends to eliminate harmonics and aids in preventing coupling between the oscillators. Special band-pass filters and a mixing circuit designed to obtain the proper voltage ratio between the fixed and variable frequency oscillators insure a nearly pure sine wave in the output of the detector. The output of the detector, which is a Type RCA-30 Radiotron, is amplified by a resistance-coupled stage employing a Type UX-112-A Radiotron. The volume control is placed in the grid circuit of this amplifier. The amplifier feeds an output transformer having secondary taps to match 250, 500 or 5,000 ohms and a center-tap for balance to ground.

A reed frequency meter provides for calibration adjustments. The reed is resonant at a low frequency marked "C" on the scale. Adjustment is made by setting the frequency control at this point and tuning the compensating condenser for maximum deflection of the reed.

FREQUENCY RANGE—The frequency control is calibrated from 20 cycles to 17,000 cycles—the oscillator, however, will produce a beat note as low as one cycle without locking in step.

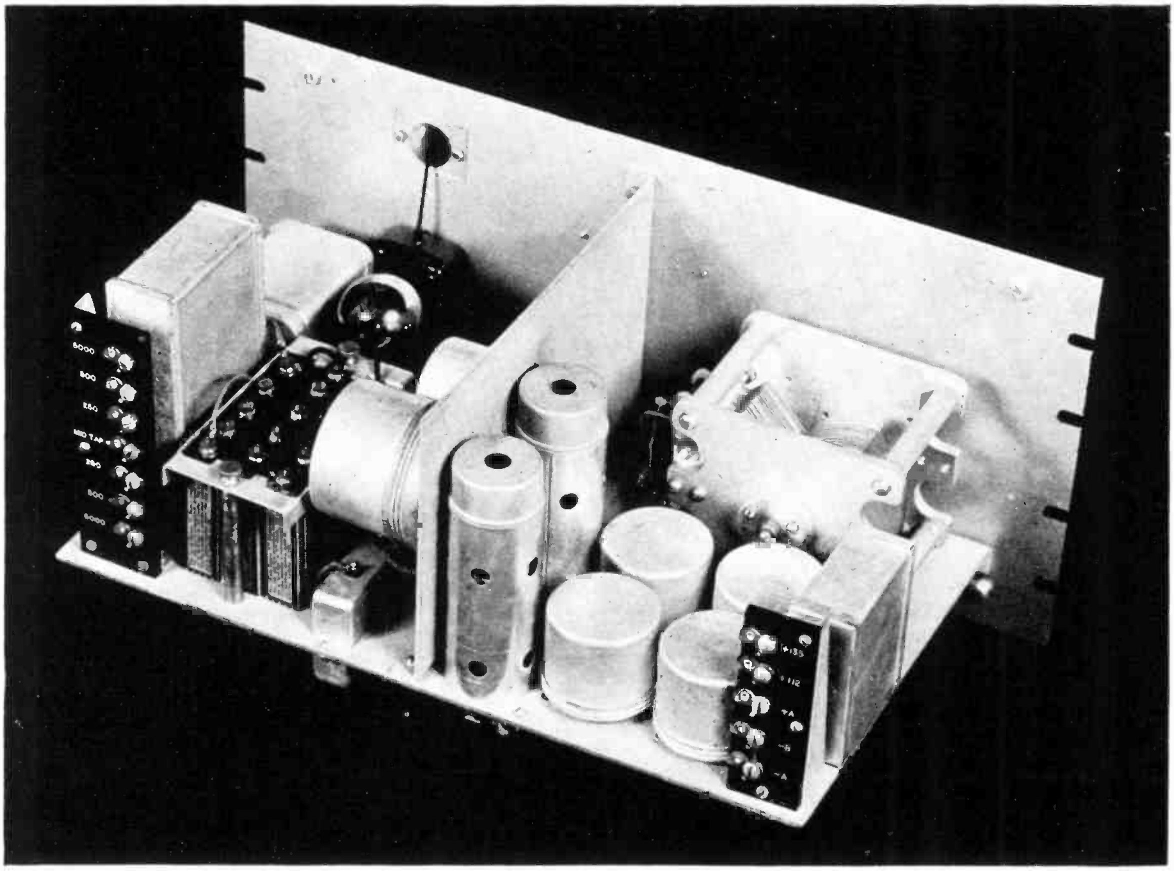
FREQUENCY CALIBRATION—Each Type TMV-52-E Oscillator is individually calibrated against the frequency standards of the RCA Victor Company. Sixty points are calibrated on a scale which extends over more than 15" of a dial 6½" in diameter. When the adjustment has been checked against the reed indicator, this calibration may be relied upon to within 2% over the entire range.

FREQUENCY STABILITY—The oscillators employed are probably the most stable designed to date and they have been made as nearly identical as possible to minimize temperature effect. During ordinary periods of use, the output frequency will not vary more than a few cycles. The drift can, of course, be corrected for at any time by means of the calibration adjustment and reed indicator.

OUTPUT LEVEL—The open-circuit output is 25 volts. The load output is approximately 40 milliwatts. This is equivalent to a +5 db. level as compared to a zero level of 12.5 milliwatts—or a +8.25 db. level as compared to a zero level of 6 milliwatts. The output voltage is constant to within 1 db.—over the entire frequency range.

OUTPUT WAVE-SHAPE—As shipped, and with no further adjustment, the total harmonic content of this oscillator under load is less than 5% over the entire range. However, by adjusting for the tubes used—as detailed in the accompanying instructions—this harmonic content may be reduced to less than 2% above 100 cycles.

OUTPUT IMPEDANCES—A balanced transformer for output coupling is incorporated in this oscillator. Taps on this transformer provide for matching 250, 500 or 5,000 ohm line or input impedances. The oscillator may be used with −A or +A grounded speech systems.



AN OSCILLATOR PARTICULARLY ADAPTED FOR BROADCAST USE

An audio oscillator is one of the most important pieces of test equipment in a modern broadcast station. It is invaluable in determining the frequency response characteristics of amplifiers, volume indicators, studio lines and even of the transmitter itself—in measuring the loss in attenuator networks, station circuits, remote lines, etc. The Type TMV-52-E is probably the first really fine oscillator designed particularly to meet the requirements of broadcasting as well as laboratory use.

RUGGED CONSTRUCTION FOR PORTABLE USE—NEAT APPEARANCE FOR PERMANENT LABORATORY INSTALLATION

Rear of the oscillator assembly showing the neat subpanel construction. The radio frequency oscillators and their associated circuits are at the right—the detector and amplifier stages, and the reed indicator, at the left. Note that all of the oscillator components, except the tuning condenser, are individually shielded to reduce reaction. The aluminum parts are sand-blasted and finished with clear lacquer, which is matched in appearance by the gray opalescent lacquer finish of the other metallic parts. The logarithmic tuning condenser is substantially constructed to insure holding of calibration. The power supply terminals can be seen at the right and the audio output terminals at the left. The whole assembly shown fits into a cabinet for portable use—or, with the addition of four cover supports, into a dust cover for rack mounting.

ELECTRON-COUPLED OSCILLATOR CIRCUITS—THE ANSWER TO THE QUEST FOR STABILITY

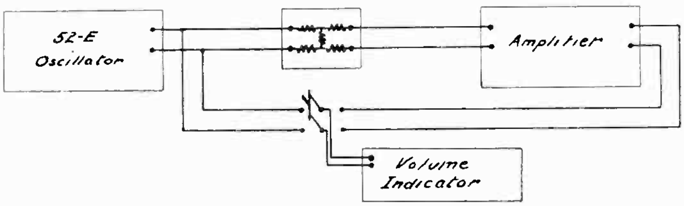
Beating two radio frequency oscillators to obtain a desired audio frequency seems on first thought a simple matter. That it is not is due to the necessity of eliminating reaction between oscillators. The fixed oscillator, for instance, must not change frequency when the variable oscillator is tuned. Similarly the variable oscillator must not lock in step with the fixed oscillator at low frequencies. This cannot be accomplished unless the frequencies of the two oscillators are nearly independent of load conditions.

Commonly used types of oscillators are not independent of load. In practically all of them the output circuit—to which the load is coupled—forms, directly or by inductive or capacitive coupling, a part of the oscillator circuit. Variations in load change the constants of the frequency determining circuit and hence the oscillator frequency. As a result, beat frequency oscillator development has become a search for an oscillator sufficiently stable as to be practically independent of load.

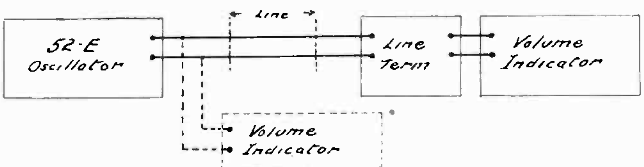
Engineers of the RCA Victor Company believe that in the electron-coupled oscillators used in the Type TMV-52-E Oscillator they have come closer to the solution than ever before. These oscillators are five-element tubes. The third and fourth elements function together as the anode of the frequency determining circuit and also act as an electrostatic shield for the regular plate which is the anode of the output circuit. The frequency of the current in the output circuit is thus determined by the control of electron flow to the plate. No part of the output circuiting forming any part of the frequency determining circuit, load reaction in the ordinary sense is eliminated. The action may be visualized by considering the oscillator tube to be functioning simultaneously as a buffer amplifier—the plate of the oscillator being also the grid of the amplifier. The stability resulting is, in fact, comparable to that which would be obtained if each oscillator were followed by a separate buffer amplifier.

AN AUDIO OSCILLATOR IS INVALUABLE IN TESTING SPEECH INPUT EQUIPMENT

AMPLIFIER FREQUENCY CHARACTERISTIC: The diagram just below indicates the method of obtaining a curve of amplifier gain versus frequency. The pad, which may be either fixed or variable, should have a drop about equal to the gain of the amplifier. With this setup the amplifier gain for any particular frequency equals the pad drop plus the difference in volume indicator readings for the two switch positions. The method may, of course, be used for various equipment items other than amplifiers.



LINE FREQUENCY CHARACTERISTIC: The diagram below indicates a method of determining the frequency characteristic of a line terminating at points separated some distance. Where only relative values are required, a volume indicator is required at the receiving end only, as the oscillator output can be held constant. Where absolute values are needed, an additional volume indicator is required at the sending end.



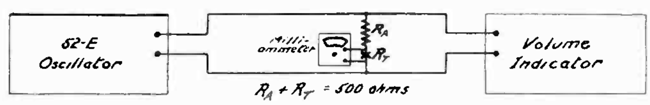
RACK MOUNTING TYPE

When specified for rack mounting, the Type TMV-52-E Oscillator is furnished with cover supports and dust-cover similar to those supplied with other speech input units. The panel is slotted for standard rack mounting and is designed to harmonize in appearance with other standard speech input equipment.

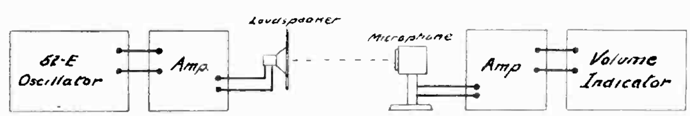
PORTABLE TYPE

Unless otherwise specified, the Type TMV-52-E Oscillator is supplied with a black crackle-finished cabinet fitted with a substantial leather carrying handle. The binding posts on the cabinet are connected by flexible cable to the subpanel. The battery requirements are 6 volts A, 135 volts B, and 22½ volts C.

VOLUME INDICATOR CALIBRATION: The diagram below indicates a method of calibrating a volume indicator using a thermo-couple milliammeter as reference. For a zero level of 12.5 milliwatts, the meter should read 5.0 milliamperes; for a zero level of 10 milliwatts, it should read 4.47 milliamperes, and for a zero level of 6 milliwatts, 3.47 milliamperes. Constant tone is supplied by the oscillator. For such a tone the galvanometer of a volume indicator calibrated to read average levels will show a deflection of 30 on the scale for a zero level input. It should be noted, however, that volume indicators calibrated to read peak levels will show a deflection of only 23 on the galvanometer scale for the same constant tone input level.



MICROPHONE CALIBRATION: The diagram below indicates a method of calibrating a microphone against a loudspeaker which has been previously calibrated by some absolute method. Or, similarly, a loudspeaker may be calibrated against a microphone which has been previously calibrated by some other method, as, for instance, the Raleigh Disc Method. As this method is seriously influenced by acoustical phenomena, the results must be considered only approximate unless full account is taken of the acoustical properties of the room in which the measurements are made.



RCA Parts Division

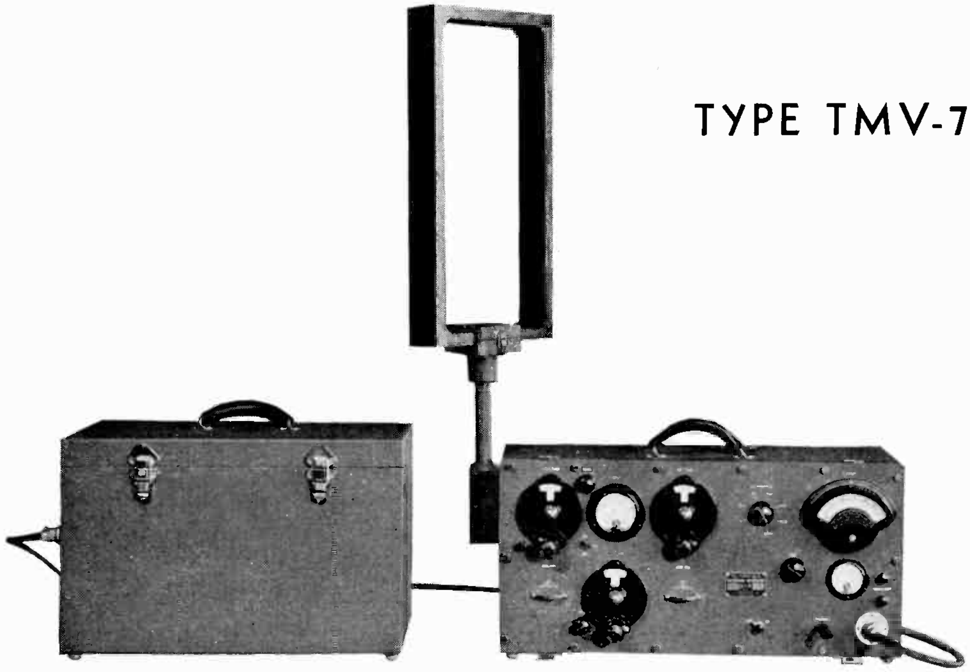
RCA Victor Company, Inc.

Camden, N. J., U. S. A.

RCA FIELD INTENSITY METER

PORTABLE DIRECT-READING SELF-CALIBRATING

TYPE TMV-75-B



COMPLETE EQUIPMENT IN TWO CARRYING CASES, CONSISTING ESSENTIALLY OF AN EXTREMELY SENSITIVE LOOP RECEIVER (OF THE SUPERHETERODYNE TYPE) INCORPORATING A SELF-CALIBRATING OSCILLATOR

FREQUENCY RANGE	500 kc. to 20,000 kc.
FIELD INTENSITY RANGE	20 Microvolts/Meter to 6 Volts/Meter
CONVENIENT OPERATION	Coils Plug in from Front of Panel, Simplified Controls
HIGH ACCURACY	By Means of a Newly Developed Circuit

FOR

BROADCAST STATION SURVEYS

COMMERCIAL STATION SURVEYS

TRANSMISSION TESTS   INTERFERENCE LOCATION

RCA Develops New Field Intensity Meter

By WILLIAM F. DIEHL, Test Methods and Equipment Engineer, RCA Victor Company, Inc.

(Reprinted from Broadcast News)

DEVELOPMENT and field tests have been completed on a new instrument for measuring the field intensity of all type transmitters. This instrument will be designated as RCA Victor Type TMV-75-B Field Intensity Meter and will replace the well-known TMV-21-A instrument which has been in such demand for the past several years and which has proven exceedingly popular due to its portability, wide frequency range and wide range of field intensity.

The increasing interest in field strength measurements and the widespread acceptance of this type of measurement as a figure of merit of the transmitter have indicated to us that certain new features, such as greater stability, higher accuracy, still wider range of field intensity and carrier frequency, are highly desirable if an instrument of this type is to adequately meet the future requirements.

The front cover shows the complete TMV-75-B equipment, which consists of the Field Intensity Meter proper and a separate carrying case to house the loops, plug-in coils and batteries.

The equipment is self contained in two metal cabinets whose weights, less batteries, are each about 30 pounds. While its weight with batteries is somewhat high it is considered that the stability and extreme range of the instrument justify this weight.

As shown in Figure 2, the controls have been so arranged and grouped as to make the instrument easy and simple to operate. Because of the method of calibration, loop constants do not have to be measured, so several measuring operations have been eliminated from previous equipments of this type.

All tuned circuits are controlled by means of vernier dials whose vernier ratio may be varied between 6-1 and 20-1. This makes possible easy tuning of the various circuits at high frequencies without too great a vernier action at the lower frequencies.

The equipment requires a power supply of 25 M. A. at 135 volts for "B" supply and 1.6 amperes at 6 volts for "A" supply. A choice of batteries may be made, depending upon the battery life desired. The approximate life of the various batteries which may be used is illustrated in the following table:

"A" SUPPLY

Type	*Hours*
Four No. 6 cells	4
Eight No. 6 cells (*series parallel*)	15
Six volt storage cell (*motorcycle type*)	20 (*per charge*)

"B" SUPPLY

Type	*Hours*
No. 4156	7
No. 5308	15
No. 2305	60

The instrument will measure intensities between 20 microvolts per meter and 6 volts per meter at carrier frequencies between 500 kc. and 20,000 kc. It consists, essentially, of a loop receiver using the superheterodyne principle in which the intermediate frequency operates at 300 kilocycles. A resistor attenuator operating at 300 kc. is provided in the intermediate frequency amplifier to control the gain of the receiver and, thereby, permit measurements of field strength over a wide range. In order to measure extremely high field intensities, an additional attenuator is provided by C-2, R-1 and C-3 in the schematic diagram. The switch S-2 is provided for switching the additional attenuator in and out of the circuit. A separate calibrating oscillator and mutual inductor attenuator is provided for the purpose of maintaining the calibration. Four loops are provided to cover the frequency range and four sets of plug-in coils are required, one set for the beating oscillator (shown on the print as detector oscillator), the other set for the calibrating oscillator.

The switch S-1 when open disconnects stator plates from the variable condenser C-1 to permit proper tuning in the high frequency range. The variable condenser C-4 is provided for compensation so that the capacity to ground across each side of the loop will be constant.

The field picked up by the loop at the carrier frequency (500–20,000 kc.) is applied to the grid or input circuit of the RCA-78 detector and the frequency changed to 300 kc. by introducing the voltage from the beating oscillator which uses a tuned grid circuit and an RCA-30 tube. The plate circuit of the RCA-78 is tuned to 300 kc. and the secondary of the I. F. transformer (L-9) is connected to a resistance attenuator, the output of which feeds the input of the first I. F. amplifier consisting of an RCA-36. The signal is then amplified by a second I. F. amplifier (RCA-39) and a third I. F. amplifier (RCA-78), after which it is applied to the diodes of an RCA-85 connected in parallel to supply half-wave rectification and also amplified at audio frequencies by the same tube. For the purpose of listening to the signals a jack (J-1) is provided, connected in the secondary of an audio transformer (T-1). For purposes of measuring the output meter (M-3) it is connected in the diode or detector circuit and remains connected and operates regardless of whether the telephone receivers are plugged in or out of the circuit. The switch (S-4) is an "On–Off" switch and the meter (M-2) is a double range voltmeter. Resistors R-4 and R-5 are provided for the purpose of changing the gain in the I. F. amplifier and thereby performing the functions of a volume control.

The Calibration

The calibrating oscillator utilizes an RCA-30 tube in a tuned plate circuit indicated by L-4 and C-7. The output of the calibrating oscillator is applied to the primary L-2 of a mutual inductor attenuator and a thermo-couple meter (M-1) reads the voltage across L-2. The coupling between L-2 and L-1 is fixed and a definite voltage appears across L-1 which is connected in series with the loop, and this voltage acts in the same manner as the signal and is used for the purpose of calibration. Since the secondary (L-1) of the mutual inductor always remains connected in the circuit, no error results, due to changing impedance conditions with calibration.

When a loop antenna is placed in a magnetic field a voltage is induced in its circuit. The magnitude of this voltage is dependent upon the strength of the field, the effective height of the loop and the angle between the field and the loop. When the loop is so directed as to give maximum induced voltage this induced voltage may be expressed by the formula:

$e = Fh$ (1)

where e = induced voltage in microvolts

F = field intensity in microvolts per meter

h = effective height of the loop antenna in meters

If a variable capacitor is placed across the loop antenna and the circuit tuned to resonance with the frequency of the field, a voltage will appear across the loop antenna and condenser larger than the induced voltage by an amount called here, the step-up of the loop, and expressed by the symbol Q. We now have for the voltage across the loop antenna in the magnetic field a voltage E expressed by the formula

$$E = Qe = QF\,h \quad (2)$$

Due to the necessity of balancing the loop to ground to prevent antenna effects, only one-half of this voltage, or $\frac{E}{2}$, is impressed on the grid of the first detector and heterodyned with the heterodyne oscillator. Across the plate load of the first detector will now appear a 300 kc. voltage whose amplitude is dependent on the voltage $\frac{E}{2}$ and a constant, the conversion conductance of the first detector tube designed as M_d. The circuits associated with the first detector are so designed as to make this quantity M_d constant for any input voltage $\frac{E}{2}$ over the range of the instrument at any given frequency and as nearly constant as possible, for all frequencies, without overloading any of the associated tubes.

We now have a voltage E_d at a frequency of 300 kc., the intermediate amplifier frequency

$$\text{and } Ed = \frac{E}{2}\,Md$$

$$\text{or } Ed = \frac{Q\,F\,h\,Md}{2} \quad (3)$$

This voltage is impressed across a resistance attenuator network where it may be attenuated by any amount up to 50,000 in steps of 4 and 5 each, that the attenuation factors are 1, 5, 20, 100, 500, 2000, 10,000 and 50,000. The attenuated voltage is impressed on the grid circuit of the first tube of the intermediate frequency amplifier. The gain of the amplifier may be varied by means of a gain control between rather wide limits. The gain at any constant setting will be designated by M_a and the attenuation of the attenuator will be designated by A_1, A_2, etc. The output voltage of the I. F. amplifier is measured by means of a d.c. microammeter and a diode rectifier. Because of the fact that the diode rectifier is not a true linear device, a marked scale is placed on the meter so that the meter readings are directly proportional to the I. F. output voltage. The output of the I. F. amplifier will be designated as R_1, R_2, etc. Thus

$$R = \frac{E_d \times M_a}{A}$$

$$\text{from (3) } R = \frac{Fh\,Q\,Md\,Ma}{2\,A} \quad (4)$$

$$\text{or } F = \frac{2\,RA}{h\,Q\,Md\,Ma}$$

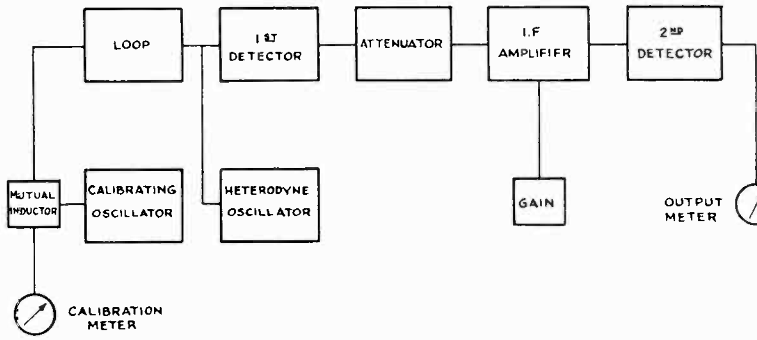


FIGURE 1—BLOCK DIAGRAM OF FIELD INTENSITY METER

In order to be able to calculate the field intensity giving the reading R, it is now necessary to know h, Q, M_d, and M_a. To find these values it is necessary to calibrate the instruments. If a known voltage V is induced in the loop circuit it will be possible to calculate a value which will include all of these constants with the exception of h, which is known from the physical dimensions of the loop. This voltage is introduced in the loop circuit by means of a mutual inductance attenuator.

The mutual inductance attenuator consists of two self-inductances inductively coupled to each other and so shielded as to prevent any capacity coupling. The primary or larger inductance is fed with current from the calibrating oscillator and the voltage across the coil is measured by means of a thermocouple voltmeter. The secondary or smaller coil is connected in series with the loop antenna, opening the loops at their electrical center so that one side of the secondary of the mutual inductance may be at ground potential as well as one side of the primary. The secondary voltage V is proportional to the primary current and the mutual inductance between the two coils,

$$V = 2\pi f I_p \quad L_m \qquad (5)$$

$$E_p = I_p 2\pi f L_p \text{ or } I_p = \frac{E_p}{2\pi f L_p} \qquad (6)$$

$$\text{Thus } V = \frac{E_p}{L_p} Lm \qquad (7)$$

as L_m and L_p are constants, it follows, if E_p is held constant, the secondary voltage V will be constant regardless of the frequency. We thus have a known constant voltage source as long as the primary voltage is held constant by means of the thermocouple voltmeter across the primary coil.

FIGURE 2—A CLOSEUP OF THE CONTROL PANEL ON THE NEW TMV-75-B FIELD INTENSITY METER

If we now introduce the voltage V in the loop circuit as stated we have impressed on the grid of the first detector a voltage equal to $\frac{VQ}{2}$, which will produce an output reading proportional to Md, M_a, and A.

$$R = \frac{VQ\ Md\ Ma}{2\ A} \qquad (8)$$

To calibrate the instrument we will set certain values as calibrating values. These values will be

$$R = R_1$$

$$V = V_1$$

$$A = A_1$$

and will adjust Ma so that these conditions may be met at this frequency. We then have from (8)

$$R_1 = \frac{V_1\ Q\ Md\ Ma_1}{2A_1}$$

$$\text{or } \frac{2A_1\ R_1}{V_1} = Q\ Md\ Ma_1 \qquad (9)$$

If now we place the loop of the instrument in an unknown field of field strength F and allow the gain of the I. F. amplifier to remain Ma_1, but vary the attenuator setting to A_2, the output reading will be some value R_2 and from (4) we have

$$F = \frac{2\ R_2\ A_2}{h\ Q\ M_d\ Ma_1} \qquad (10)$$

Substituting (9) in (10) we have

$$F = \frac{2\ R_2\ A_2\ V_1}{2\ h\ A_1\ R_1}$$

from which the field strength may be calculated, as all quantities are known.

By collecting the terms of the calibrating conditions this formula is simplified to the form

$$F = \frac{R_2\ A_2\ K}{h} \text{ (11) where } K = \frac{V_1}{A_1\ R_1}$$

This formula is still further simplified by substituting in it the formula for the effective height of a loop antenna

$$h = 2\pi S N A F$$

where S = a constant

N = number of turns

A = area enclosed by the loop

For any given loop this becomes

$$h = s^1 f \qquad (12)$$

Substituting (12) in (11)

$$F = \frac{R_2\ A_2\ C}{f} \text{ (13) where } C = \frac{K}{S^1}$$

The value C is calculated for each loop so that calculation of field intensities from R_2 and A_2 are very simple, f being a known and constant quantity for many measurements such as making a station survey or when recording fading. It must be remembered that the quantities Q and Md are not constants with respect to frequency, so the instrument must be recalibrated for each different frequency if the frequency difference is greater than a few per cent. Up to 5 per cent change in frequency these quantities do not vary appreciably.

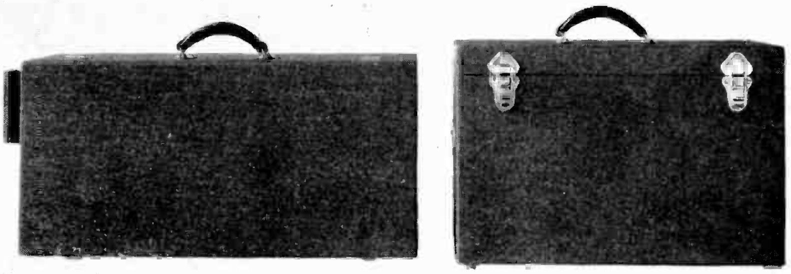
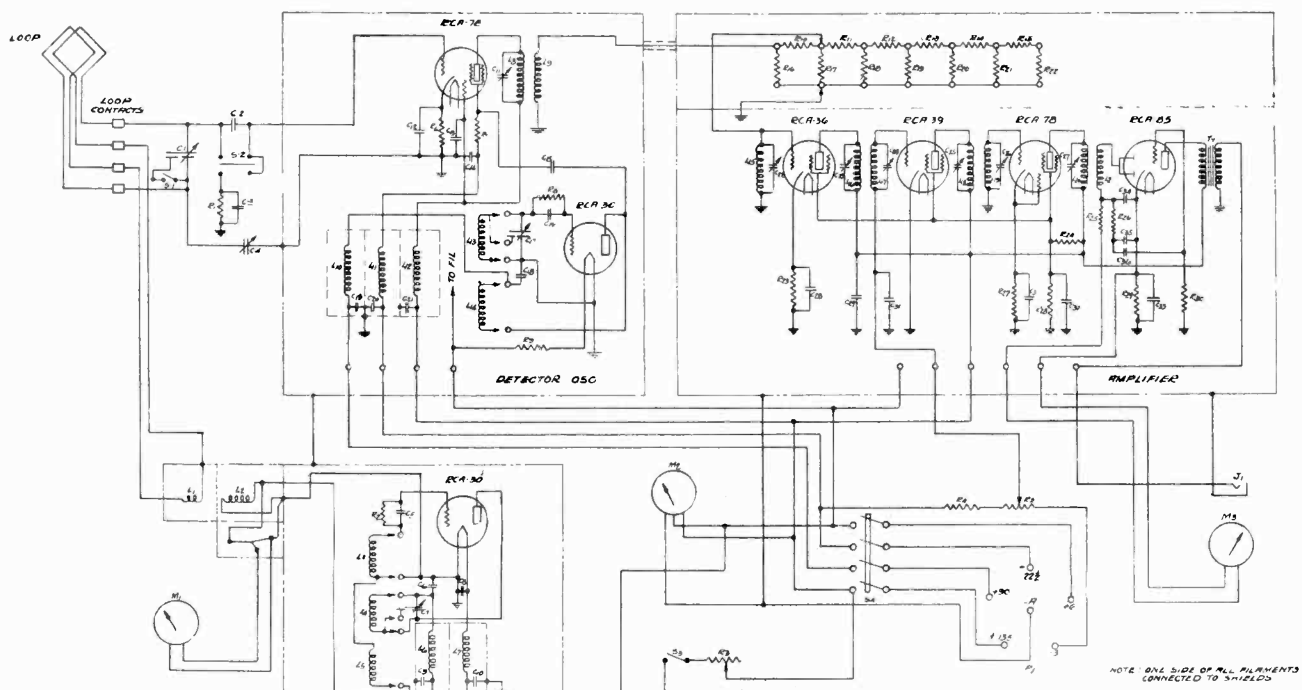


FIGURE 3—THE TMV-75-B FIELD INTENSITY METER EQUIPMENT, CLOSED UP IN ITS CARRYING CASES, READY FOR TRANSPORTATION

In order that the higher field intensities may be measured it is necessary to attenuate the voltage across the loop to prevent overloading of the first detector. This is accomplished by placing a capacity attenuator in the grid circuit of the first detector. This attenuator may be placed in or out of the circuit, as desired. No attempt has been made to keep the attenuation ratio of this unit constant with respect to frequency, and so when making measurements with this unit in the circuit it will also be necessary to calibrate with like conditions.

When calibrating with the input attenuator in the circuit (position L) it will be found necessary to calibrate with the I. F. attenuator on a different position than when the input attenuator is disconnected (position H). The field strength calculated by (13) must therefore be multiplied by the ratio of the previous I. F. attenuator setting for calibration to the new I. F. attenuator calibrating setting.

The writer wishes to acknowledge the assistance given by Mr. H. E. Ghiring, whose experience in field survey work was invaluable in preparing the original specifications, and credit Mr. H. J. Schrader for his conscientious assistance in carrying through the development and design. The writer wishes also to thank Mr. Raymond Guy, of the National Broadcasting Company, for his excellent co-operation and valuable suggestions during the development, and for his data taken in the field using the first development model.



SCHEMATIC DIAGRAM
FOR TMV-75B FIELD INTENSITY METER

Mechanical Design

The Field Intensity Meter is contained in a rugged aluminum case and is provided with a neatly engraved panel. The case is approximately 9½" x 24½" x 11¾" high. The finish is baked gray crystalline varnish.

The accessory equipment case of the same finish for the coils, loops, and batteries measures 9" x 20½" x 13" high. Clips are provided to hold the 8 coils and 4 loops while not in use.

The weight of both cases exclusive of batteries is approximately 30 pounds each.

◆ ◆ ◆

Instruction Books

Each Model TMV-75-B Field Intensity Meter is furnished with a set of instructions for installation, calibration and operation of the equipment, together with detailed wiring diagrams and all data required for satisfactory operation and servicing of the equipment.

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Equipment Supplied

1 Type 75-B Field Intensity Meter with Case
4 Loops
4 Pairs Plug-in Coils
1 Carrying Case for Loops, Coils, Batteries
1 Interconnecting Cable
1 Instruction Book
1 Calibration Chart
1 Set of Radiotrons consisting of
- 2 RCA-78
- 1 RCA-36
- 2 RCA-30
- 1 RCA-85
- 1 RCA-39

Equipment not included but necessary for operation:

1 Set of batteries for A, B and C voltages
1 Set of Headphones

Regulated Power Unit

TMV-118-B

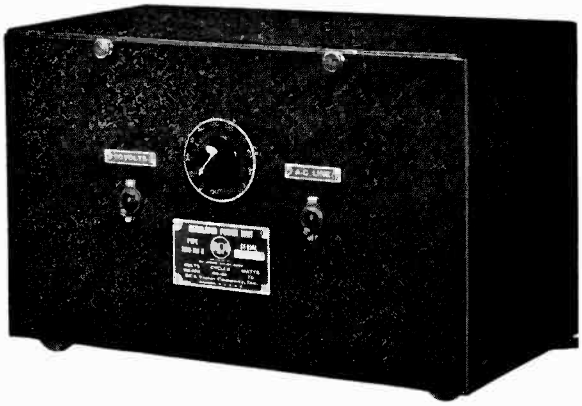
A Constant Source of "B" Voltage

FOR

Designers, Development Laboratories, Electrical Laboratories, Experimenters, Engineers, Manufacturing Tests, Production Inspection, Physical Laboratories, School Demonstration Rooms, Scientific Service Organizations, Universities, etc., etc.

Supplies pure D.C. voltage without ripples . . . Automatically compensates for variation in load and in line voltage

The RCA Regulated Power Unit, No. 9560



Front view of RCA Regulated Power Unit shows accessible controls for 90-volt tap and a. c. line

A Constant "B" Supply

The RCA Regulated Power Unit is a product of our research engineering department, designed to meet the demands of our factory, test and engineering departments for self-regulated voltage power source for its test equipments.

RCA Victor, like other recognized manufacturers in the radio industry, tests and re-tests its products many times during their orderly movement from the design laboratories to final completion.

Nearly every type of test apparatus employs vacuum tubes and the plate or "B" voltage supplied to these tubes must not vary. If the apparatus is to be depended upon for any degree of accuracy, the test load on the tube must be constant. Batteries or other forms of unregulated "B" voltage supply devices have failed to meet these requirements.

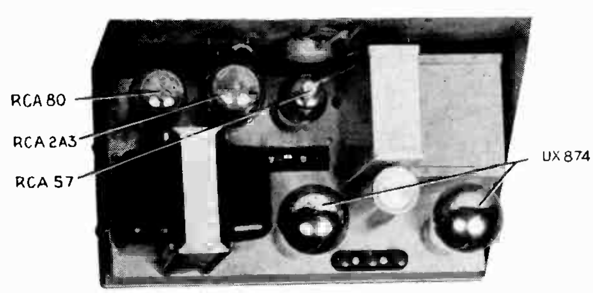
The RCA Regulated Power Unit has answered demands for this service so successfully in our own factories and laboratories that it is certain to assume definite leadership when its performance and possibilities become known to others. It will be found particularly valuable for—

1. Permanent installations of vacuum tube voltmeters, standard signal generators, beat frequency oscillators, field intensity meters, and comparable devices where it is necessary to have an automatically regulated "B" supply available.

2. Design laboratories which need a source of B current to use in the development of detector circuits, I. F. circuits, A. V. C. circuits or other portions of a receiver prior to the design of the power supply for the complete equipment.

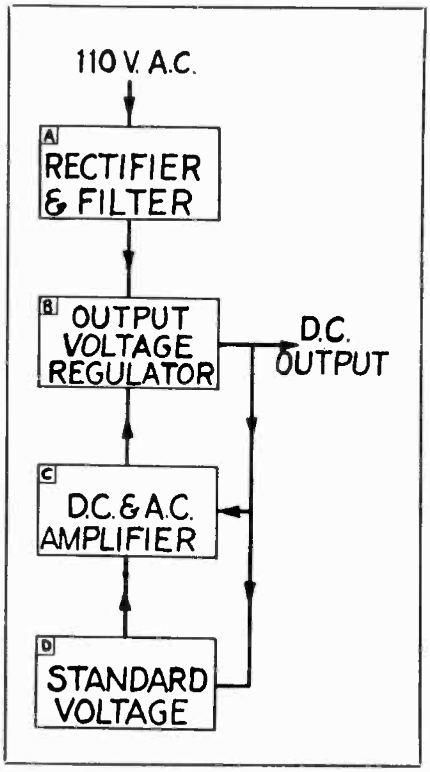
3. Test voltage services which must remain constant under varying conditions of line voltage or load.

4. Many scientific service organizations which operate on a scale comparable to that of the engineering laboratories of radio manufacturers. By means of the RCA Regulated S. P. U. they may isolate portions of circuits and study suspected difficulties independently instead of being forced to rely upon the associated power supply. Those who serve a territory where battery receivers are still in use will find the Regulated S. P. U. to be helpful in meeting the test requirements of varied circuits.



Power Unit from top with hinged cover removed to show compact design and sturdy construction

The RCA Regulated Power Unit



Block Diagram Regulated Power Unit

Circuit Description . . .

The block diagram at the left illustrates the method whereby the performance shown in the curves on page 4 is obtained. The Regulated Power Unit consists of a conventional rectifier and filter (A) and a means of governing the amplitude of this rectified voltage which is delivered to the output binding posts.

The regulator (B) which in this device is a tube, is placed in series with the output terminal. As the regulation is varied, the output voltage is changed so that the tube functions as an automatic rheostat, holding the d. c. output voltage constant with either variable line voltage, variable load current, or both. Reference to the diagram on this page shows that the d. c. output voltage is also balanced against a standard voltage (D) which in this case is a tube. The balanced voltage is applied to the grid of a d. c. amplifier (C). If the line voltage or load current is varied, the difference in voltage between the standard voltage at (D) and the output voltage will appear across the grid of the d. c. amplifier (C).

This amplified difference voltage is caused to actuate the regulator (B) by applying it to the grid of this tube. Thus any variations in the d. c. output voltage are amplified and the regulator (B) attempts to readjust to hold a constant difference between the output voltage and the standard voltage (D).

The block diagram indicates that the unit (C) is both a d. c. and an a. c. amplifier. Should any a. c. be present at the d. c. output terminals it is amplified by the unit (C), impressed on unit (B) in reversed phase and so tends to cancel.

In the Regulated Power Unit the standard voltage (D) is an 874 glow tube. A portion of the output voltage through the use of a potentiometer is compared with this voltage. By varying the position of the potentiometer arm the d. c. output regulated voltage may be varied.

Specifications

TUBES—RCA 80, Rectifier; RCA 2A3, Voltage Regulator; RCA 57, D. C.–A. C. Amplifier; RCA 874, Voltage Standard; RCA 874, Regulator for 90-Volt Tap.

The RCA Regulated Power Unit will deliver voltages between 135 volts and 180 volts d. c. at a current drain between 10 m. a. and 80 m. a. with line voltages of 110 volts ± 10% or 120 volts ± 10% with **a load voltage variation of not over** 2%. As illustrated by the curves on page 4, even higher voltages may be obtained at reduced current drains.

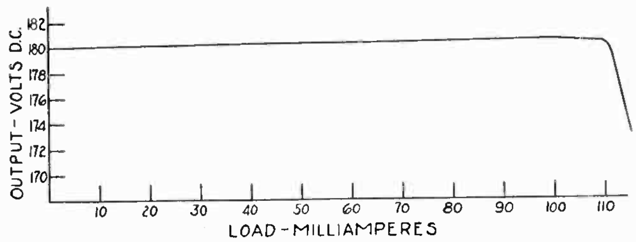
In addition, the RCA Regulated Power Unit will deliver both 90 volts and 135 volts for operation of equipment such as the TMV-180 RCA Signal Generator Type TMV-180 which required both of these voltages. The 90-volt tap will deliver up to 20 m. a. at 90 volts, while the output from the main section is 40 m. a. at 135 volts.

Net Price, F. O. B. Camden $39.50 (With Tubes)

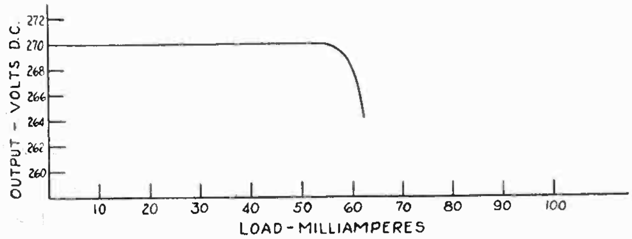
THE RCA PARTS DIVISION, Camden, N. J.

Performance Data—RCA Regulated Power Unit

The accompanying curves indicate the remarkable regulation constancy of the RCA Regulated Power Unit under varying load conditions. Note the negligible variation in output voltage under operating fluctuations more severe than are usually encountered on most power circuits.



VOLTAGE REGULATION VS. LOAD
WITH CONSTANT LINE VOLTAGE (110 V.-60~)



VOLTAGE REGULATION VS. LOAD
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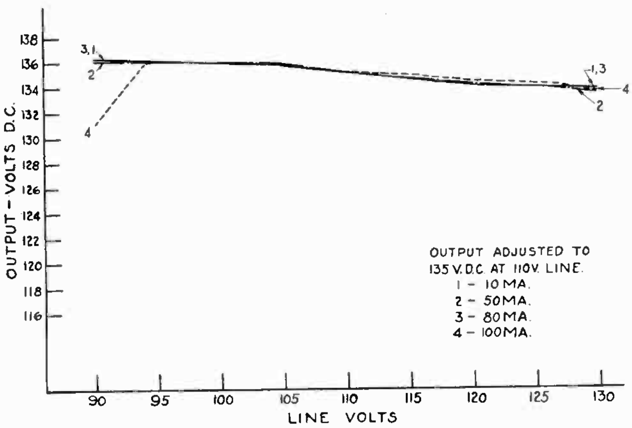
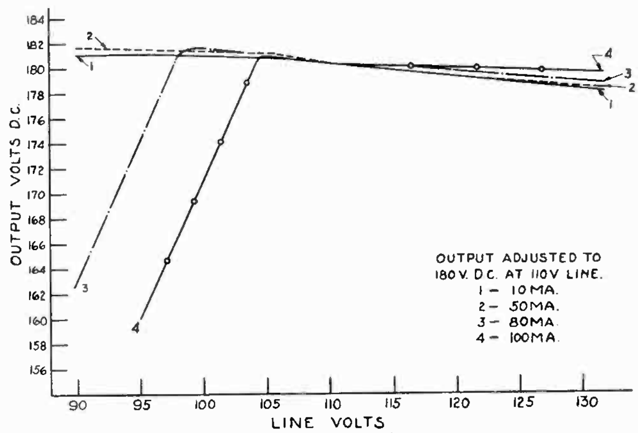
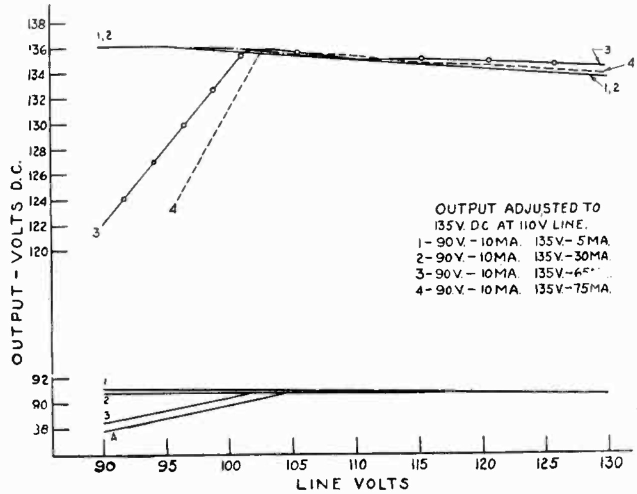


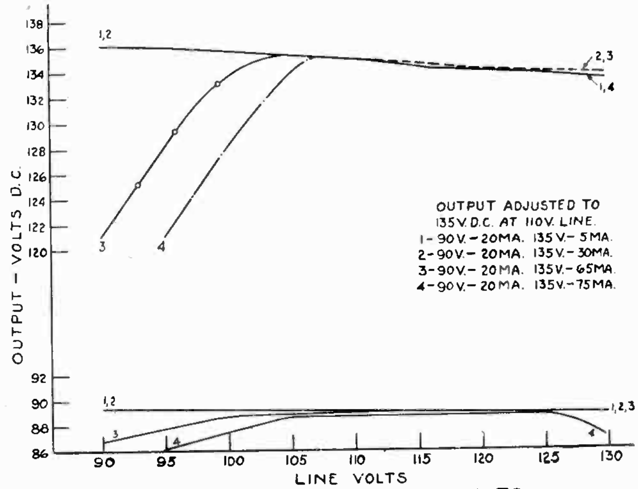
VOLTAGE REGULATION VS. LINE VOLTS



VOLTAGE REGULATION VS. LINE VOLTS



VOLTAGE REGULATION VS. LINE VOLTS



VOLTAGE REGULATION VS. LINE VOLTS

RCA

ANTENNA SYSTEMS

THE original noise-reducing RCA World-Wide Antenna System was one of the sensational radio developments of 1934. Introduced to a skeptical trade early in the year, it was accepted only after severe tests under difficult conditions had proven it to be a distinct advance in antenna practice and a real aid to satisfied short-wave customers.

Newspaper radio columnists and trade paper editors tested it and became enthusiastic about the results. It received columns of publicity all over the country. Amateurs adopted it for their short-wave stations and soon one amateur was telling another, over the air, of the improved results obtainable with this new achievement of the RCA Victor research laboratory.

New improvements now make the RCA World-Wide Antenna Systems more outstanding than ever. Basic principles are unchanged, however. The famous "double-doublet" antennae give double efficiency on *all* the short-wave bands. The switch on the receiver-coupling transformer, for shifting from short-wave to standard-broadcast reception, has been eliminated. RCA World-Wide Antenna Systems now give maximum efficiency on either short-wave or standard broadcast without the need of throwing a switch. Elimination of the switch on the transformer has permitted shortening of the inconspicuous twisted-pair transmission line to 80 feet. As before, additional lengths may be used where necessary to remove the antenna beyond the range of local interference.

The improved RCA World-Wide Antenna System may now be had in four different Kits, a model for every requirement. The De Luxe Kit has all the famous advantages of the improved Kit, plus noise reduction on standard broadcast as well as on short-waves.

RCA World-Wide Antenna Systems are adaptable to any location. Where space is limited, loading coils reduce the length of the antenna. Complete instructions with each kit explain the various styles of installation which may be used to suit conditions.

SELL AN RCA WORLD-WIDE ANTENNA SYSTEM WITH EVERY SET
MAKE SATISFIED CUSTOMERS AND INCREASE YOUR UNIT OF SALE

The Improved RCA World-Wide Antenna System

This is an improved model of the famous Kit that brought new reliability and freedom from noise to short-wave reception. Has all the advantages of the old Kit plus an improved receiver-coupling transformer that automatically changes the system for greatest pickup efficiency on either standard broadcast or short-wave reception. No switch on the transformer.

LESS NOISE—A twisted-pair transmission line and a receiver-coupling transformer eliminate all noise pickup by lead-in.

MORE STATIONS—Scientific "double-doublet" gives high efficiency on *all* the short-wave bands.

STANDARD BROADCAST reception improved. Electrical filter circuit in coupling transformer automatically converts antenna to "T" type for high efficiency on regular broadcasts. No switch to turn.

EASY TO INSTALL—No bulky transposition blocks. Wire cut to proper length and soldering points marked.

ADAPTABLE to all locations. Many types of installations. Overall length may be reduced to 34 feet by loading coils.

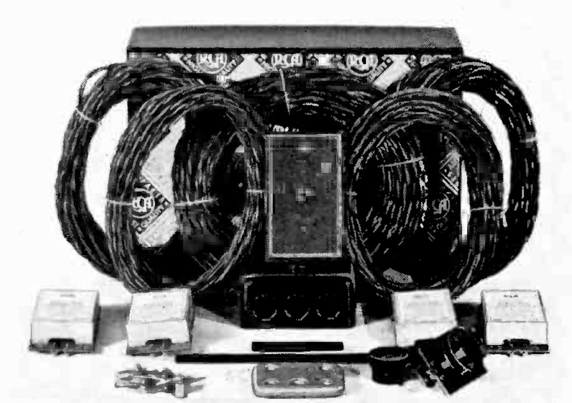
FOR ALL SETS—Improves performance of all short-wave receivers, including older types using adaptors.

CONTENTS OF KIT

2 Rolls stranded antenna wire (Each 46½ feet long)	4 Strain insulators
1 Roll specially impregnated transmission line (80 feet)	2 Nail-on knobs
1 Improved receiver-coupling transformer	1 Entrance-tube insulator
1 Crossover insulator	1 Ground clamp
	2 Links (for attaching coupling transformer
	1 Instruction sheet

Stock No. 9500-A—List Price, $6.00

RCA World-Wide Dealer Demonstration Antenna System



Think what it will mean to be able to make convincing demonstrations of short-wave or standard broadcast reception from radio sets on the floor of your store, when your prospect's interest is high. With the noise-reducing RCA World-Wide Dealer Demonstration Antenna System you no longer need to apologize for the poor reception conditions in your location.

Higher unit sales will result, because you can connect four sets to the RCA World-Wide Dealer Demonstration Antenna System and switch from one set to another instantly.

The RCA Dealer Demonstration Antenna System is the same as the standard RCA World-Wide Antenna System except that it handles four sets which may be placed at convenient points in the store.

CONTENTS OF KIT

1 Transmission line (53 in.)	1 Four-position switch complete with switch box and flush plate
4 Secondary transmission lines (27 in.)	8 Links for attaching transformer
4 Receiver-coupling transformers	1 Instruction sheet
1 Crossover insulator	

Stock No. 9504-A—Net Price to Dealers, $9.85

RCA World-Wide Antenna System Kit of Essential Parts

For dealers, service engineers, or experimenters, who may prefer to buy standard parts locally, the Kit of Essential Parts of the RCA World-Wide Antenna System is provided. All the advantages of the standard Kit (Stock No. 9500-A) may be obtained by the use of this Kit plus antenna wire, insulators, etc., purchased locally. A special instruction sheet discusses results obtained with different lengths of antenna wire and different types of installations.

Amateurs who desire to experiment with the RCA "double-doublet," and dealers and service engineers who buy wire, insulators, etc., in bulk, can get the required special parts for the RCA World-Wide Antenna System in this Kit.

The receiver-coupling transformer included is the improved type having no switch. It *automatically* gives the advantages of the "double-doublet" on short-waves and of a "T" type antenna on standard broadcast.

CONTENTS OF KIT

1 Roll transmission line (80 feet) — 1 Receiver-coupling transformer — 1 Crossover insulator

Stock No. 9550—Net to Dealers, $2.85

The De Luxe RCA World-Wide Antenna System

The ideal antenna system for any home receiver of the all-wave type. Noise reduction on standard broadcast as well as on short-wave reception. A combination of all the desirable features of RCA Shielded Antenna Systems for standard broadcast and the improved RCA World-Wide Antenna System for short-wave reception.

EFFICIENT—Utilizes the famous RCA "double-doublet" which is automatically converted to "T" type antenna for standard broadcast reception. Provides the most efficient type of antenna for *all* types of reception. No switch on receiver-coupling transformer.

LESS NOISE—Man-made "static" can be eliminated on *all* types of reception, insuring enjoyable domestic reception as well as foreign. This kit has both a receiver-coupling transformer and an antenna transformer, both specially designed for this kit.

ATTRACTIVE appearance. No bulky transposition blocks. Inconspicuous transmission line (80 feet) and antenna transformer.

ALL ADVANTAGES of the regular RCA World-Wide Antenna System plus noise reduction on standard broadcast. No switch to change from standard broadcast to short-wave.

CONTENTS OF KIT

2 Rolls stranded antenna wire (Each 46½ feet)	4 Strain insulators
1 Roll specially impregnated transmission line	2 Nail-on knobs
1 Antenna transformer	1 Entrance-tube insulator
1 Improved receiver-coupling transformer	1 Ground clamp
1 Crossover insulator	2 Links (for attaching coupling transformer)
	1 Instruction sheet

Stock No. 9555—List Price, $7.75

RCA AUTO ROOF ANTENNAE

For use in cars which have no built-in antenna or when the factory-installed antenna does not give satisfaction. Makes a neat job at small expense. Easily installed, being simply pinned to the inside fabric of the car roof with six safety-pin type fasteners that come with the antenna. Size 11 inches by 32 inches. Composed of No. 23 gauge cotton-covered soft copper wire wound on heavy flat cardboard, then covered with attractive book-cover paper.

Stock No. 7622 (Gray cover)—List Price, $1.50
Stock No. 7621 (Tan cover)—List Price, $1.50

« « » »

LOADING COILS

Loading coils may be used with any RCA World-Wide Antenna System where space does not permit the use of the standard lengths of the "double-doublet" antenna. They provide the tuning effect lost by cutting the longer doublet. The all-over loss when using loading coils is not appreciable. Not furnished with the kits.

Each loading coil consists of the proper number of turns of enameled wire wound on a high-grade porcelain tube; entire assembly dipped in weather-proof compound. Tinned soldering lugs are provided for easy connection. Size of each coil 2⅛ inches long and $\frac{7}{16}$ inches in diameter.

Stock No. 6958—List Price, per pair, 60 Cents

« « » »

EXTRA TRANSMISSION LINE

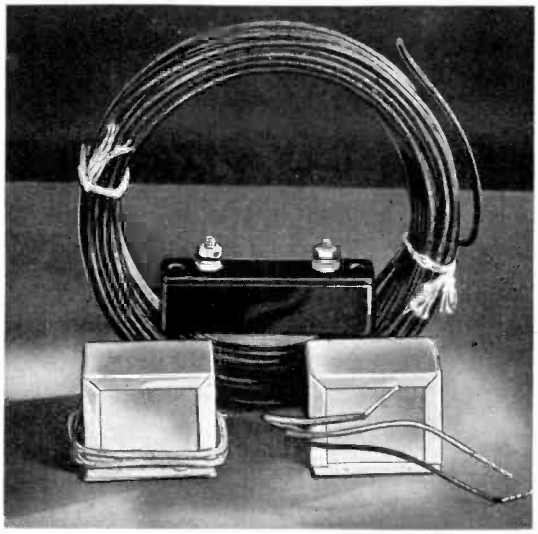
for RCA World-Wide Antenna Kits

Each kit contains 80 feet of transmission line. When less than 80 feet is required, the excess line provided in kit should be coiled behind the receiver. When more than 80 feet, and less than 160 feet, of transmission line is required, a second 80-foot length should be purchased and spliced and taped to the first length and excess coiled behind receiver. Above 160 feet, transmission line may be cut to exact length required. Only this special transmission line should be used in order to secure proper impedance matching between the "double-doublet" antenna and the receiver-coupling transformer.

Stock No. 4738 1 Roll transmission line (80 feet) **List Price, $3.48**

RCA Shielded Antenna Systems

For Standard Broadcast Reception Only



RCA Standard Shielded Antenna Systems bring startlingly improved performance to the radio listener accustomed to an ordinary make-shift antenna. An antenna transformer matches the antenna impedance to the shielded transmission-line impedance. A receiver-coupling transformer matches the receiver input impedance to the shielded transmission line. This permits having a shielded transmission line of a low impedance value. Having a low impedance value insures little or no electrical noise pickup in the lead-in.

CONTENTS OF KIT

1 Antenna transformer	1 Lightning arrester
1 Receiver-coupling transformer	1 Instruction sheet
1 Roll of shielded transmission line (100 feet)	

For use with all standard broadcast receivers. Not recommended for all-wave or short-wave receivers.

Stock No. 7718 (illustrated)—List Price, $5.00

RCA Victor Model 280, and other receivers having a similar antenna input transformer, do not require the receiver-coupling transformer of the above kit. For such receivers use Stock No. 7717 Kit (same as Stock No. 7718, less the receiver-coupling transformer).

Stock No. 7717 (not illustrated)—List Price, $3.50

Read what they say about the RCA WORLD-WIDE ANTENNA SYSTEM

WE'LL SELL 400 or 500 THIS WINTER

"I want to find out all about these RCA World-Wide Antenna Systems," said A. O. Rabassa, Capitol Radio Service Company of Baltimore, on his recent visit to the plant. "We'll sell 400 or 500 of them this winter and I want to know my stuff."

UNQUESTIONABLY SUPERIOR

Martin Gosh, Radio Editor of the New York Post, says: "We hand the palm to RCA Engineers for having developed an Antenna System which unquestionably is superior to anything we've tried so far."

AN INTERNATIONAL HOOK-UP

"Previous to the installation of the new RCA World-Wide Antenna System we had no results with short-wave reception, whereas now we really have an international hook-up."

—Stern & Company,
706-714 Market St., Philadelphia, Pa.

AMAZED BY THE IMPROVEMENT

"I erected an RCA World-Wide Antenna System for one of my customers and sure was amazed by the improvement in reception on both short wave and regular broadcasts. I called on another customer, explained the antenna, and the sale was made immediately. I have about seventy-five old customers who may be interested in this antenna."

—Samuel Borick,
12612 Maple Avenue, Cleveland, Ohio

HAD CONSIDERABLE BUILDING NOISE

"Prior to installing the RCA World-Wide Antenna System, we had considerable building noise to contend with in our demonstrations. This now is practically eliminated."

—D. R. O'Connor, Mgr., Radio Dept., J. O. Hudson Co., Detroit, Mich.

FAVORABLE COMMENTS FROM CUSTOMERS

"We find from tests that the RCA World-Wide Antenna System is most efficient and we are receiving very favorable comments on this antenna from our customers who have installed it."

—Ayre & Sons, Ltd.,
St. Johns, Newfoundland

DIAL FILLED WITH STATIONS

"After installing the RCA World-Wide Antenna System, the dial was filled with stations where I never had received anything at all. There was no noise from the high lines and, in fact, noise consisted only of the rushing sounds known as tube noise."

—H. C. Allsch,
112 West Overland St., El Paso, Texas

WHAT A RELIEF!

"What a relief it was to install the RCA World-Wide Antenna System and watch the Neon signs across the street, the barbers' clippers, the shoemaker's machines, and the beauty parlor hair driers stop interfering with our radio reception."

—Ridge Radio-Electric Shop,
6155½ Ridge Ave., Philadelphia, Pa.

Sell RCA World-Wide Antenna Systems . . . Win an RCA Service Engineer's Pencil.

RCA SERVICE ENGINEER'S PENCIL

As useful as it is beautiful . . . It automatically tells you the code value of resistors . . .

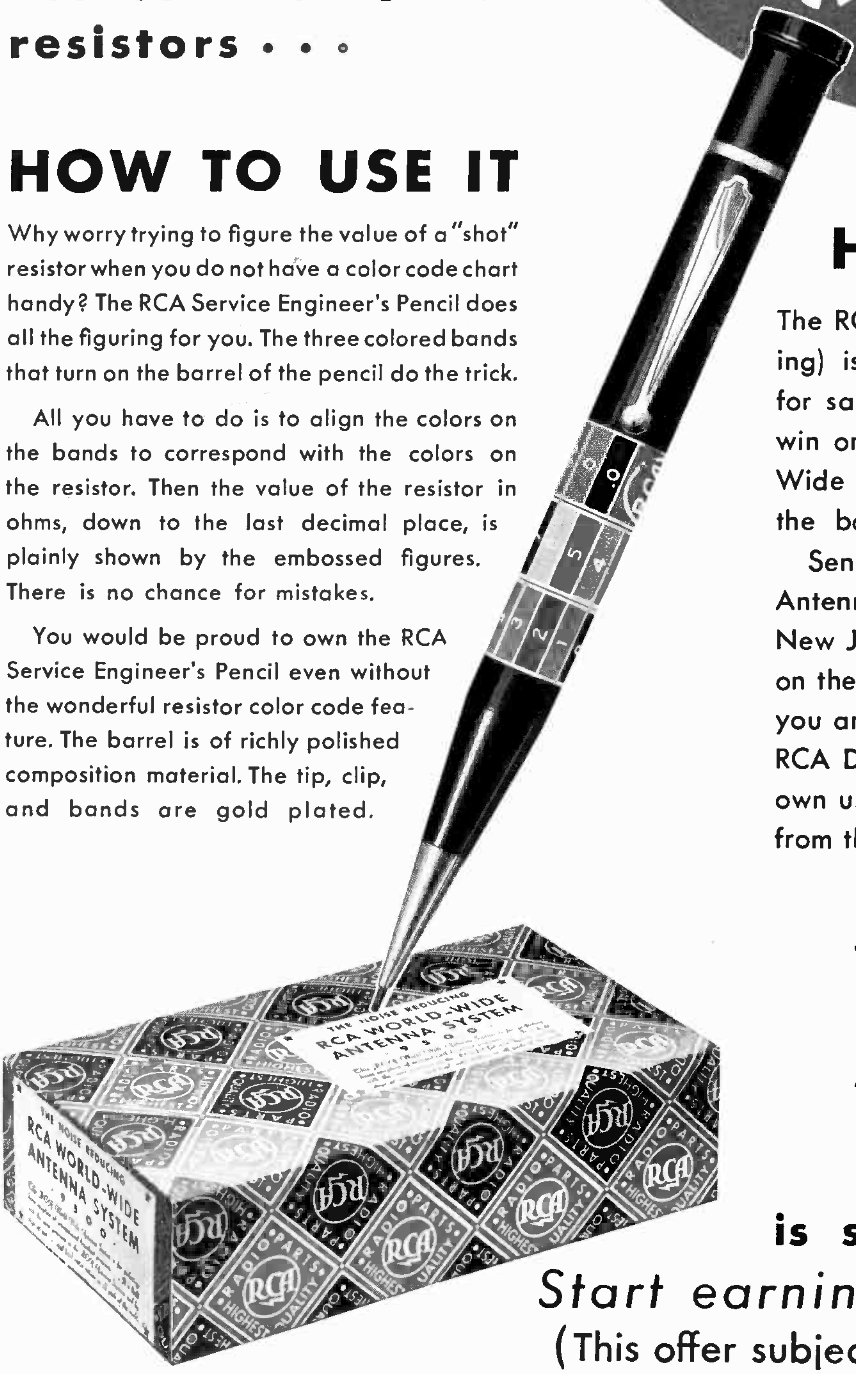
Win one of these Pencils

HOW TO USE IT

Why worry trying to figure the value of a "shot" resistor when you do not have a color code chart handy? The RCA Service Engineer's Pencil does all the figuring for you. The three colored bands that turn on the barrel of the pencil do the trick.

All you have to do is to align the colors on the bands to correspond with the colors on the resistor. Then the value of the resistor in ohms, down to the last decimal place, is plainly shown by the embossed figures. There is no chance for mistakes.

You would be proud to own the RCA Service Engineer's Pencil even without the wonderful resistor color code feature. The barrel is of richly polished composition material. The tip, clip, and bands are gold plated.



HOW TO WIN IT

The RCA Service Engineer's Pencil (Patent Pending) is controlled by RCA exclusively. It is not for sale. But any service engineer or dealer can win one without cost. Just sell ten RCA World-Wide Antenna Systems and save the labels on the boxes. There are two labels on each box.

Send the 20 labels from 10 RCA World-Wide Antenna Kit boxes to RCA Parts Division, Camden, New Jersey. Print your name and address plainly on the back of one label. Your pencil is ready for you and will be sent you promptly. (If you buy an RCA Dealer Demonstration Antenna Kit for your own use, the label counts as much as four labels from the regular RCA World-Wide Antenna Kit.)

WORLD RCA WIDE

ANTENNA SYSTEM

is selling like hot cakes

Start earning your pencil Today!

(This offer subject to withdrawal without notice)

RCA Tools and Accessories

The following tools and accessories are useful for servicing Radio Receivers, Combinations and Short-Wave Instruments of all types and manufacture.

Alignment Tool

Stock No. 4160 **Net Price $0.60**

The Stock No. 4160 Alignment Tool is a bakelite shaft combination screwdriver and socket wrench. The metal screwdriver bit is so shaped that the increase in capacity caused by its touching a trimmer screw is offset by the reduction in inductance caused by its shape. This is very important when making adjustments on all-wave receivers where the screwdriver must be inserted through the end of the coil. The socket end fits the main tuning capacitor trimmer adjustment screws used on numerous RCA Victor Receivers. The bakelite shaft is 7/32" diameter, which gives entrance to 1/4" holes, used on older model Radiola receivers.

Oscillator Adapter

Stock No. 4316 **Net Price $0.45**

The Stock No. 4316 Oscillator Adapter is a desirable accessory for use with the TMV-97.B Test Oscillator. The adapter is for inserting in the modulator tube socket when operation without modulation is desired

Riveting Punch

Stock No. 10987 **Net Price $0.50**

The Stock No. 10987 Riveting Punch is a special metal punch for use with a riveting anvil. The punch may be used with the rivets usually used on radio receivers and permits the service man to make a factory type repair, instead of using machine screws to replace rivets. The punch is 5/16" in diameter and 5½" long.

Riveting Anvil

Stock No. 10988 **Net Price $0.70**

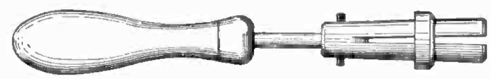
The Stock No. 10988 Off-Set Riveting Anvil is a special anvil that permits riveting in places ordinarily inaccessible. It is to be used in conjunction with a riveting punch such as Stock No. 10987. The Anvil is 5/16" in diameter and 3½" long.

Tuning Wand

Stock No. 6679 **Net Price $1.10**

The Stock No. 6679 Tuning Wand is a special alignment tool which makes possible the checking of alignment in all-wave receivers without disturbing the adjustment of the trimmer capacitors. The tool consists of a bakelite rod having a brass cylinder at one end and a special finely divided iron core at the other end. Inserting the brass cylinder into a coil lowers its inductance, while inserting the iron increases the inductance. From this it is evident that before adjusting trimmers, the adjustment may be checked by inserting each end of the wand into the coil. Proper adjustment is evidenced by a reduction in output with either end of the wand inserted into the coil.

Knurled Nut Wrench



Stock No. 10982 **Net Price $1.20**

The Stock No. 10982 Knurled Nut Wrench is a special wrench designed for tightening or removing the knurled nuts such as are used with toggle type switches. These nuts are ordinarily impossible to remove or tighten without marring. The wrench will hold a nut from 5/8" to ½" diameter The overall length is 8½".

Off-Set Screwdrivers

Stock No. 3064
Net Price $0.50

Stock No. 2930
Net Price $0.50

The Stock Nos. 3064 and 2930 Off-Set Screwdrivers are useful for making adjustments to remote control units and other small screws that are inaccessible with an ordinary screwdriver. The No. 3064 screwdriver is 2½" long while No. 2930 has an overall length of 4⅜".

Socket Wrench

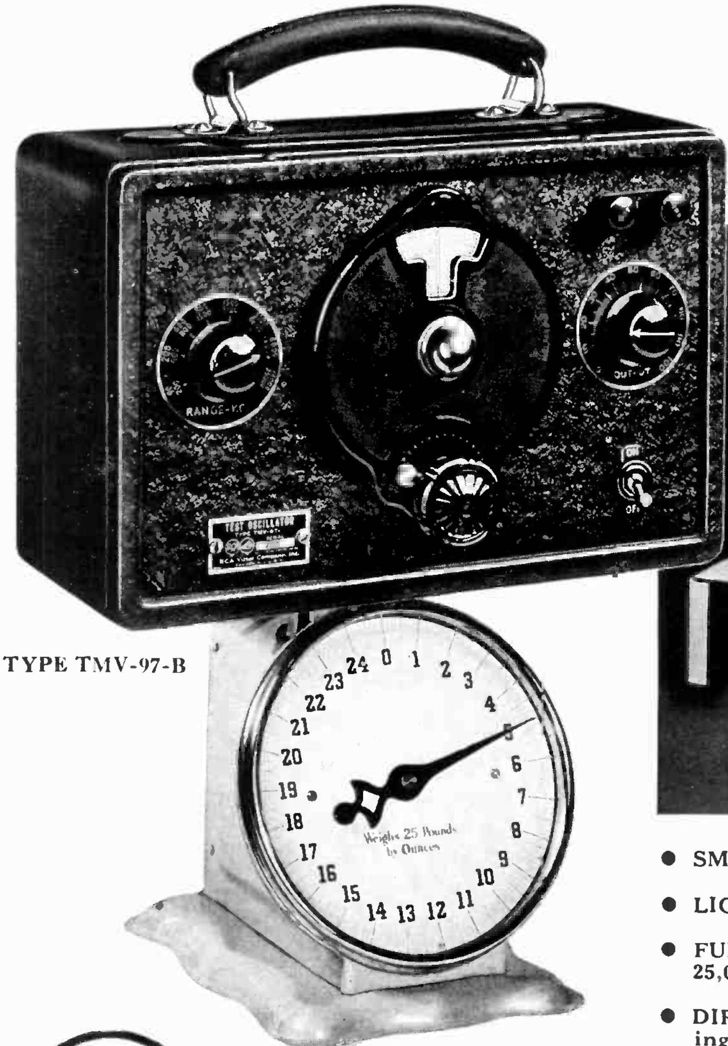
Stock No. 10983 **Net Price $1.80**

The Stock No. 10983 Socket Wrench is a special flexible end socket wrench designed for adjusting the alignment screws of the 1929 and 1930 Victor Receivers, Models R-32, R-35, etc. The overall length is 8¾".

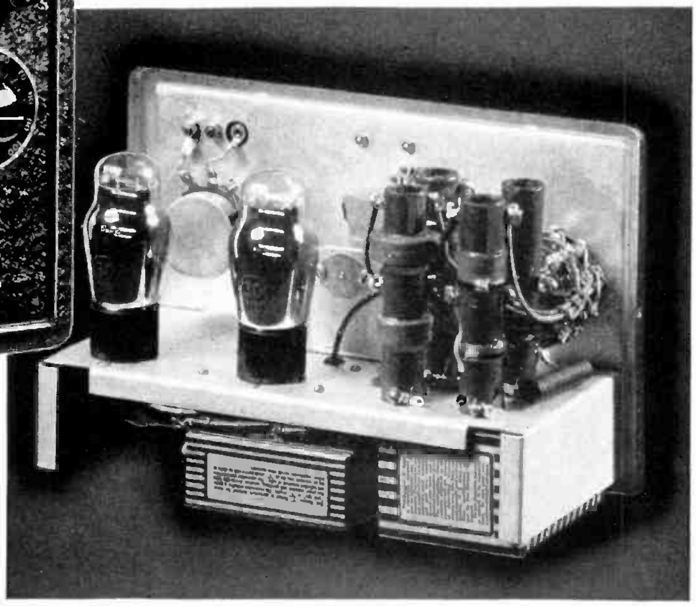
. . . AND IT'S FULL RANGE, TOO

$29.50

WITH TUBES ◆ LESS BATTERIES



TYPE TMV-97-B



- SMALL SIZE.
- LIGHT WEIGHT.
- FULL RANGE—90 kc. to 25,000 kc.
- DIRECT Kilocycle Reading Dial.
- ACCURATE to within 3 per cent.
- MAY BE USED with all makes of sets.
- OUTPUT adjustable to any desired level.
- ADAPTABLE — with or without modulation.

RCA FULL RANGE TEST OSCILLATOR

SPECIFICATIONS

Circuit—A tuned-grid, plate-modulated circuit is used, which gives good stability over a wide range of voltage and climatic conditions. The output is modulated 50% at 400 cycles.

Two RCA Radio Tubes, Type RCA-30, are used, one as an R. F. oscillator and one as an A. F. modulator.

Batteries Required—One 22½ volt "B" battery and one 4½ volt "C" battery are used. The "C" battery provides filament power for the Radiotrons, the filaments of which are connected in series.

Size—Height 8½ inches (including raised handle), case alone 6½ inches, width 9¾ inches, depth 4½ inches.

Weight—5 lbs., including batteries.

Frequency Range—90 K. C.–25,000 K. C. by eight bands. The Range Switch is located on the front panel and marked directly in frequency.

Output—Two binding posts on the front panel, together with an attenuator, give an easy means of connecting and adjusting the output, an important point in servicing sets having dual-purpose AVC tube.

Dial—Variable vernier dial adjustable from 6:1 to 20:1 speed reduction. The dial glass has been made thicker so that the indicator line is very close to the dial, thus avoiding a possible parallax.

Calibration—The dial is calibrated directly in frequency to an accuracy of ±3%. No charts to read. Complete individual calibration may be obtained at an additional cost of $5.00.

Case—The entire oscillator is enclosed in a black wrinkle-finished aluminum case provided with a leather handle.

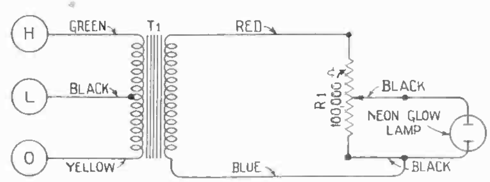
Net Price—$29.50, with RCA Radio Tubes, less batteries. Stock No. 9050.

OUTPUT INDICATOR

Stock No. 4317

No Longer Need You "Peak" Receivers by Ear. Get an RCA Output Indicator

- **High Sensitivity**
- **No burn-outs in normal use**
- **Has three impedances**
- **Use it on any receiver**
- **Sturdy and foolproof**
- **No delicate parts**
- **For use with any oscillator**
- **Attractive bakelite case**



The RCA Output Indicator is a small, compact, visual output indicator designed for use with an oscillator when aligning radio receivers. The instrument consists of a tapped step-up transformer, a potentiometer, a glow tube and three binding posts for connecting the output of the receiver to the transformer. Three input impedances are available, namely, 0.6 ohm, 1.5 ohms and 4 ohms, which cover practically all receivers manufactured.

The instrument is used by connecting it across the leads of the input to the voice coil of the loudspeaker. The speaker may or may not be connected, as desired by the user. So connected, the glow tube will glow when a signal is impressed on the output indicator. The glow of this lamp is very sensitive, following variations in frequency and intensity. Naturally, this provides a very sensitive indicator for adjusting trimmer capacitors to their optimum position.

The entire mechanism is housed in an attractive die-cast bakelite case.

SPECIFICATIONS

Dimensions	**5 3/8" x 2 7/8" x 2 3/8"**
Weight	**13 Ounces**
Case	**Die-cast moulded bakelite**
Lamp Rating	**50–60 volts breakdown**
Transformer Rating	**80:1 (maximum)**
Input Impedances	**O to H, 4 ohms, O to L, 1½ ohms, H to L, .6 ohm**
Potentiometer Resistance	**100,000 ohms**

NET PRICE $4.00

RCA AUTO RADIO ACCESSORIES

RCA AUTO RADIO LOCK
Stock No. 4575

Auto Radio Sets are easy to install—but also easy to steal—unless protected by an RCA Auto Radio Lock. Just remove old nut from bulkhead bolt, slip on special bushing and nut, and lock slips over nut and bushing like a spare tire lock. Lock barrel made by Yale. Fits all makes of auto receivers.

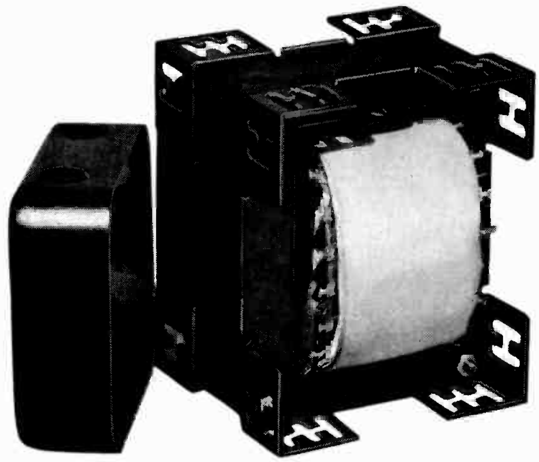
RCA Auto Radio Lock Stock No. 4575	**List Price $1.35**

Instrument Panel Control Unit for RCA Victor Models M-123 and M-107
Stock No. 4476

Makes the remote control unit of RCA Victor Models M-123 and M-107 an integral part of the instrument panel. Specially designed for 1934 model Ford, Plymouth, Chrysler, DeSoto, and Dodge cars—over half of the total production of cars in first four months of 1934. May be adapted to other cars where sufficient panel space is available. Mounts flush with instrument panel. Chromium finish with black enamel stripes.

This control unit makes a neat job that will increase your sales of RCA Victor Auto Radio Receivers.

Instrument Panel Control Unit Stock No. 4476	**Suggested Net to dealers $1.25**



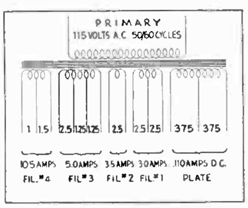
Fitzall Universal Power Transformers

No longer is it necessary to "send away" for transformers for any make of radio receiver. RCA Fitzall Universal Transformers for *all makes* of radio receivers from 1927 to 1937 have been perfected . . . even anticipating future receiver design.

FOR 10- 12-TUBE SETS

Stock No. 9551

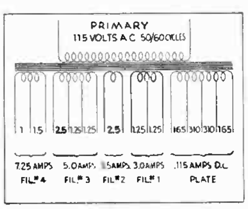
List Price, $6.00



FOR ALL CLASS B SETS

Stock No. 9552

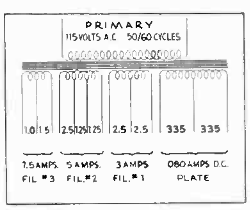
List Price, $6.50



FOR 5- 9-TUBE SETS

Stock No. 9553

List Price, $4.75



Stock No. 9556

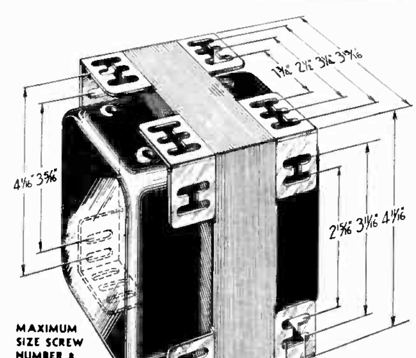
FOR FOUR-TUBE SETS

(Not Illustrated)

Specifications

Slotted in every conceivable position for quick attachment anywhere, "H" type holes are provided in the mounting lugs differently spaced on opposite surfaces to allow maximum flexibility in mounting. Only four types are needed for the large 12-tube jobs down to the 4-tube midgets. RCA Fitzall Universal Transformers present the solution to one of the Service Engineer's most annoying problems.

Terminals are provided to allow ample flexibility for adapting the transformer to any receiver circuit. Plenty of windings are available to meet the requirements of any circuit. RCA Fitzall Universal Transformers in four types fit all sets from 1927 to 1937.



DIMENSIONS				
Transformer Stock No.	A	B	C	D
9551	1 1/8"	1 1/16	2 1/4	3 1/4"
9552	1 1/8	1 13/16"	2 1/4	3 1/4"
9553	7/8"	1 1/16	2	3"

Dimensions in diagram same for all three models.

Check and Triple Check the Uniform High Quality of RCA Fitzall Universal Transformers » » »

THE old adage, "You can't tell what a book contains by looking at its covers," applies with equal force to Universal Transformers. No Service Engineer can tell how a transformer has been constructed by looking at it, nor can he tell how accurately it has been tested and checked.

In preparing to manufacture and market a Universal Transformer, RCA determined that the Fitzall Universal Transformer must in every way square itself with the RCA reputation for high quality parts and replacements. It must be able to "take it" under any and all service conditions that might arise. And the RCA Fitzall can.

In the RCA Fitzall production, line testing and inspection is the order of the day. Primary windings are checked for shorted turns. The high voltage plate is tested for center-tap and the total windings for shorted turns. Each separate filament winding is tested for shorted turns. All this testing is done before any of the component units are assembled.

Next comes impregnation. The primary and high voltage windings are heated to the temperature of the bath before immersion to assure uniform penetration. Impregnation is accomplished in vacuum tanks which remove air and moisture from the insulation and seal it.

The units are then assembled and tests are made for voltage ratio between primary and all other windings before the core is installed. The core is then applied and tests are made for core loss and exciting current.

At this stage of production every single part has been tested separately and then collectively.

After final assembly of all the parts, the transformers are tested all over again for primary watts input and primary exciting current. And then they are tested again—this time automatically on a traveling test belt, with all possibilities of human error removed—under conditions more severe than ever developed in actual service.

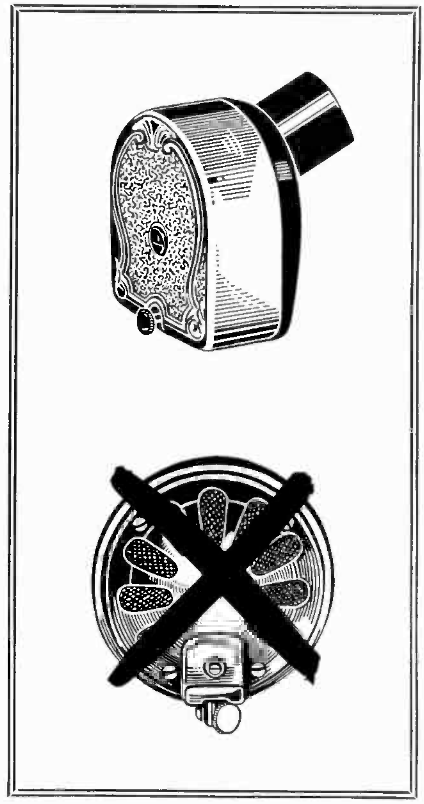
Transformers that meet the exacting specifications of each of these many tests and inspections are considered worthy of the RCA name and are sold with the RCA guarantee.

Modernizing Phonographs

The 1935 Money-Maker for Service Engineers

▼

RCA Phonograph Modernization Kits



THE phonograph is coming back into its own. The amazing technical perfection of "Higher Fidelity" Recording has revitalized interest in recorded music. The introduction of low-priced Bluebird Records has brought recorded music within the reach of all.

Old Victrolas, talking machines of all descriptions are being modernized by alert Service Engineers, who realize a handsome profit from every sale.

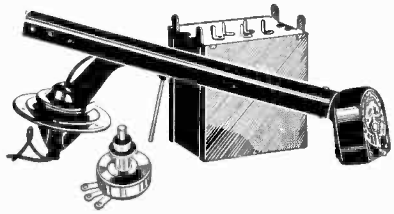
The modernization of phonographs is the Service Engineer's job, **his opportunity** for 1935. He alone in the entire industry gets into the home under conditions favorable to the promotion of this new and profitable phase of home entertainment.

PACKAGE		CONTENTS							
		Pickup Arm With Escutcheon		Pickup		Volume Control		Input Trans.	
Stock No.	List Price	No.	Type	No.	Impedances	No.	Resistance	No.	Works Into
11099	$12.10	10779	Straight	10781	200	10795	500	10414	RCA-26
11075	10.80	8858	Straight	7394	20	6225	60	7445	General
11076	10.54	11102	Inertia	6474	700	6475	5000	None	RCA-57
11080	13.10	11091	Inertia	6335	7	6355	200000	7529	RCA-56
11100	5.85	6592	Midget	6592	2450	6590	5000	None	RCA-77

To make his work easy; to simplify his purchases of parts, the kits described on this and the next page are presented and are available at RCA Parts Distributors. Write to RCA Parts Division, Camden, N. J., for booklet, "Phonograph Modernization."

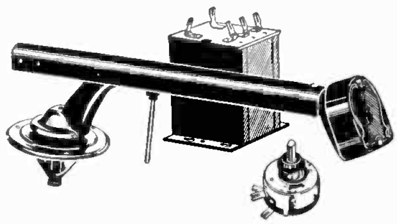
ORDER FROM YOUR RCA PARTS DISTRIBUTOR

RCA Phonograph Modernization Kits



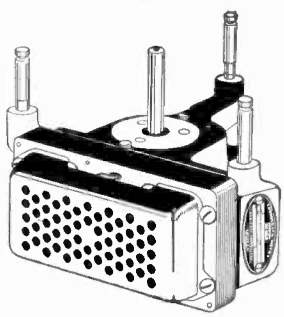
RCA
Phonograph Modernization Kit
Stock No. 11099

Contents: 200-ohm Pickup, Straight Type Pickup Arm, 500-ohm Volume Control, and Input Transformer. List price, $12.10.



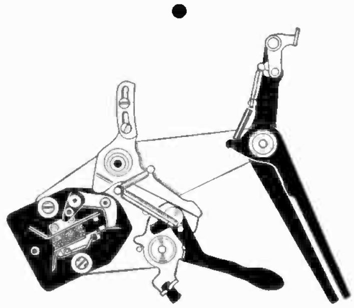
Stock No. 3599

MOTOR MOUNTING ASSEMBLY (not illustrated), comprising one screw, one washer and one lock washer. This unit contains the three sets necessary for mounting the Stock No. 8989 Motor on the motor board. List price, $.30.



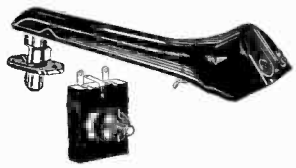
Stock No. 8989

MOTOR complete, for 60 cycles, 115 volts. This is the same sturdy motor used in the highest quality of phonographs and combinations made by the RCA Victor Company. List price, $18.52.



Stock No. 3391

MOTOR BOARD SUSPENSION SPRING ASSEMBLY (not illustrated), comprising 1 bolt, 1 top spring, 1 bottom spring, 2 cap washers, 1 C washer and 1 nut. Recommended for mounting a motor board for Stock No. 8989 in a cabinet. Specially tuned springs prevent vibration being transmitted mechanically to the pickup and spoiling reproduction. Four sets required. List price, 4 sets, $2.00.



RCA
Phonograph Modernization Kit
Stock No. 11100

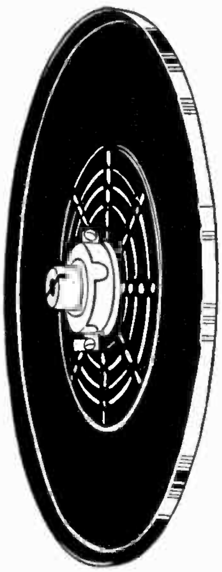
Contents: A 2450-ohm Midget Pickup and 5000-ohm Volume Control. For inexpensive installations where space is limited. Usually used with Stock No. 9038 Motor, shown directly below at right. List price, $5.85.

RCA Phonograph Modernization Kit
Stock No. 11075

Contents: 20-ohm Pickup, Straight Type Pickup Arm, 60-ohm Volume Control, and Input Transformer. List price, $10.80.

RCA Phonograph Modernization Kit
Stock No. 11076

Contents: 700-ohm Pickup, Inertia Type Pickup Arm, 5000-ohm Volume Control. Due to high impedance of pickup, no input transformer is included. List price, $10.50.



Stock No. 8948

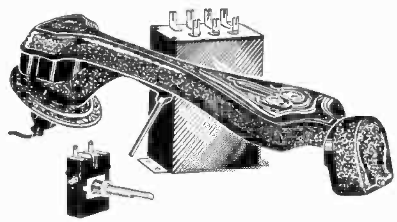
TWO SPEED TURNTABLE. Fits shaft of Stock No. 8989 Motor (shown above). This turntable adds distinction to your work and gives it the stamp of modern workmanship. It is the same turntable used in RCA Victor Combinations to play both standard (78 R.P.M.) and long-playing (33⅓ R.P.M.) recordings. List price, $5.50.

Stock No. 7180

AUTOMATIC ECCENTRIC BRAKE (left) to stop the turntable at the end of a record having an eccentric groove. To be used with Kits Nos. 11099 and 11075 (Pickup arms of the "straight type"). List price, $2.60.

Stock No. 11106

The SHIFT LEVER used to change the speed of the turntable (8948) from standard to long playing. Not included with 8948. List price, $.98.

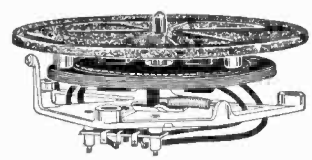


RCA
Phonograph Modernization Kit
Stock No. 11080

Contents: 7-ohm Pickup, Inertia Type Pickup Arm, 20,000-ohm Volume Control, and Input Transformer. List price, $13.10.

Stock No. 3813

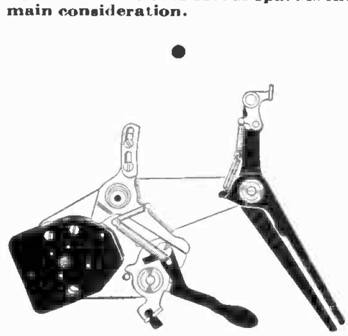
MOTOR MOUNTING ASSEMBLY (not illustrated), comprising one metal bushing, two rubber bushings, one flat washer, one lock washer and one nut. Three sets required to mount Stock No. 9038 Motor (above). List price, 3 sets, $1.68.



Stock No. 9038

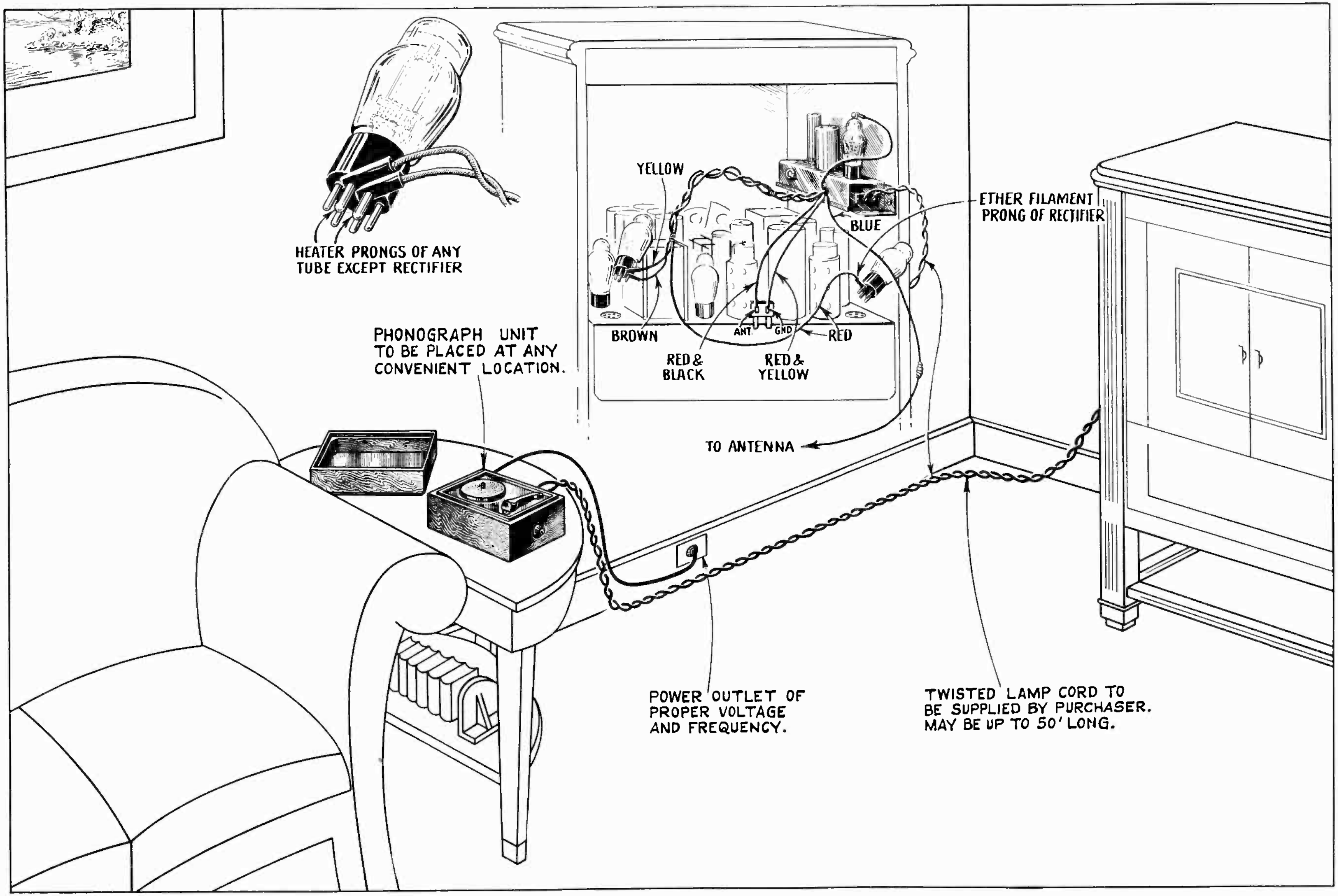
SYNCHRONOUS TYPE MOTOR WITH TURNTABLE — 115 volts, 60 cycles. Although this motor is not self-starting, it serves the purpose admirably where cost is a factor. Where space is limited this unit fits in easily. Plays either 10 or 12-inch records at standard speed. List price, $8.00.

This is the sturdy motor and turntable used in the RCA Victor Record Player. Its small size, light weight and low price make it ideal for portable equipment or for permanent installations in which either cost or space is the main consideration.



Stock No. 6896

AUTOMATIC ECCENTRIC BRAKE to stop turntable at end of record having an eccentric groove. To be used with Kits Nos. 11075 and 11099 (Pickup arms of the inertia type). List price, $2.50.

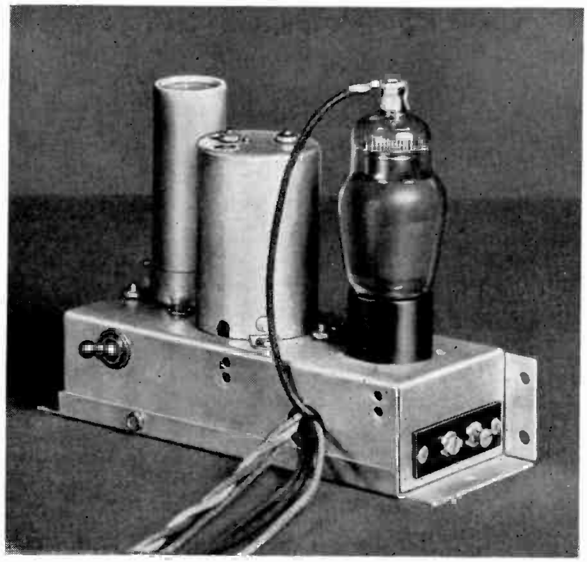


Typical Installation of R-93 and RK-24 Phonograph Oscillator

A miniature *Broadcast Station*

for every receiver... profits for Service Engineers!

SHOW YOUR customers how to broadcast records to themselves with the RCA Phonograph Oscillator. Possessing all the appeal of a distinct novelty, but with RCA practicability and durability built in, the RCA Phonograph Oscillator will prove popular with Service Engineers and receiver owners.



RCA Phonograph Oscillator

For the Service Engineer: For the Service Man the RCA Phonograph Oscillator does two things. It makes additional profits for him through the sale of additional equipment and solves one of his toughest problems in phonograph modernization work. The output from the pickup coil modulates the oscillator which is coupled to the antenna of the receiver. This modulated signal is tuned in on the receiver just like any broadcasting station.

Only a few minutes are required to attach the RCA Phonograph Oscillator. No struggle is involved to get the grid bias right; no circuit changes to make; no impedance matching. Just a few simple connections are necessary, for which directions are supplied with the equipment.

For the Receiver Owner: The RCA Phonograph Oscillator provides a miniature broadcasting station for every receiver-owning home. Its fidelity of record reproduction is limited only by the qualities of the receiver to which it is attached. It enables the owner to hear his favorite artists whenever he wants and as often.

With the rapidly reviving interest in record reproduction, and low-priced Bluebird records now within the reach of all, a tremendous field for profits awaits the alert Service Man.

This unit presents one more RCA profit maker for Service Engineers—one more trouble saver. Watch for the announcements of new, interesting, money-making, labor-saving devices that RCA Parts Division Engineers are developing now. Keep in touch with your RCA Parts Distributor.

Stock No. 9554, List Price, *(without tube)* ***$7.75***

ORDER FROM YOUR **RCA** PARTS DISTRIBUTOR

Here's more about that money-making Oscillator RK-24

THE RK-24 Phonograph Oscillator is a small broadcast band oscillator unit designed for use with the RCA Victor Record Player (Model R-93), it may be attached to radio sets of all kinds and types. In addition to its primary use with the R-93, it may be used also for attaching any type of magnetic pickup to any type of receiver with slight modifications (usually the inclusion of an input transformer).

The primary purpose of the RK-24 Phonograph Oscillator is to insure proper phonograph reproduction within the limits of the receiver in all cases, avoiding the necessity of any circuit changes. No longer is the Service Engineer worried with the problems involved in overcoming avoidance of hum, distortion in the audio system and other factors that invariably occur.

FOOL-PROOF CONSTRUCTION

The unit is of simple design and fool-proof construction, and may be attached to practically any set by one unskilled in the art of radio service. Suitable leads with special contacts are provided for obtaining filament and plate power for the oscillator unit, so that internal wiring to the chassis is not necessary.

Of unusual interest is its ability, through the use of the RCA-6A7 or 2A7 tubes, to be used with receivers having either 2.5-volt heater type tubes or 6.3-volt heater type tubes. *For this reason it is sold without tube.* This adaptability makes it possible to operate the RK-24 Oscillator with practically all radio sets of the AC type manufactured during the last five years.

A TRANSMITTING STATION

The RK-24 is actually a miniature transmitting station, modulated with the output of the phonograph pickup. As the frequency range of the pickup is usually equal to or better than the transmission range of the ordinary broadcasting station and there is no intervening factor such as fading and distortion due to transmission, the phonograph quality will, in practically all cases, be that obtained with the very best possible local broadcasting stations to which the receiver may be tuned.

For this reason, one will know in advance that the phonograph reproduction quality will be limited only by the capabilities of the receiver to which it is attached.

The simplicity of connections is such that it usually takes about five minutes to install.

A TRANSFERABLE UNIT

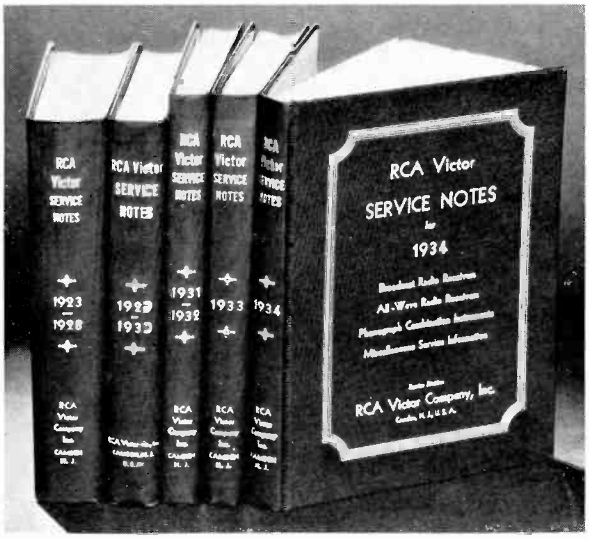
The RK-24 may be removed from one receiver to another very quickly and easily. Optimum results will be obtained in all cases. Avoidance of any switching requirements in the radio chassis proper, as well as any circuit changes, such as changing of detector tube bias to operate them as audio amplifiers and lack of sufficient audio gain, are all eliminated through the use of the RK-24 Oscillator.

We believe this oscillator fills a long-felt need often expressed by service men modernizing old phonographs, or service men attaching electric phonographs to ordinary radio sets. It also opens up a new field due to the simplicity of its connections, and the assured results obtained.

ELECTRICAL SPECIFICATIONS

Tuning Range..........1400–1700 Kilocycles
Type of Oscillator Circuit...Hartley Oscillator
Type of Modulation
Suppressor Grid Modulation
Input Voltage.....................0.3 Volt
Output Impedance.................30 Ohms
Heater Current
1.0 Ampere (2.5 V.), 0.3 Ampere (6.3 V.)
Plate Current...2.0 Milliamperes at 250 Volts

All RCA Victor Service Notes
. . . Now in Five Bound Volumes



This library contains complete service information, drawings and price lists 1923-1934

So immediate was the acceptance of the bound volumes of RCA Victor Service Notes for 1931–32 and 1933; so strong was the demand that three more volumes have been compiled. There are now five bound volumes included in the RCA Victor Service Library.

The five volumes cover all RCA or Victor models produced from 1923 to 1935 except old Victrola instruments that did *not* contain a radio receiver. Complete replacement parts lists are provided for all models issued since 1929.

When the Service Engineer wants technical information on any RCA Victor model, he turns to the index of his bound volume; a moment later diagrams, parts lists and prices and service notes are lying *flat* on the table before him.

Service Engineers who use the volumes regard them as their "Business Bible," not alone for the diagrams and drawings but for the time saving service information, conveniently arranged for every RCA Victor receiver. Schematic drawings can be obtained elsewhere, but the technical information is not so readily found.

In addition, each volume will contain other valuable information such as impedance, inductance and capacity charts, and other data peculiar to the receivers described therein.

A limited edition is being published and to make sure of copies for yourself, we suggest that you place your order now.

★ NET PRICE ★
$1.00 PER VOLUME

F. O. B. CAMDEN, N. J.

ORDER FROM YOUR RCA PARTS DISTRIBUTOR

CONTENTS

1923-28

1929-30

1931-32

1933

1934

You can save *time* and *money*

RCA Cabinet Refinishing Kit

YOU won't call in the cabinet refinisher nearly so often after you get the RCA Cabinet Refinishing Kit. Of course you can't do every refinishing job with it, but you can do most of them—saving time and money on every job. It's the little touch-up jobs that occur most often anyhow. Someone in the shop lays a hammer on the cabinet; a button on the truck driver's coat scratches it in delivery; or perhaps it has been marred in home demonstrations or while on display in the dealer's store. But whatever the cause, you have the remedy at hand for use.

- 1 Can Refco Oil
- 1 Can Valvoline
- 1 Can Tripoli
- 1 Assortment Sand Paper
- 1 Assortment Stick Shellac
- 2 Pkgs. Aniline Stain Powders
- 1 Touch-up Brush
- 1 Spatula
- 1 Rubbing Block
- 1 Instruction Sheet

The RCA Cabinet Refinishing Kit does not contain all the material you will need for every job. For example, it does not contain lacquer, or a lamp for heating the spatula. But things like that are obtainable anywhere. Only the hard-to-obtain things have been included; the items you would have to run all over town to get, if obtainable at all.

Packed in a durable leatherette case, measuring 9½" x 4½" x 2¼", it opens like a purse. Stock No. 9546. Net to Service Engineers $2.90.

ORDER FROM YOUR RCA PARTS DISTRIBUTOR

Radio Tube Chart←RCA Radiotron-Cunningham→Radio Tube Chart

TYPE	NAME	BASE	SOCKET CONNECTIONS	DIMENSIONS MAXIMUM OVERALL LENGTH x DIAMETER	CATHODE TYPE ■	RATING: FILAMENT OR HEATER VOLTS	RATING: FILAMENT OR HEATER AMPERES	RATING: PLATE MAX. VOLTS	RATING: SCREEN MAX. VOLTS
RCA-1A6	PENTAGRID CONVERTER ◘	SMALL 6-PIN	FIG. 26	$4\frac{17}{32}'' \times 1\frac{9}{16}''$	D-C FILAMENT	2.0	0.06	180	67.5
RCA-2A3	POWER AMPLIFIER TRIODE	MEDIUM 4-PIN	FIG. 1	$5\frac{3}{8}'' \times 2\frac{1}{16}''$	FILAMENT	2.5	2.5	250	—
RCA-2A5	POWER AMPLIFIER PENTODE	MEDIUM 6-PIN	FIG. 15A	$4\frac{11}{16}'' \times 1\frac{13}{16}''$	HEATER	2.5	1.75	250	250
RCA-2A6	DUPLEX-DIODE HIGH-MU TRIODE	SMALL 6-PIN	FIG. 13	$4\frac{17}{32}'' \times 1\frac{9}{16}''$	HEATER	2.5	0.8	250	—
RCA-2A7	PENTAGRID CONVERTER ◘	SMALL 7-PIN	FIG. 20	$4\frac{17}{32}'' \times 1\frac{9}{16}''$	HEATER	2.5	0.8	250	100
RCA-2B7	DUPLEX-DIODE PENTODE	SMALL 7-PIN	FIG. 21	$4\frac{17}{32}'' \times 1\frac{9}{16}''$	HEATER	2.5	0.8	250	125
RCA-6A4 *also LA*	POWER AMPLIFIER PENTODE	MEDIUM 5-PIN	FIG. 6	$4\frac{11}{16}'' \times 1\frac{13}{16}''$	FILAMENT	6.3	0.3	180	180
RCA-6A7	PENTAGRID CONVERTER ◘	SMALL 7-PIN	FIG. 20	$4\frac{17}{32}'' \times 1\frac{9}{16}''$	HEATER	6.3	0.3	250	100
RCA-6B7	DUPLEX-DIODE PENTODE	SMALL 7-PIN	FIG. 21	$4\frac{17}{32}'' \times 1\frac{9}{16}''$	HEATER	6.3	0.3	250	125
RCA-6F7	TRIODE-PENTODE	SMALL 7-PIN	FIG. 27	$4\frac{17}{32}'' \times 1\frac{9}{16}''$	HEATER	6.3	0.3	100 250	— 100
UX-200-A	DETECTOR TRIODE	MEDIUM 4-PIN	FIG. 1	$4\frac{11}{16}'' \times 1\frac{13}{16}''$	D-C FILAMENT	5.0	0.25	45	—
RCA-01-A	DETECTOR★ AMPLIFIER	MEDIUM 4-PIN	FIG. 1	$4\frac{11}{16}'' \times 1\frac{13}{16}''$	D-C FILAMENT	5.0	0.25	135	—
RCA-10	POWER AMPLIFIER TRIODE	MEDIUM 4-PIN	FIG. 1	$5\frac{5}{8}'' \times 2\frac{3}{16}''$	FILAMENT	7.5	1.25	425	—

◘ Grids #3 and #5 are screen. Grid #4 is signal-input control-grid.
★For Grid-leak Detection—plate volts 45, grid return to + filament or to cathode.

TYPE	NAME	BASE	SOCKET CONNECTIONS	DIMENSIONS MAXIMUM OVERALL LENGTH x DIAMETER	CATHODE TYPE ■	RATING: FILAMENT OR HEATER VOLTS	RATING: FILAMENT OR HEATER AMPERES	RATING: PLATE MAX. VOLTS	RATING: SCREEN MAX. VOLTS
WD-11 WX-12	DETECTOR★ AMPLIFIER TRIODE	WD 4-PIN MEDIUM 4-PIN	FIG. 12 FIG. 1	$4\frac{1}{8}'' \times 1\frac{3}{16}''$ $4\frac{11}{16}'' \times 1\frac{7}{16}''$	D-C FILAMENT	1.1	0.25	135	—
UX-112-A	DETECTOR★ AMPLIFIER TRIODE	MEDIUM 4-PIN	FIG. 1	$4\frac{11}{16}'' \times 1\frac{13}{16}''$	D-C FILAMENT	5.0	0.25	180	—
RCA-19	TWIN AMPLIFIER	SMALL 6-PIN	FIG. 25	$4\frac{1}{4}'' \times 1\frac{9}{16}''$	D-C FILAMENT	2.0	0.26	135	—
UX-120	POWER AMPLIFIER TRIODE	SMALL 4-PIN	FIG. 1	$4\frac{1}{8}'' \times 1\frac{3}{16}''$	D-C FILAMENT	3.3	0.132	135	—
RCA-22	R-F AMPLIFIER TETRODE	MEDIUM 4-PIN	FIG. 4	$5\frac{1}{32}'' \times 1\frac{13}{16}''$	D-C FILAMENT	3.3	0.132	135	67.5
RCA-24-A	R-F AMPLIFIER TETRODE	MEDIUM 5-PIN	FIG. 9	$5\frac{1}{32}'' \times 1\frac{13}{16}''$	HEATER	2.5	1.75	275	90
RCA-26	AMPLIFIER TRIODE	MEDIUM 4-PIN	FIG. 1	$4\frac{11}{16}'' \times 1\frac{13}{16}''$	FILAMENT	1.5	1.05	180	—
RCA-27	DETECTOR★ AMPLIFIER TRIODE	MEDIUM 5-PIN	FIG. 8	$4\frac{11}{16}'' \times 1\frac{13}{16}''$	HEATER	2.5	1.75	275	—
RCA-30	DETECTOR★ AMPLIFIER TRIODE	SMALL 4-PIN	FIG. 1	$4\frac{1}{4}'' \times 1\frac{9}{16}''$	D-C FILAMENT	2.0	0.06	180	—
RCA-31	POWER AMPLIFIER TRIODE	SMALL 4-PIN	FIG. 1	$4\frac{1}{4}'' \times 1\frac{9}{16}''$	D-C FILAMENT	2.0	0.13	180	—
RCA-32	R-F AMPLIFIER TETRODE	MEDIUM 4-PIN	FIG. 4	$5\frac{1}{32}'' \times 1\frac{13}{16}''$	D-C FILAMENT	2.0	0.06	180	67.5
RCA-33	POWER AMPLIFIER PENTODE	MEDIUM 5-PIN	FIG. 6	$4\frac{11}{16}'' \times 1\frac{13}{16}''$	D-C FILAMENT	2.0	0.26	135	135
RCA-34	SUPER-CONTROL R-F AMPLIFIER PENTODE	MEDIUM 4-PIN	FIG. 4A	$5\frac{1}{32}'' \times 1\frac{13}{16}''$	D-C FILAMENT	2.0	0.06	180	67.5
RCA-35	SUPER-CONTROL R-F AMPLIFIER TETRODE	MEDIUM 5-PIN	FIG. 9	$5\frac{1}{32}'' \times 1\frac{13}{16}''$	HEATER	2.5	1.75	275	90

★For Grid-leak Detection—plate volts 45, grid return to + filament or to cathode.
■Either A. C. or D. C. may be used on filament or heater, except as specifically noted. For use of D. C. on A-C filament types, decrease stated grid volts by ½ (approx.) of filament voltage.

USE (Values to right give operating conditions and characteristics for indicated typical use)	PLATE SUPPLY VOLTS	GRID VOLTS ■	SCREEN VOLTS	SCREEN MILLI-AMP.	PLATE MILLI-AMP.	A-C PLATE RESISTANCE OHMS	MUTUAL CONDUCTANCE MICROMHOS	VOLTAGE AMPLIFICATION FACTOR	LOAD FOR STATED POWER OUTPUT OHMS	POWER OUTPUT WATTS	TYPE
CONVERTER	180	−3.0 min.	67.5	2.4	1.3	500000	Anode-Grid (#2) 135 Max. Volts, 2.3 Ma. Oscillator Grid (#1) Resistor, 50000 Ohms. Conversion Conductance, 300 Micromhos.				C-1A6
CLASS A AMPLIFIER	250	−45	—	—	60.0	300	5250	4.2	2500	3.5	C-2A3
PUSH-PULL AMPLIFIER	300 300	−62 −62	Self-bias Fixed-bias		40.0 40.0	Power Output is for 2 tubes at stated load, plate-to-plate			5000 3000	10.0 15.0	
CLASS A AMPLIFIER	250	−16.5	250	6.5	34.0	100000	2200	220	7000	3.0	C-2A5
TRIODE UNIT AS CLASS A AMPLIFIER	250 ✖	−1.35	—	—	0.4	—	—	Gain per stage = 50-60			C-2A6
CONVERTER	250	−3.0	100	2.2	3.5	360000	Anode Grid (#2) 200 Max. Volts, 4.0 Ma. Oscillator Grid (#1) Resistor, 50000 Ohms. Conversion Conductance, 520 Micromhos.				C-2A7
PENTODE UNIT AS R-F AMPLIFIER	100 250	−3.0 −3.0	100 125	1.7 2.3	5.8 9.0	300000 650000	950 1125	285 730	—	—	C-2B7
PENTODE UNIT AS A-F AMPLIFIER	250✣	−4.5	50	—	0.65	—	—	—	—	—	
CLASS A AMPLIFIER	100 180	−6.5 −12.0	100 180	1.6 3.9	9.0 22.0	83250 45500	1200 2200	100 100	11000 8000	0.31 1.40	C-6A4 *also LA*
CONVERTER	250	−3.0	100	2.2	3.5	360000	Anode Grid (#2) 200 Max. Volts, 4.0 Ma. Oscillator Grid (#1) Resistor, 50000 Ohms. Conversion Conductance, 520 Micromhos.				C-6A7
PENTODE UNIT AS R-F AMPLIFIER	100 250	−3.0 −3.0	100 125	1.7 2.3	5.8 9.0	300000 650000	950 1125	285 730	—	—	C-6B7
PENTODE UNIT AS A-F AMPLIFIER	250✣	−4.5	50	—	0.65	—	—	—	—	—	
TRIODE UNIT AS AMPLIFIER	100	−3.0	—	—	3.5	17800	450	8	—	—	C-6F7
PENTODE UNIT AS AMPLIFIER	250	−3.0	100	1.5	6.5	850000	1100	900	—	—	
PENTODE UNIT AS MIXER	250	−10.0	100	0.6	2.8	Oscillator peak volts = 7.0. Conversion conductance = 300 micromhos.					
GRID LEAK DETECTOR	45	Grid Return to (−) Filament			1.5	30000	666	20	—	—	CX-300-A
CLASS A AMPLIFIER	90 135	−4.5 −9.0	—	—	2.5 3.0	11000 10000	725 800	8.0 8.0	—	—	C-01-A
CLASS A AMPLIFIER	350 425	−31.0 −39.0	—	—	16.0 18.0	5150 5000	1550 1600	8.0 8.0	11000 10200	0.9 1.6	C-10

✣Applied through plate coupling resistor of 200000 ohms.
✖Applied through plate coupling resistor of 250000 ohms.

USE	PLATE SUPPLY VOLTS	GRID VOLTS ■	SCREEN VOLTS	SCREEN MILLI-AMP.	PLATE MILLI-AMP.	A-C PLATE RESISTANCE OHMS	MUTUAL CONDUCTANCE MICROMHOS	VOLTAGE AMPLIFICATION FACTOR	LOAD FOR STATED POWER OUTPUT OHMS	POWER OUTPUT WATTS	TYPE
CLASS A AMPLIFIER	90 135	−4.5 −10.5	—	—	2.5 3.0	15500 15000	425 440	6.6 6.6	—	—	C-11 CX-12
CLASS A AMPLIFIER	90 180	−4.5 −13.5	—	—	5.0 7.7	5400 4700	1575 1800	8.5 8.5	—	—	CX-112-A
CLASS B AMPLIFIER	135 135	0 −3.0	—	—	Power output value is for one tube at stated load, plate-to-plate.				10000 10000	2.1 1.9	C-19
CLASS A AMPLIFIER	90 135	−16.5 −22.5	—	—	3.0 6.5	8000 6300	415 525	3.3 3.3	9600 6500	0.045 0.110	CX-220
SCREEN GRID R-F AMPLIFIER	135 135	−1.5 −1.5	45 67.5	0.6* 1.3*	1.7 3.7	725000 325000	375 500	270 160	—	—	C-22
SCREEN GRID R-F AMPLIFIER	180 250	−3.0 −3.0	90 90	1.7* 1.7*	4.0 4.0	400000 600000	1000 1050	400 630	—	—	C-24-A
BIAS DETECTOR	275●	−5.0 approx.	20 to 45	—	Plate current to be adjusted to 0.1 milliampere with no signal.						
CLASS A AMPLIFIER	90 180	−7.0 −14.5	—	—	2.9 6.2	8900 7300	935 1150	8.3 8.3	—	—	C-26
CLASS A AMPLIFIER	135 250	−9.0 −21.0	—	—	4.5 5.2	9000 9250	1000 975	9.0 9.0	—	—	C-27
BIAS DETECTOR	250	−30.0	—	—	Plate current to be adjusted to 0.2 milliampere with no signal.						
CLASS A AMPLIFIER	90 135 180	−4.5 −9.0 −13.5	—	—	2.5 3.0 3.1	11000 10300 10300	850 900 900	9.3 9.3 9.3	—	—	C-30
CLASS A AMPLIFIER	135 180	−22.5 −30.0	—	—	8.0 12.3	4100 3600	925 1050	3.8 3.8	7000 5700	0.185 0.375	C-31
SCREEN GRID R-F AMPLIFIER	135 180	−3.0 −3.0	67.5 67.5	0.4* 0.4*	1.7 1.7	950000 1200000	640 650	610 780	—	—	C-32
BIAS DETECTOR	180♥	−6.0 approx.	67.5	—	Plate current to be adjusted to 0.2 milliampere with no signal.						
CLASS A AMPLIFIER	135	−13.5	135	3.0	14.5	50000	1450	70	7000	0.7	C-33
SCREEN GRID R-F AMPLIFIER	135 180	−3.0 min.	67.5 67.5	1.0 1.0	2.8 2.8	600000 1000000	600 620	360 620	—	—	C-34
SCREEN GRID R-F AMPLIFIER	180 250	−3.0 min.	90 90	2.5* 2.5*	6.3 6.5	300000 400000	1020 1050	305 420	—	—	C-35

● Applied through plate coupling resistor of 250000 ohms or 500-henry choke shunted by 0.25 megohm resistor.
♥Applied through plate coupling resistor of 100000 ohms.

*Maximum.

Radio Tube Chart (Continued)←RCA Radiotron-Cunningham→Radio Tube Chart (Continued)

TYPE	NAME	BASE	SOCKET CONNECTIONS	DIMENSIONS MAXIMUM OVERALL LENGTH x DIAMETER	CATHODE TYPE ■	RATING: FILAMENT OR HEATER VOLTS	RATING: FILAMENT OR HEATER AMPERES	RATING: PLATE MAX. VOLTS	RATING: SCREEN MAX. VOLTS
RCA- 36	R-F AMPLIFIER TETRODE	SMALL 5-PIN	FIG. 9	4 17/32″ x 1 9/16″	HEATER	6.3	0.3	250	90
RCA- 37	DETECTOR★ AMPLIFIER TRIODE	SMALL 5-PIN	FIG. 8	4 1/4″ x 1 9/16″	HEATER	6.3	0.3	250	—
RCA- 38	POWER AMPLIFIER PENTODE	SMALL 5-PIN	FIG. 9A	4 17/32″ x 1 9/16″	HEATER	6.3	0.3	250	250
RCA-39-44	SUPER-CONTROL R-F AMPLIFIER PENTODE	SMALL 5-PIN	FIG. 9A	4 17/32″ x 1 9/16″	HEATER	6.3	0.3	250	90
UX -240	VOLTAGE AMPLIFIER TRIODE	MEDIUM 4-PIN	FIG. 1	4 11/16″ x 1 13/16″	D-C FILAMENT	5.0	0.25	180	—
RCA- 41	POWER AMPLIFIER PENTODE	SMALL 6-PIN	FIG. 15A	4 1/4″ x 1 9/16″	HEATER	6.3	0.4	250	250
RCA- 42	POWER AMPLIFIER PENTODE	MEDIUM 6-PIN	FIG. 15A	4 11/16″ x 1 13/16″	HEATER	6.3	0.7	250	250
RCA- 43	POWER AMPLIFIER PENTODE	MEDIUM 6-PIN	FIG. 15A	4 11/16″ x 1 13/16″	HEATER	25.0	0.3	135	135
RCA- 45	POWER AMPLIFIER TRIODE	MEDIUM 4-PIN	FIG. 1	4 11/16″ x 1 13/16″	FILAMENT	2.5	1.5	275	—
RCA- 46	DUAL-GRID POWER AMPLIFIER	MEDIUM 5-PIN	FIG. 7	5 5/8″ x 2 1/16″	FILAMENT	2.5	1.75	250 400	— —
RCA- 47	POWER AMPLIFIER PENTODE	MEDIUM 5-PIN	FIG. 6	5 5/8″ x 2 3/16″	FILAMENT	2.5	1.75	250	250
RCA- 46	POWER AMPLIFIER TETRODE	MEDIUM 6-PIN	FIG. 15	5 3/8″ x 2 1/16″	D-C HEATER	30.0	0.4	125	100
★For Grid-leak Detection—plate volts 45, grid return to + filament or to cathode.									
RCA- 49	DUAL-GRID POWER AMPLIFIER	MEDIUM 5-PIN	FIG. 7	4 11/16″ x 1 13/16″	D-C FILAMENT	2.0	0.120	135 180	— —
UX -250	POWER AMPLIFIER TRIODE	MEDIUM 4-PIN	FIG. 1	6 1/4″ x 2 11/16″	FILAMENT	7.5	1.25	450	—
RCA- 53	TWIN-TRIODE AMPLIFIER	MEDIUM 7-PIN#	FIG. 24	4 11/16″ x 1 13/16″	HEATER	2.5	2.0	300	—
RCA- 55	DUPLEX-DIODE TRIODE	SMALL 6-PIN	FIG. 13	4 17/32″ x 1 9/16″	HEATER	2.5	1.0	250	—
RCA- 56	SUPER-TRIODE AMPLIFIER DETECTOR★	SMALL 5-PIN	FIG. 8	4 1/4″ x 1 9/16″	HEATER	2.5	1.0	250	—
RCA- 57	TRIPLE-GRID AMPLIFIER DETECTOR	SMALL 6-PIN	FIG. 11	4 15/16″ x 1 9/16″	HEATER	2.5	1.0	250	100
RCA- 58	TRIPLE-GRID SUPER-CONTROL AMPLIFIER	SMALL 6-PIN	FIG. 11	4 15/16″ x 1 9/16″	HEATER	2.5	1.0	250	100
RCA- 59	TRIPLE-GRID POWER AMPLIFIER	MEDIUM 7-PIN#	FIG. 18	5 3/8″ x 2 1/16″	HEATER	2.5	2.0	250 250 400	— 250 —
RCA- 71-A	POWER AMPLIFIER TRIODE	MEDIUM 4-PIN	FIG. 1	4 11/16″ x 1 13/16″	FILAMENT	5.0	0.25	180	—
RCA- 75	DUPLEX-DIODE HIGH-MU TRIODE	SMALL 6-PIN	FIG. 13	4 17/32″ x 1 9/16″	HEATER	6.3	0.3	250	—
RCA- 77	TRIPLE-GRID AMPLIFIER DETECTOR	SMALL 6-PIN	FIG. 11	4 17/32″ x 1 9/16″	HEATER	6.3	0.3	250	100
RCA- 78	TRIPLE-GRID SUPER-CONTROL AMPLIFIER	SMALL 6-PIN	FIG. 11	4 17/32″ x 1 9/16″	HEATER	6.3	0.3	250	125

★For Grid-leak Detection—plate volts 45, grid return to + filament or to cathode.
■Either A. C. or D. C. may be used on filament or heater, except as specifically noted. For use of D. C. on A-C filament types, decrease stated grid volts by 1/2 (approx.) of filament voltage.
#Requires different socket from small 7-pin.

USE (Values to right give operating conditions and characteristics for indicated typical use)	PLATE SUPPLY VOLTS	GRID VOLTS ■	SCREEN VOLTS	SCREEN MILLI-AMP.	PLATE MILLI-AMP.	A-C PLATE RESISTANCE OHMS	MUTUAL CONDUCTANCE MICROMHOS	VOLTAGE AMPLIFICATION FACTOR	LOAD FOR STATED POWER OUTPUT OHMS	POWER OUTPUT WATTS	TYPE
SCREEN GRID R-F AMPLIFIER	100 180 250	− 1.5 − 3.0 − 3.0	55 90 90	— — 1.7*	1.8 3.1 3.2	550000 500000 550000	850 1050 1080	470 525 595	—	—	C - 36
BIAS DETECTOR	100● 250●	− 5.0 − 8.0	55 90	—	Plate current to be adjusted to 0.1 milliampere with no signal.						C - 36
CLASS A AMPLIFIER	90 180 250	− 6.0 −13.5 −18.0	—	—	2.5 4.3 7.5	11500 10200 8400	800 900 1100	9.2 9.2 9.2	—	—	C - 37
BIAS DETECTOR	90 250	−10.0 −28.0	—	—	Plate current to be adjusted to 0.2 milliampere with no signal.						C - 37
CLASS A AMPLIFIER	100 180 250	− 9.0 −18.0 −25.0	100 180 250	1.2 2.4 3.8	7.0 14.0 22.0	140000 110000 100000	875 1050 1200	120 120 120	15000 11600 10000	0.27 1.00 2.50	C - 38
SCREEN GRID R-F AMPLIFIER	90 180 250	− 3.0 min.	90 90 90	1.6 1.4 1.4	5.6 5.8 5.8	375000 750000 1000000	960 1000 1050	360 750 1050	—	—	C -39-44
CLASS A AMPLIFIER	135✖ 180✖	− 1.5 − 3.0	—	—	0.2 0.2	150000 150000	200 200	30 30	—	—	CX-340
CLASS A AMPLIFIER	100 180 250	− 7.0 −13.5 −18.0	100 180 250	1.6 3.0 5.5	9.0 18.5 32.0	103500 81000 68000	1450 1850 2200	150 150 150	12000 9000 7600	0.33 1.50 3.40	C - 41
CLASS A AMPLIFIER	250	−16.5	250	6.5	34.0	100000	2200	220	7000	3.00	C - 42
CLASS A AMPLIFIER	100 135	−15.0 −20.0	100 135	4.0 7.0	20.0 34.0	45000 35000	2000 2300	90 80	4500 4000	0.90 2.00	C - 43
CLASS A AMPLIFIER	180 250 275	−31.5 −50.0 −56.0	180 250 275	—	31.0 34.0 36.0	1650 1610 1700	2125 2175 2050	3.5 3.5 3.5	2700 3900 4600	0.82 1.60 2.00	C - 45
CLASS A AMPLIFIER ☐	250	−33.0	—	—	22.0	2380	2350	5.6	6400	1.25	C - 46
CLASS B AMPLIFIER ◆	300 400	0 0	—	—	Power output values are for 2 tubes at indicated plate-to-plate load.				5200 5800	16.0 20.0	C - 46
CLASS A AMPLIFIER	250	−16.5	250	6.0	31.0	60000	2500	150	7000	2.7	C - 47
CLASS A AMPLIFIER	95 125	−20.0 −22.5	95 100	9.0 9.0	47.0 50.0	10000 10000	2800 2800	28 28	2000 2000	1.6 2.5	C - 48
● Applied through plate coupling resistor of 250000 ohms or 500-henry choke shunted by 0.25 megohm resistor. ✖ Applied through plate coupling resistor of 250000 ohms. ◆ Two grids tied together. *Maximum.											
CLASS A AMPLIFIER ☐	135	−20.0	—	—	5.7	4000	1125	4.5	11000	0.17	C - 49
CLASS B AMPLIFIER ◆	180	0	—	—	Power output values are for 2 tubes at indicated plate-to-plate load.				12000	3.5	C - 49
CLASS A AMPLIFIER	300 400 450	−54.0 −70.0 −84.0	—	—	35.0 55.0 55.0	2000 1800 1800	1900 2100 2100	3.8 3.8 3.8	4600 3670 4350	1.6 3.4 4.6	CX-350
CLASS B AMPLIFIER	250 300	0 0	—	—	Power output value is for one tube at stated load, plate-to-plate.				8000 10000	8.0 10.0	C - 53
TRIODE UNIT AS CLASS A AMPLIFIER	135 180 250	−10.5 −13.5 −20.0	—	—	3.7 6.0 8.0	11000 8500 7500	750 975 1100	8.3 8.3 8.3	25000 20000 20000	0.075 0.160 0.350	C - 55
CLASS A AMPLIFIER	250	−13.5	—	—	5.0	9500	1450	13.8	—	—	C - 56
BIAS DETECTOR	250	−20.0	—	—	Plate current to be adjusted to 0.2 milliampere with no signal.						C - 56
SCREEN GRID R-F AMPLIFIER	250	− 3.0	100	0.5	2.0	exceeds 1.5 meg.	1225	exceeds 1500	—	—	C - 57
BIAS DETECTOR	250	− 3.9	100	Cathode current 0.97 ma.		—	Plate coupling resistor 250000 ohms. Grid coupling resistor 250000 ohms**.				C - 57
SCREEN GRID R-F AMPLIFIER	250	− 3.0 min.	100	2.0	8.2	800000	1600	1280	—	—	C - 58
MIXER IN SUPERHETERODYNE	250	−10.0	100	—	—	Oscillator peak volts = 7.0.					C - 58
AS TRIODE ¶ CLASS A AMPLIFIER	250	−28.0	—	—	26.0	2400	2600	6.0	5000	1.25	C - 59
AS PENTODE ** CLASS A AMPLIFIER	250	−18.0	250	9.0	35.0	40000	2500	100	6000	3.00	C - 59
AS TRIODE ● CLASS B AMPLIFIER	300 400	0 0	—	—	Power output values are for 2 tubes at indicated plate-to-plate load.				4600 6000	15.0 20.0	C - 59
CLASS A AMPLIFIER	90 180	−19.0 −43.0	—	—	10.0 20.0	2170 1750	1400 1700	3.0 3.0	3000 4800	0.125 0.790	C - 71-A
TRIODE UNIT AS CLASS A AMPLIFIER	250✖	−1.35	—	—	0.4	—	—	Gain per stage = 50-60			C - 75
SCREEN GRID R-F AMPLIFIER	100 250	− 1.5 − 3.0	60 100	0.4 0.6	1.7 2.3	650000 1500000	1100 1250	715 1500	—	—	C - 77
BIAS DETECTOR	250	− 1.95	50	Cathode current 0.65 ma.		—	Plate coupling resistor 250000 ohms. Grid coupling resistor 250000 ohms**.				C - 77
SCREEN GRID R-F AMPLIFIER	90 180 250 250	− 3.0 min.	90 75 100 125	1.5 1.0 2.0 3.0	5.4 4.0 7.0 10.5	315000 1000000 800000 600000	1275 1100 1450 1650	400 1100 1160 990	—	—	C - 78

**Grid #1 is control grid. Grid #2 is screen. Grid #3 tied to cathode. ◆Two grids tied together.
¶Grid #1 is control grid. Grids #2 and #3 tied to plate. ✖ Applied through plate coupling resistor of 250000 ohms.
●Grids #1 and #2 connected together. Grid #3 tied to plate. **For grid of following tube.

Radio Tube Chart (Continued)←RCA Radiotron-Cunningham→Radio Tube Chart (Continued)

TYPE	NAME	BASE	SOCKET CONNECTIONS	DIMENSIONS MAXIMUM OVERALL LENGTH x DIAMETER	CATHODE TYPE ■	RATING: FILAMENT OR HEATER VOLTS	RATING: FILAMENT OR HEATER AMPERES	RATING: PLATE MAX. VOLTS	RATING: SCREEN MAX. VOLTS
RCA-79	TWIN-TRIODE AMPLIFIER	SMALL 6-PIN	FIG. 19	$4\frac{17}{32}$" x $1\frac{9}{16}$"	HEATER	6.3	0.6	250	—
RCA-85	DUPLEX-DIODE TRIODE	SMALL 6-PIN	FIG. 13	$4\frac{17}{32}$" x $1\frac{9}{16}$"	HEATER	6.3	0.3	250	—
RCA-89	TRIPLE-GRID POWER AMPLIFIER	SMALL 6-PIN	FIG. 14	$4\frac{17}{32}$" x $1\frac{9}{16}$"	HEATER	6.3	0.4	250	250
UV-199 UX-199	DETECTOR★ AMPLIFIER TRIODE	SMALL 4-NUB SMALL 4-PIN	FIG. 10 FIG. 1	$3\frac{1}{2}$" x $1\frac{1}{16}$" $4\frac{1}{8}$" x $1\frac{3}{16}$"	D-C FILAMENT	3.3	0.063	90	—
RCA-864	AMPLIFIER TRIODE	SMALL 4-PIN	FIG. 1	4" x $1\frac{3}{16}$"	D-C FILAMENT	1.1	0.25	135	—

★For Grid-leak Detection—plate volts 45, grid return to + filament or to cathode.
■Either A. C. or D. C. may be used on filament or heater, except as specifically noted. For use of D. C. on A-C filament types, decrease stated grid volts by ½ (approx.) of filament voltage.

RECTIFIERS

TYPE	NAME	BASE	SOCKET CONNECTIONS	DIMENSIONS	CATHODE TYPE	VOLTS	AMPERES	PLATE MAX. VOLTS	SCREEN MAX. VOLTS
RCA-5Z3	FULL-WAVE RECTIFIER	MEDIUM 4-PIN	FIG. 2	$5\frac{3}{8}$" x $2\frac{1}{16}$"	FILAMENT	5.0	3.0	—	—
RCA-12Z3	HALF-WAVE RECTIFIER	SMALL 4-PIN	FIG. 22	$4\frac{1}{4}$" x $1\frac{9}{16}$"	HEATER	12.6	0.3	—	—
RCA-25Z5	RECTIFIER-DOUBLER	SMALL 6-PIN	FIG. 5	$4\frac{1}{4}$" x $1\frac{9}{16}$"	HEATER	25.0	0.3	—	—
RCA-1-v°	HALF-WAVE RECTIFIER	SMALL 4-PIN	FIG. 22	$4\frac{1}{4}$" x $1\frac{9}{16}$"	HEATER	6.3	0.3	—	—
RCA-80	FULL-WAVE RECTIFIER	MEDIUM 4-PIN	FIG. 2	$4\frac{11}{16}$" x $1\frac{13}{16}$"	FILAMENT	5.0	2.0	—	—
UX-281	HALF-WAVE RECTIFIER	MEDIUM 4-PIN	FIG. 3	$6\frac{1}{4}$" x $2\frac{7}{16}$"	FILAMENT	7.5	1.25	—	—
RCA-82	FULL-WAVE ▶ RECTIFIER	MEDIUM 4-PIN	FIG. 2	$4\frac{11}{16}$" x $1\frac{13}{16}$"	FILAMENT	2.5	3.0	—	—
RCA-83	FULL-WAVE ▶ RECTIFIER	MEDIUM 4-PIN	FIG. 2	$5\frac{3}{8}$" x $2\frac{1}{16}$"	FILAMENT	5.0	3.0	—	—
RCA-84 also 6Z4	FULL-WAVE RECTIFIER	SMALL 5-PIN	FIG. 23	$4\frac{1}{4}$" x $1\frac{9}{16}$"	HEATER	6.3	0.5	—	—
RCA-866	HALF-WAVE ▶ RECTIFIER	MEDIUM 4-PIN	FIG. 3 See Note ⊟	$6\frac{5}{8}$" x $2\frac{7}{16}$"	FILAMENT	2.5	5.0	—	—

▶ Mercury Vapor Type. ° Interchangeable with type 1.
⊟ Plate connection made to top cap of tube.

PHOTOTUBES

TYPE	NAME	BASE	SOCKET CONNECTIONS	DIMENSIONS	NOTE
RCA-868	PHOTOTUBE	SMALL 4-PIN	FIG. 1 See Note →	$4\frac{1}{8}$" x $1\frac{3}{16}$"	Note: Pins No. 1 and No. 3—No Connections, Pin No. 2—Anode (+), Pin No. 4—Cathode (−).

INDEX OF TYPES BY USE AND BY CATHODE VOLTAGE

CATHODE VOLTS	POWER AMPLIFIERS	VOLTAGE AMPLIFIERS *Including Duplex-Diode Types*	CONVERTERS IN SUPERHETERODYNES
1.1	—	11, 12, 864	—
1.5	—	26	—
2.0	19, 31, 33, 49	30, 32, 34	1A6
2.5	2A3, 2A5, 45, 46, 47, 53, 59	2A6, 2B7, 24-A, 27, 35, 55, 56, 57, 58	2A7
3.3	'20	22, '99	—
5.0	112-A, 71-A	01-A, '40, 112-A	—
6.3	6A4, 38, 41, 42, 79, 89	6B7, 6F7, 36, 37, 39-44, 75, 77, 78, 85	6A7, 6F7
7.5	10, '50	—	—
12.6	—	—	—
25.0	43	—	—
30.0	48	—	—

USE (Values to right give operating conditions and characteristics for indicated typical use)	PLATE SUPPLY VOLTS	GRID VOLTS ■	SCREEN VOLTS	SCREEN MILLI-AMP.	PLATE MILLI-AMP.	A-C PLATE RESISTANCE OHMS	MUTUAL CONDUCTANCE MICRO-MHOS	VOLTAGE AMPLIFICATION FACTOR	LOAD FOR STATED POWER OUTPUT OHMS	POWER OUTPUT WATTS	TYPE
CLASS B AMPLIFIER	180 250	0 0	—	—	Power output value is for one tube at stated load, plate-to-plate.				7000 14000	5.5 8.0	C-79
TRIODE UNIT AS CLASS A AMPLIFIER	135 180 250	−10.5 −13.5 −20.0	—	—	3.7 6.0 8.0	11000 8500 7500	750 975 1100	8.3 8.3 8.3	25000 20000 20000	0.075 0.160 0.350	C-85
AS TRIODE ¶ CLASS A AMPLIFIER	160 180 250	−20.0 −22.5 −31.0	—	—	17.0 20.0 32.0	3300 3000 2600	1425 1550 1800	4.7 4.7 4.7	7000 6500 5500	0.300 0.400 0.900	C-89
AS PENTODE ■■ CLASS A AMPLIFIER	100 180 250	−10.0 −18.0 −25.0	100 180 250	1.6 3.0 5.5	9.5 20.0 32.0	104000 80000 70000	1200 1550 1800	125 125 125	10700 8000 6750	0.33 1.50 3.40	C-89
AS TRIODE ● CLASS B AMPLIFIER	180	0	—	—	Power output values are for 2 tubes operating at indicated plate-to-plate load.				13600 9400	2.50 3.50	C-89
CLASS A AMPLIFIER	90	− 4.5	—	—	2.5	15500	425	6.6	—	—	C-299 CX-299
CLASS A AMPLIFIER	90 135	− 4.5 − 9.0	—	—	2.9 3.5	13500 12700	610 645	8.2 8.2	—	—	C-864

■■Grid #1 is control grid. Grid #2 is screen. Grid #3 tied to cathode
¶Grid #1 is control grid. Grids #2 and #3 tied to plate.
●Grids #1 and #2 connected together. Grid #3 tied to plate.

RECTIFIERS

CHARACTERISTICS	TYPE
Maximum A-C Voltage per Plate 500 Volts, RMS; Maximum D-C Output Current 250 Milliamperes	C-5Z3
Maximum A-C Voltage per Plate 250 Volts, RMS; Maximum D-C Output Current 60 Milliamperes	C-12Z3
Maximum A-C Voltage per Plate 125 Volts, RMS; Maximum D-C Output Current 100 Milliamperes	C-25Z5
Maximum A-C Voltage per Plate 350 Volts, RMS; Maximum D-C Output Current 50 Milliamperes	C-1v°
A-C Voltage per Plate (Volts RMS) 350 400 550; D-C Output Current (Maximum MA.) 125 110 135. The 550 volt rating applies to filter circuits having an input choke of at least 20 henries.	C-80
Maximum A-C Plate Voltage 700 Volts, RMS; Maximum D-C Output Current 85 Milliamperes	CX-381
Maximum A-C Voltage per Plate 500 Volts, RMS; Maximum D-C Output Current 125 Milliamperes; Maximum Peak Inverse Voltage 1400 Volts; Maximum Peak Plate Current 400 Milliamperes	C-82
Maximum A-C Voltage per Plate 500 Volts, RMS; Maximum D-C Output Current 250 Milliamperes; Maximum Peak Inverse Voltage 1400 Volts; Maximum Peak Plate Current 800 Milliamperes	C-83
Maximum A-C Voltage per Plate 225 Volts, RMS; Maximum D-C Output Current 50 Milliamperes	C-84 also 6Z4
Maximum Peak Inverse Voltage 7500 Volts; Maximum Peak Plate Current 0.6 Ampere	C-866 (CX-366)

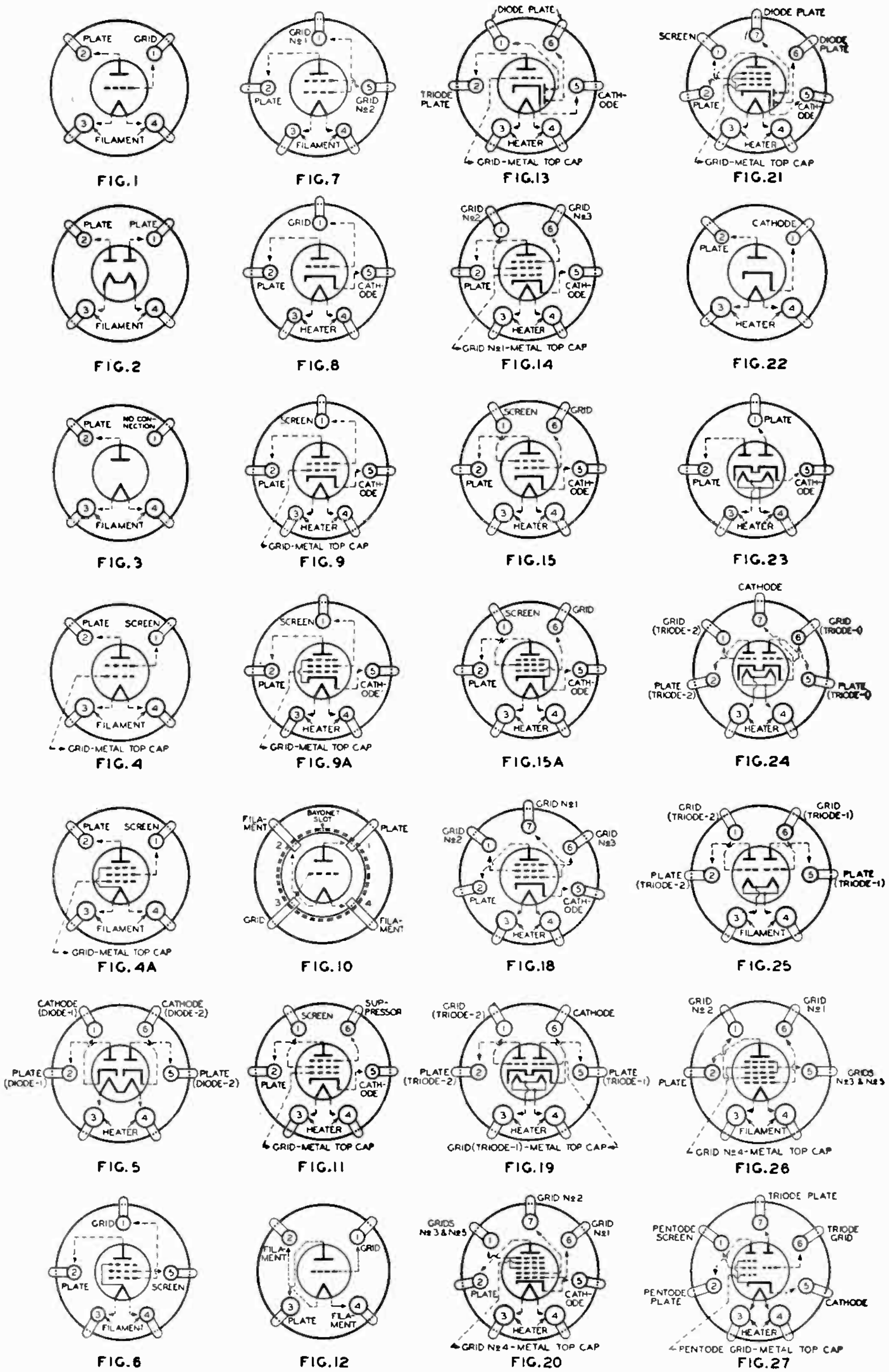
PHOTOTUBES

CHARACTERISTICS	TYPE
Max. Anode Supply Voltage, 90 Volts. Max. Anode Current, 20 Microamperes. Static Sensitivity, 55 Microamperes per Lumen. Dynamic Sensitivity, 50 and 48 Microamperes per Lumen at 1000 and 5000 Cycles per second, respectively.	C-868

INDEX OF TYPES BY USE AND BY CATHODE VOLTAGE

DETECTORS	MIXER TUBES IN SUPERHETERODYNES	RECTIFIERS	CATHODE VOLTS
11, 12, 864	—	—	1.1
—	—	—	1.5
30, 32	1A6, 34	—	2.0
2A6, 2B7, 24-A, 27, 55, 56, 57	2A7, 35, 58	82, 866 (C-366)	2.5
'99	—	—	3.3
00-A, 01-A, '40, 112-A	—	5Z3, 80, 83	5.0
6B7, 6F7, 36, 37, 75, 77, 85	6A7, 6F7, 39-44, 78	1-v, 84	6.3
—	—	'81	7.5
—	—	12Z3	12.6
—	—	25Z5	25.0
—	—	—	30.0

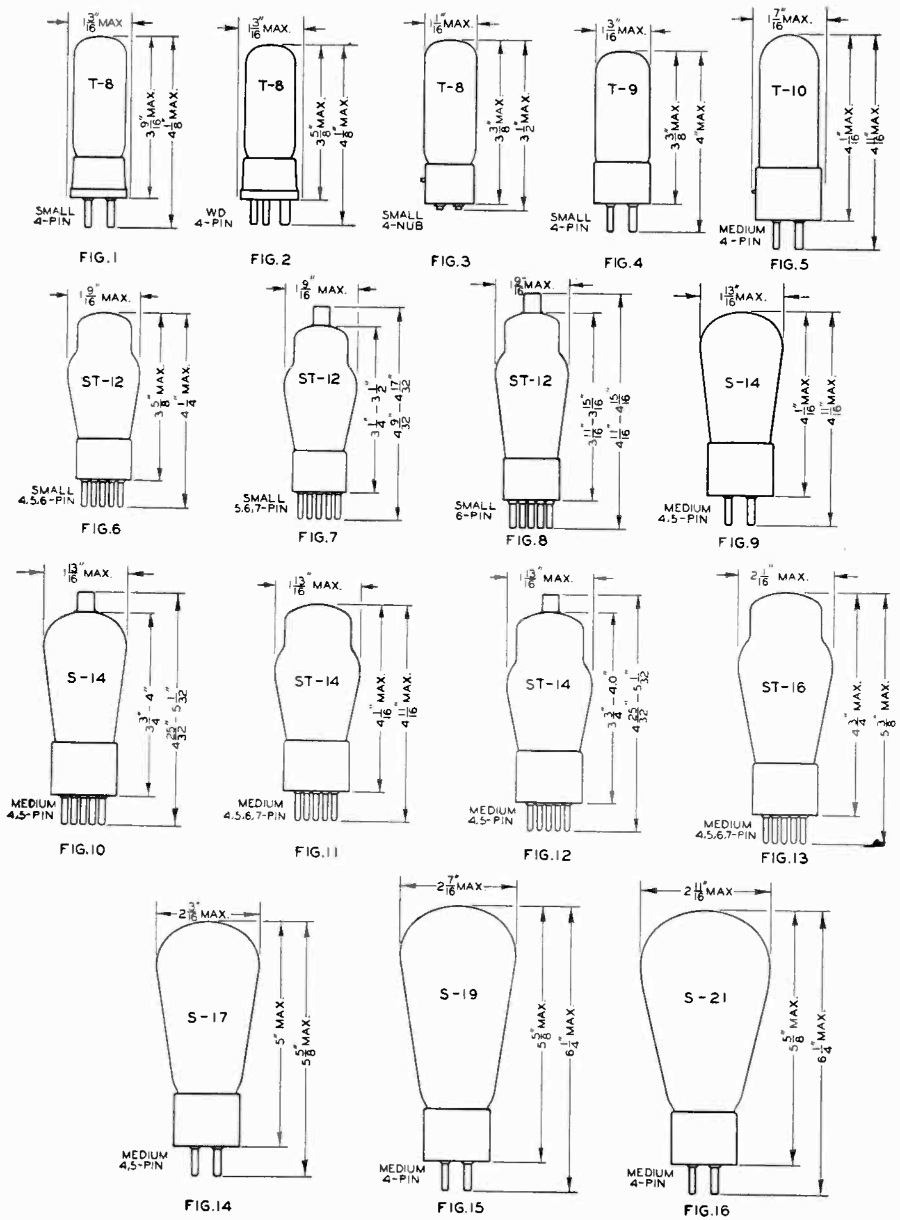
Tube Symbols and Bottom Views of Socket Connections



Outline Dimensions of RCA Radiotron and Cunningham Radio Tube Types

This chart of tube dimensions is to be used in conjunction with the text. The bulb reference number for each tube is given under its CHARACTERISTICS.

The prefix letters of the bulb designation indicate the bulb shape; as S for "straight side," T for "tubular," ST for a combination of tubular and straight side, or "dome type." The suffix numbers of the bulb designations indicate the nominal maximum diameter of the bulb in eighths of inches, i.e., the diameter of the S-12 is 12 eighths, or 1½".



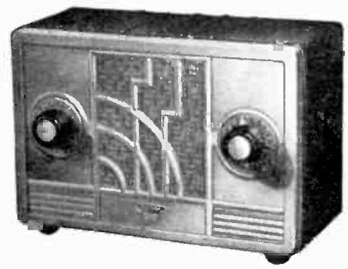
MODELS NOT ILLUSTRATED

MODEL 91-B

Model 91-B—A compact, portable three-tube battery set with good sensitivity, selectivity and tone. Five-inch magnetic speaker and volume control. Comes with 7-foot cable for storage battery connection and fuse in "B" battery lead as tube protector. Cabinet of metal, of midnight blue top and sides, silver front and back.

MODEL 102

Model 102—Four-tube Standard T. R. F. radio capable of operation on A. C. or D. C. Police reception, five-inch permanent magnet speaker, 0.9-watt output. In blue-black metal cabinet with front and back silver lacquered. 9¾" wide, 6¾" high, 5⅛" deep.



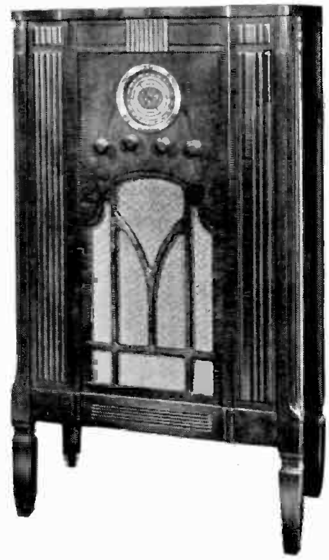
MODEL 124

Model 124—A 6-tube Superheterodyne with automatic volume control, tone control, 6-to-1 vernier tuning, big dynamic speaker, police call reception, illuminated dial. Cabinet with aspen veneered front panel and metallic-finished grille.

MODEL 135-B

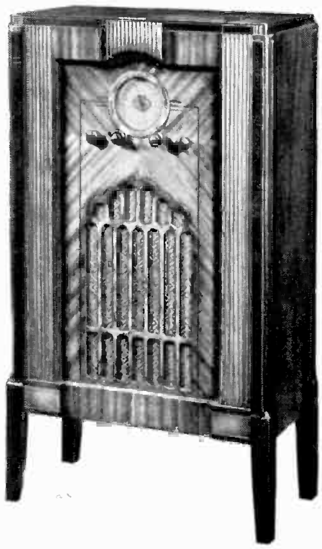
Model 135-B—A seven-tube, two-band (540 to 1720 and 5400 to 18,000 kc.) Globe Trotter Superheterodyne operating on batteries. Identical with Model 235-B, except for eight-inch permanent magnet speaker and table cabinet. Cabinet neo-classic with two-tone hand-rubbed finish. 17$^{13}/_{16}$" high, 14½" wide, 10" deep.

MODELS NOT ILLUSTRATED



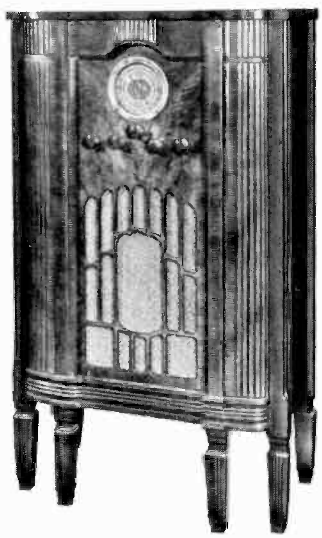
MODEL 211

Model 211—A five-tube, two-band (540 to 1720 and 5400 to 18,000 kc.) Superheterodyne Globe Trotter identical with Model 118, but housed in an engaging console cabinet and equipped with a ten-inch dynamic speaker. Cabinet is of neo-classic design with blended, hand-rubbed walnut finish. Dimensions: 40″ high, 23½″ wide, 11⅜″ deep.



MODEL 221

Model 221—A six-tube, two-band (540 to 1500 and 5400 to 15,500 kc.) Superheterodyne Globe Trotter with ten-inch dynamic speaker, airplane dial, dual ratio vernier tuning, automatic volume control, tone control, and 3.5 watts output. In neo-classic console finished in two-tone blended walnut. 40″ high, 23½″ wide, 12⅛″ deep.



MODEL 224

Model 224—A six-tube, three-band (540 to 18,000 kc.) Superheterodyne Globe Trotter with the identical chassis of Model 128, but equipped with a ten-inch dynamic speaker, and housed in a cabinet of console type. Cabinet is neo-classic in style and finished in blended, hand-rubbed walnut. 41″ high, 24½″ wide, 12¼″ deep.

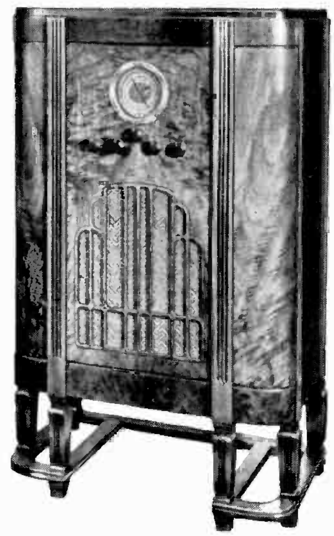
MODELS NOT ILLUSTRATED

MODEL 240

Model 240 World-Wide Radio—A powerful eight-tube Superheterodyne (short-wave and standard programs) with remarkable tone quality and freedom from background noises. Automatic volume control, 50-to-1 vernier tuning, tone control, oversize dynamic speaker, full vision airplane dial. Housed in a beautiful walnut veneered console.

MODEL 242

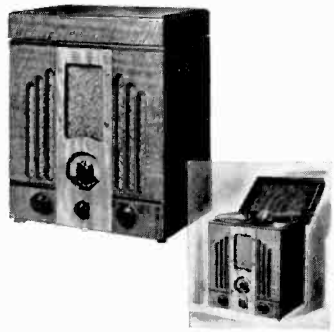
Model 242—An eight-tube, four-band (140 to 410 and 540 to 18,000 kc.) Superheterodyne Globe Trotter, identical with Model 143, except for a ten-inch dynamic speaker and a console cabinet. Cabinet is neo-classic in design. Finish is blended, two-tone, hand-rubbed walnut. 41½″ high, 26″ wide, 14″ deep.



MODEL 261

Model 261—A magnificent ten-tube standard (540 to 2800 kc.) Superheterodyne with ten-inch dynamic speaker, vernier tuning, hi-low tone control, sensitivity control, automatic tone compensation, automatic volume control and eight watts output. In console cabinet with aspen overlays and oriental wood veneers. 41¾″ high, 26½″ wide, 14½″ deep.

MODELS NOT ILLUSTRATED



MODEL 301

Duo 301—A four-tube standard Superheterodyne combined with electric phonograph. (Range 540 to 3500 kc.) Tone control, illuminated dial, five-inch dynamic speaker, 2.5 watts output, police reception, electric pickup, synchronous motor. In mahogany-veneered table cabinet with aspen overlays. 14¾″ high, 11½″ wide, 9″ deep.

MODEL 320

Model 320—The radio chassis of the Model 320 is similar to that of the 122, with the exception that it uses a full ten-inch loudspeaker. The phonograph has a two-speed turntable, magnetic pickup, inertia suspension arm and synchronous motor. The radio record switch is combined with the phonograph volume control and mounted on the motor board. The console cabinet is of classical Eighteenth Century design of walnut veneers.

MODEL 321

Duo 321—A six-tube, two-band (540 to 1500 and 5400 to 15,500 kc.) Globe Trotter Superheterodyne with two-speed all-electric phonograph. ten-inch dynamic speaker, airplane dial, dual ratio vernier tuning, automatic volume control, tone control and 3.5 watts output. In walnut-veneered console cabinet. 40″ high, 21⅞″ wide, 15″ deep.

CROSS-INDEX

to

RCA Victor, General Electric, Westinghouse and Graybar Models

RCA Victor Models not listed have no Brand equivalents

RCA Victor	G. E.	West.	Graybar
SW-2	JZ-30	—	—
R-4	J-70	WR-17	GT-7
R-5	T-12	WR-14	GB-4
R-5-DC	T-12-D	—	—
R-5-X	T-12-E	WR-14-CR	—
T-5	E-52	WR-9	—
R-6	J-75	—	GC-13
R-7	S-22 & S-22-X	WR-10	GB-8
R-7A	S-22 (2)	WR-10-A	GB-8-A
R-8	J-80	WR-18	GT-8
R-9	S-42	WR-12	—
R-10	S-132	WR-15-A	GB-989
R-11	K-62	WR-15	GB-9
R-12	J-85	—	GC-14
Rad. 16	—	—	GB-300
RE-16	SZ-42-P	WR-13	—
RE-16-A	—	WR-13-A	—
R-17-M	BX or K-41	WR-26-M	—
RE-18 & RE-18A	KZ-62-P	—	—
R-18-W	K-40-A	—	—
Rad. 18	—	—	GB-310
Rad. 21	B-1	—	—
Rad. 22	B-2	—	—
R-22-S	L-50	—	—
R-22-W	L-51	—	—
RO-23	JZ-835	WR-16	—
R-24	JZ-822	—	—
R-24-A (47)	JZ-822-A	WR-24	—
R-24-A (2A5)	—	WR-24	—
R-27	K-40	WR-26	—
R-28	K-50	—	—
R-28-P	K-50-P	—	—
R-28-P (A to G)	K-51-P	WR-27	—
M-30	A-90	—	—
P-31	A-81	—	—
M-32	A-60	—	—
Rad. 33	—	—	GB-311
M-34	B-40	WR-33	—
R-37	K-60	—	—
R-37-P	K-60-P	WR-28	—
R-38	K-65	—	—
R-38-P	K-65-P	—	—
RE-40	K-54	—	—
RE-40-P	K-54-P	WR-29	—
R-43	S-42-B	—	—
Rad. 44	—	—	GB-500
Rad. 46	—	—	GB-550
Rad. 48	T-41	WR-4	GB-678
R-50	H-32	—	—
Rad. 51	—	—	GB-320
R-55	—	—	GB-100
RAE-59	H-72	—	—
Rad. 60	—	—	GB-330
Rad. 62	—	—	GB-340
Rad. 66	—	—	GB-600
R-70 & R-70-N	J-72	WR-21	—
R-71	J-82	WR-19	—
R-72	J-86	—	—
R-73 (47)	J-83	WR-22	—
R-73 (2A5)	J-83-A	—	—
R-74	J-100	WR-20	—
R-75 (47)	J-87	—	—
R-75 (2A5)	J-87-A	—	—
R-76	J-105	—	—
R-77	J-107	—	—
R-78	J-125	—	—
R-78 (2)	J-125 A	—	—
RE-80	—	WR-23	—
Rad. 80	H-31	WR-5	GB-700
RE-80-SW	—	WR-25	—
Rad. 82 and 82-R	H-51 and 51-R	WR-6 and 6-R	GB-770
Rad. 86 and 86-R	H-71 and 71-R	WR-7 and 7-R	GB-900
R-90	K-106	—	—
R-90-P	K-106-P	—	—
91-B	C-30	—	—
100	K-43	WR-32	—
101	M-41	—	—
102	M-40	—	—
M-105	C-41	W R-41	—
M-107	C-60	—	—
110	K-52	—	—
111	K-53	WR-35	—
112	L-52	WR-34	—
114	L-53	—	—
115	K-53-M	—	—
M-116	B-52	WR-42	—
118	M-51	WR-48	—
120	K-63	WR-36	—
121	K-64	WR-37	—
M-123	C-61	—	—
124	M-63	—	—
126-B	C-62	—	—
127	K-64-D	—	—
128	M-61	WR-46	—
128-E	—	WR-50	—
135-B	C-70	WR-47	—
140 and 140-E	K-80	WR-30	—
141 and 141-E	K-80-X	WR-31	—
142-B	B-81	—	—
143	M-81	WR-45	—
210	K-55	—	—
211	M-56	—	—
220	K-66	—	—
221	M-65	—	—
222	K-66-M	—	—
223	C-67	—	—
224	M-67	—	—
235-B	C-75	—	—
240	K-85	—	—
241-B	B-86	—	—
242	M-86	—	—
260	K-107	—	—
261	K-105	—	—
262	M-106	—	—
280	K-126	—	—
281	M-125	—	—
300	K-48	—	—
301	M-49	—	—
310	K-58	—	—
321	M-68	—	—
322	M-69	WR-49	—
330	K-78	—	—
331	K-79	—	—
340	K-88	WR-38	—
340-E	K-88-X	WR-39	—
341	M-89	—	—
380	M-128	—	—
380 H. R.	M-128-R	—	—
381	M-129	—	—

Brand Models Without RCA Victor Equivalents

WR-8	Westinghouse WR-6 Chassis with Clock in Columnaire Cabinet.
WR-8-R	Westinghouse WR-6-R Chassis modified for Vertical operation in Columnaire Cabinet.
K-82	G. E. K-62 in Clock Cabinet.
J-88	G. E. J-82 with Manual Motor Board.
H-91	G. E. H-51 (Modified) in Clock Cabinet.
H-91-R	G. E. H-51-R (Modified) in Clock Cabinet.
J-109	G. E. J-100 Chassis and Automatic Motor Board.
JZ-826	G. E. JZ-822 in Console Cabinet.
JZ-828	G. E. J-88 with Short-Wave Adaptor.

Instructions for

RCA Victor 91-B

Three-Tube Battery-Operated Radio Receiver
(Table Model)

INSTALLATION

Location—After unpacking the instrument, select a location where connections can be made conveniently to the antenna and ground. Because of its light weight and small size, the set may be mounted upon a convenient shelf or upon an article of furniture (such as a piano or end-table) but preferably should be located where its battery cable will reach a compartment suitable for concealing the batteries.

Antenna and Ground—A well-insulated outdoor antenna having a length of from 50 to 100 feet including the lead-in wire is recommended. It should be erected as high as conveniently possible and sufficiently remote from power lines and street railways to prevent excessive local interference. If the instrument is installed in a building of non-metallic construction, an indoor antenna ordinarily will afford satisfactory reception and may be considered the most practical. Buildings in which the roof or framework is of metal, however, form an effective shield which greatly impedes the passage of radio waves; to insure best results in such installations, therefore, an outdoor antenna is essential.

A *good* ground connection is necessary for best performance of this receiver. The ground wire should be as short as possible and preferably attached to a cold-water pipe. In locations where a piped water supply is not available, an excellent alternative ground can be procured by attachment to a metallic stake driven from four to six feet into the soil. The surface of the pipe or metallic stake should be scraped clean and an approved ground clamp used to insure a tight and permanent connection.

Two flexible leads extend through the left-hand opening in the rear panel of the cabinet for connection to the antenna and ground. Connect the *black* lead to the antenna wire or lead-in and the *yellow* lead to the ground wire. Both joints should be soldered and wrapped with insulating tape.

Batteries—The following batteries are required:

"A" Battery—One 6-volt storage type.

"B" Battery—Three 45-volt dry batteries. Heavy-duty batteries (such as Eveready No. 486 or No. 870, Burgess No. 21308 or No. 10308) are to be recommended for reasons of economy. Standard-size batteries (such as Eveready No. 485 or No. 872, Burgess No. 22308 or No. 2308), however, may be used if preferred.

Make certain that the On-Off switch (small knob extending through rear panel of cabinet) is in the "off" position, then connect the battery cable (extending through right-hand opening in rear panel) to the batteries exactly as shown by the connection diagram label on the bottom of cabinet. Separate insulated wires are furnished for necessary connections between the "B" batteries.

Tubes—The instrument is equipped and tested at the factory with RCA Radiotrons and is shipped with these tubes installed. The set, therefore, is ready to operate when it is removed from the shipping container and external connections are made as heretofore described.

If, when first installed, the receiver either performs imperfectly or fails to operate, it is probable that one or more of the tubes or dome terminal (grid) clips have been jarred loose in shipment. With the "On-Off" switch in the "off" position, remove the cabinet rear panel (held in place by screws at the edges), then refer to the tube location diagram printed on the license label (also located on bottom of cabinet) and make certain that all tubes are pressed down firmly in their respective sockets and that the three grid clips are tightly attached to the dome terminals of the proper tubes.

OPERATION

Except for the "On-Off" switch on rear of instrument, two operating controls only are used. These controls appear upon the cabinet front panel, the left-hand knob being the Volume Control and the right-hand knob the Station Selector. The instrument should be operated as follows:

1. Set the "On-Off" switch to the "on" position. It will be necessary to wait approximately one-half-minute for the tube filaments to heat before reception is possible.

2. Turn the Volume Control fully clockwise and rotate the Station Selector slowly in either direction until a station is heard. Stations in the standard broadcast band (540-1500 kilocycles) will be received between dial settings of "100" and "10," approximately; police calls transmitted at frequencies up to 1712 kilocycles will be received near the "0" end of the scale.

3. After receiving a desirable signal, turn the Volume Control counter-clockwise until the volume is reduced to a low-level. Now readjust the Station Selector accurately to the position mid-way between the points where the quality becomes poor or the signal disappears.

NOTE—When tuned to a strong local station with the volume control fully advanced, a condition may be observed where a certain amount of counter-clockwise rotation of the control will improve the quality of reproduction and actually increase the volume. This condition is caused by "overloading" and may be corrected simply by setting the volume control below the readily-apparent critical point.

4. Adjust the Volume Control to obtain the desired volume.

5. When through operating, turn the On-Off switch to the "off" position.

IMPORTANT—To avoid damage to the tubes, always set the On-Off switch to the "off" position while interchanging or replacing tubes, or while new batteries are being installed.

Fuse—The receiver is protected by a 0.5 ampere fuse connected in the "B+" (red) lead from the On-Off switch. Should the receiver at any time fail to operate, separate the coupling-type fuse holder and examine the fuse (being careful not to lose the tubular spacer, which is necessary to insulate the fuse from the metal holder). If the fuse is burned out, check all battery connections and have all tubes tested by your dealer before installing a new fuse. This is a special fuse. Obtain replacement fuses from your dealer—*do not use any substitute for this fuse.*

.0179

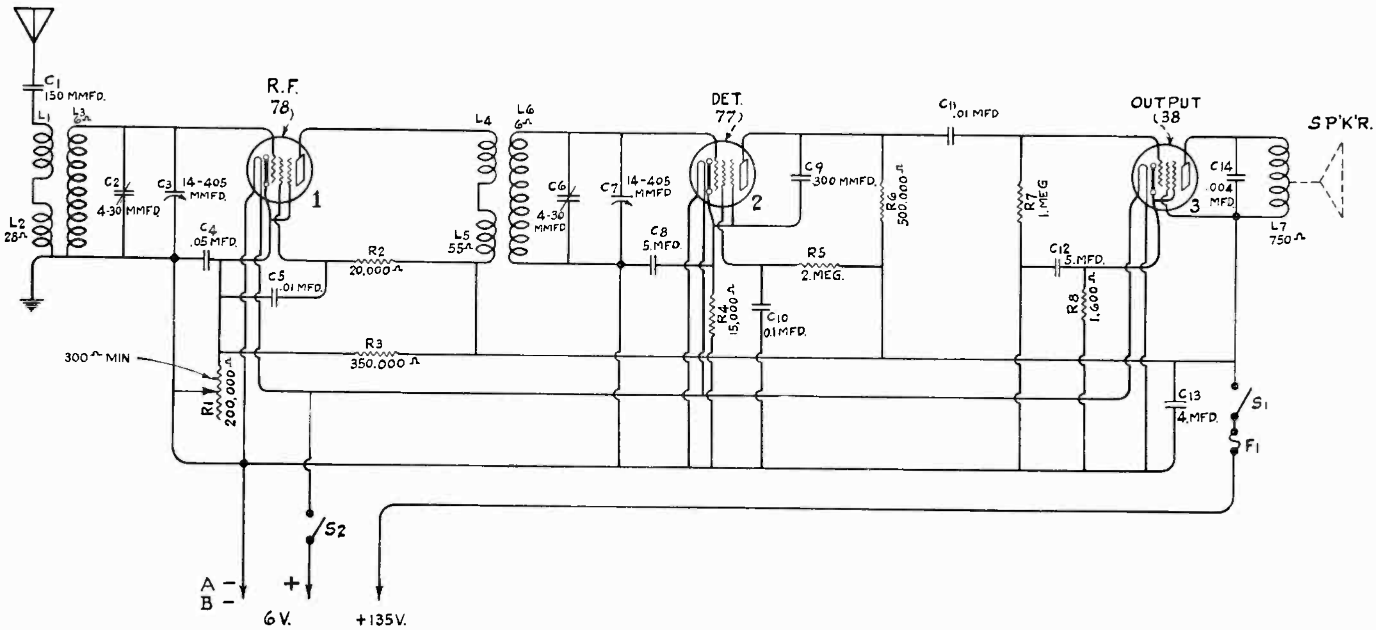


Figure A—Schematic Circuit Diagram

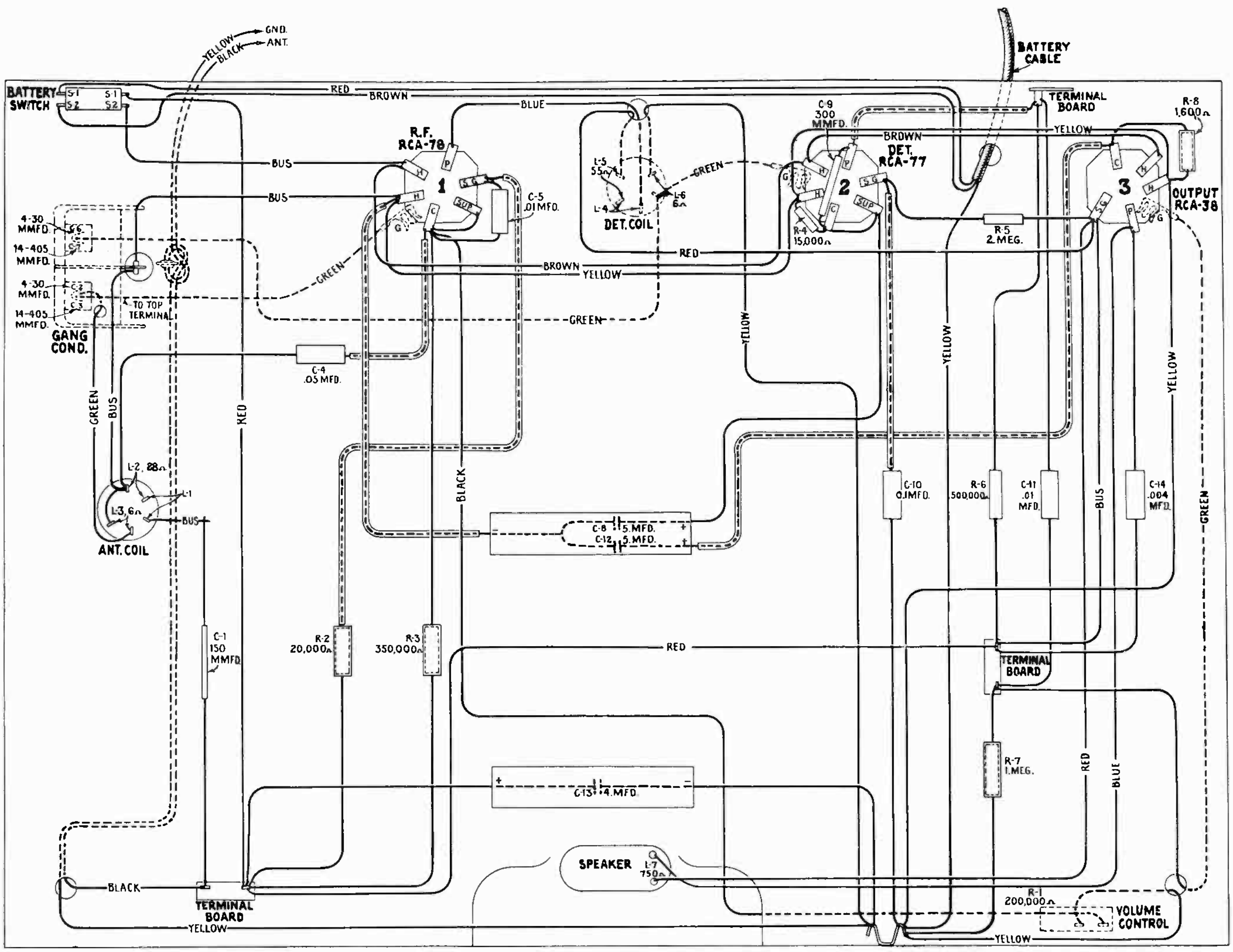


Figure B—Wiring Diagram

SERVICE DATA

"A" Battery Required............Six-Volt Storage Battery
"B" Battery Required................Three 45-Volt Blocks
"A" Current..................................0.9 Ampere
"B" Current................ (Maximum Volume) 18 M. A. / (Minimum Volume) 9 M. A.
Type and Number of Radiotrons
1 RCA-78, 1 RCA-77, 1 RCA-38, Total 3
Undistorted Output............................0.2 Watts
Tuning Range............................540-1712 K. C.
Type of Loudspeaker...........................Magnetic

This battery type tuned R. F. receiver incorporates excellent performance in conjunction with minimum cost and up-keep requirements. Service work consists principally of replacements and line-up adjustments. The proper method of aligning the receiver follows.

R. F. Line-up Capacitor Adjustments

Two adjustable capacitors are provided for adjusting the R. F. circuits to maximum electrical alignment. In order to properly adjust the capacitors, a Stock No. 9050 Test Oscillator and 7065 adjustment screwdriver are required. Also an output meter should be connected across or in place of the loudspeaker winding. Proceed as follows:

(A) Place the oscillator in operation at 1400 K. C. and connect its output to the antenna and ground of the receiver. Connect the output meter and place the receiver in operation.

(B) Tune in the signal from the oscillator and adjust the volume control and oscillator output until a deflection is obtained in the output meter. Adjust each trimmer until maximum output is obtained. The proper adjustment is when a minimum value of trimmer capacity is used. Readjusting the dial may be necessary to arrive at such a condition. Then slightly reduce the setting of the detector trimmer by turning it clockwise. This compensates for a slight increase in the capacity of this circuit that occurs when the chassis is returned to its case. A little experimenting will disclose the proper amount of this reduction.

RADIOTRON SOCKET VOLTAGES

Maximum Volume Control Setting

Radiotron No.	Cathode to Control Grid, Volts	Cathode to Screen Grid, Volts	Cathode to Plate, Volts	Plate Current, M. A.	Filament or Heater, Volts
1. RCA-78 R. F.	2.5	95	132.5	7.0	6.0
2. RCA-77 Detector	2.5*	27*	50*	0.135	6.0
3. RCA-38 Output	12.0	123	115	7.5	6.0

* Cannot be measured with ordinary voltmeter.

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
3546	Capacitor—150 mmfd. (C1)	$0.32
3560	Resistor—1,600 ohms—Carbon type—½ watt (R8)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R7)—Package of 5	1.00
3640	Capacitor—0.05 mfd. (C4)	.25
3701	Capacitor—0.01 mfd. (C5, C11)	.30
3748	Fuse—0.5 ampere (F1)—Package of 5	.40
3848	Capacitor—300 mmfd. (C9)	.30
3860	Socket—5-contact Radiotron socket	.32
3877	Capacitor—0.1 mfd. (C10)	.32
3998	Resistor—15,000 ohms—Carbon type—¼ watt (R4)—Package of 5	1.00
4070	Capacitor—0.004 mfd. (C14)	.42
4073	Resistor—350,000 ohms—Carbon type—½ watt (R3)—Package of 5	1.00
4076	Escutcheon—Volume control escutcheon—Package of 2	.26
4077	Escutcheon—Station selector escutcheon—Package of 2	.26
4078	Knob—Station selector knob—Package of 5	.75
4079	Foot—Rubber foot—Package of 4	.22
4096	Knob—Volume control knob—Package of 5	.75
4097	Switch—Operating switch—Double pole—Single throw (S1, S2)	.94
6114	Resistor—20,000 ohms—Carbon type—1 watt (R2)—Package of 5	$1.10
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R6)—Package of 5	1.00
6242	Resistor—2 megohms—Carbon type—¼ watt (R5)—Package of 5	1.00
6516	Connector—Fuse connector	.16
6820	Coil—Antenna coil (L1, L2, L3)	.86
6821	Coil—Detector coil (L4, L5, L6)	.96
6822	Condenser—2-gang variable tuning condenser (C2, C3, C6, C7)	2.34
6829	Volume control (R1)	1.05
6830	Cable—Battery cable	1.12
6844	Capacitor—Two 5.0 mfd. (C8, C12)	1.10
6832	Capacitor—4.0 mfd. (C13)	.85
7485	Socket—6-contact Radiotron socket	.40
	REPRODUCER ASSEMBLIES	
7712	Support—Cone support	.50
7713	Mechanism—Speaker mechanism complete (L7)	3.72
9470	Reproducer—Complete	4.62
9471	Cone—Speaker cone—Package of 5	3.50

RCA Victor Company, Inc.

CAMDEN, N. J., U. S. A.

23755

Printed in U. S. A.

RCA Victor
STORE RECORDER R-92

SERVICE NOTES

SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

A RADIO CORPORATION OF AMERICA SUBSIDIARY

REPRESENTATIVES IN PRINCIPAL CITIES

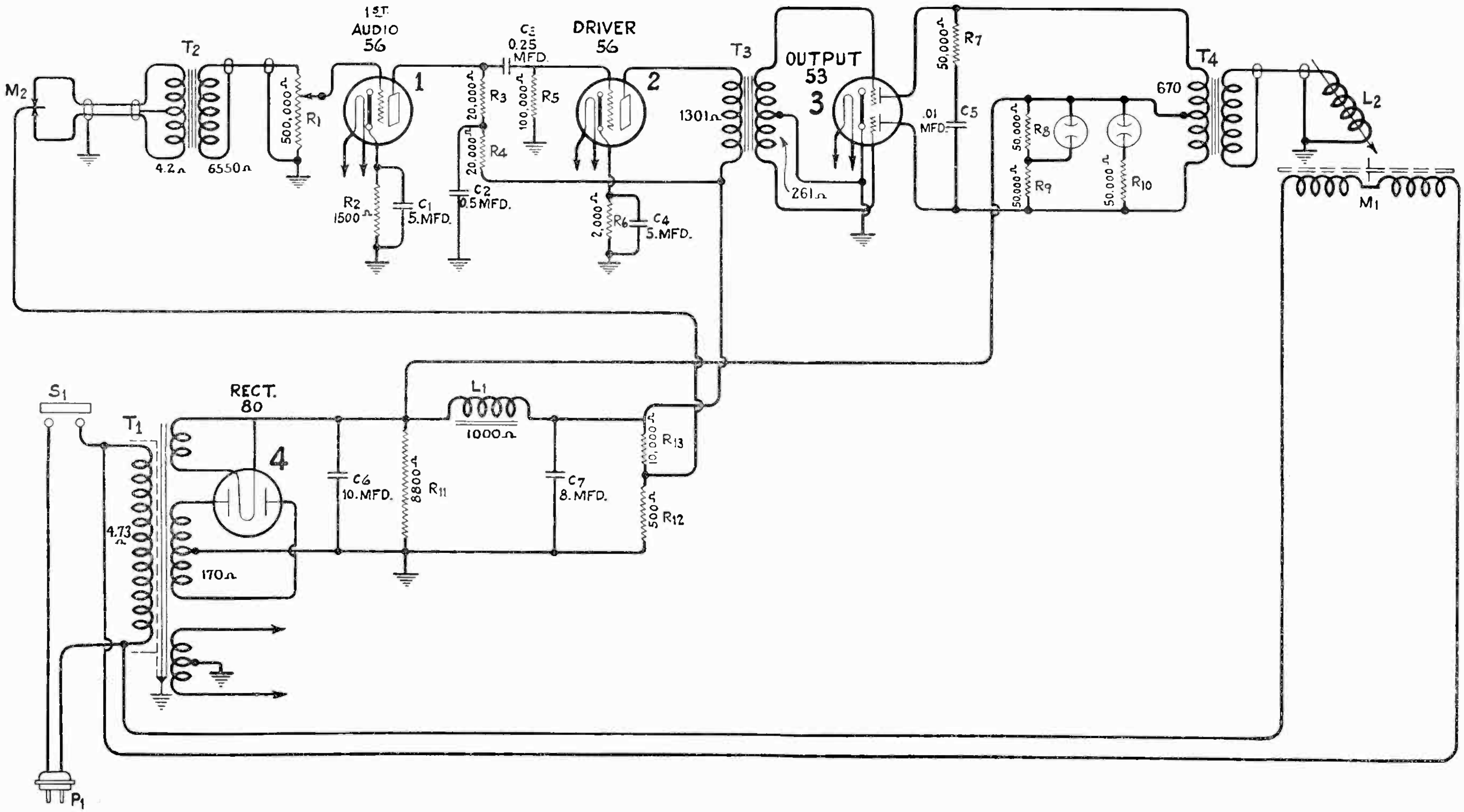


Figure 1—Schematic Circuit Diagram

RCA Victor Model R-92

STORE RECORDER

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Voltage Rating	115 Volts
Frequency Rating	60 Cycles
Power Consumption	95 Watts
Type and Number of Radiotrons	2 RCA-56, 1 RCA-53, 1 RCA-80—Total 4
Type of Microphone	Two-Button, Carbon Type
Microphone Impedance	200 Ohms Each Button (Average)
Pickup Impedance	7 Ohms at 1000 Cycles
Turntable Speed	33⅓ R.P.M. and 78 R.P.M.

PHYSICAL SPECIFICATIONS

Height	14 Inches
Width	14 Inches
Length	18½ Inches

This dealer recording instrument is a special recording unit designed primarily for making home recording records in dealers' stores. The unit consists of a special recording head and suspension arm assembly, a three-stage amplifier and a suitable power supply. Of special interest is the inclusion of two level indicating lamps which permit the proper recording level to be maintained at all times. A class "B" output stage provides sufficient power to operate the recorder at its optimum level. A two-button microphone permits a high fidelity to be obtained in the recording of all types of programs.

DESCRIPTION OF ELECTRICAL CIRCUIT

The sound to be recorded is picked up by the two-button carbon microphone which changes the sound vibrations to electrical voltage variations of corresponding frequency and dynamic range. The microphone is transformer coupled to the grid of the RCA-56 first audio amplifier. Microphone current is obtained from across a 500 ohm section of the bleeder system of the power supply.

The output of the first audio stage is resistance coupled to the RCA-56 second stage audio amplifier, which in turn is transformer coupled to the grid of the RCA-53 class B output stage.

The output of the RCA-53 is transformer coupled to the recording head, which transforms the electrical voltage variations into mechanical vibrations and thereby cuts the home recording record. A feature of the output system is the two neon level indicating lamps. They are both connected between the center tap and one side of the output transformer through a resistance network. Full brilliancy in one lamp with occasional flashes of the second lamp indicates the proper amount of power for recording.

The power supply consists of an RCA-80 full wave rectifier and the necessary power transformer, choke and filter capacitors. The power supply furnishes plate and grid voltages to all tubes and the microphone.

SERVICE DATA

Except for the replacement of defective Radiotrons, very little service work will be required in conjunction with this instrument. Figure 1 shows the schematic circuit diagram, Figure 2 the wiring diagram, and Figure 3 the various socket voltages. Figure 4 shows the assembly wiring diagram.

(1) Voltage Readings

The following voltages are those at the tube sockets while the recorder is in operating condition. No allowance has been made for current drawn by the meter and if low resistance meters are used, such allowances must be made.

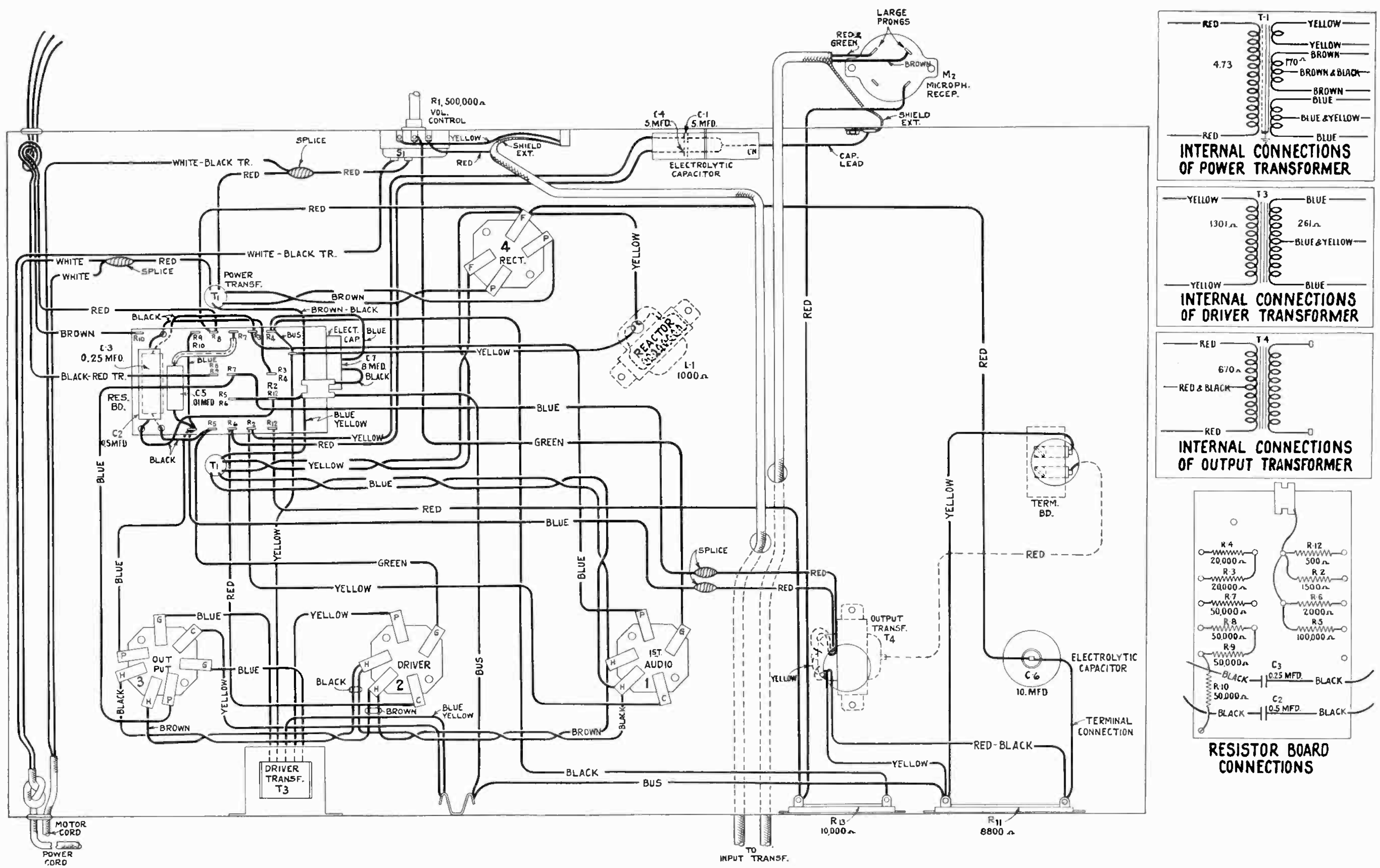


Figure 2—Wiring Diagram

(2) Service Data on Magnetic Pickup

The Magnetic Pickup used in this combination instrument is of a new design with an improved frequency range. While in physical appearance it is similar to that of the older type, details of construction are considerably different. It consists essentially of a chromium steel magnet, two thin pole pieces, a mechanism support and bracket, a coil, and an armature that is damped by means of an anchored damping block.

The use of the anchored damping block eliminates any bad peaks in the frequency range. The frequency-response characteristic is substantially flat from 50 to 5,000 cycles.

(3) Replacing Magnet Coil, Pivot Rubbers, Armature or Damping Block

In order to replace a defective coil or the hardened pivot rubbers (see Figure 6), it is necessary to proceed as follows:

(a) Remove the pickup cover by removing the center holding screw and needle screw.

(b) Remove the pickup magnet and the magnet clamp by pulling them forward.

(c) Unsolder the coil leads and remove the mechanism assembly from the back plate by releasing the two mounting screws and the damping block clamping screw.

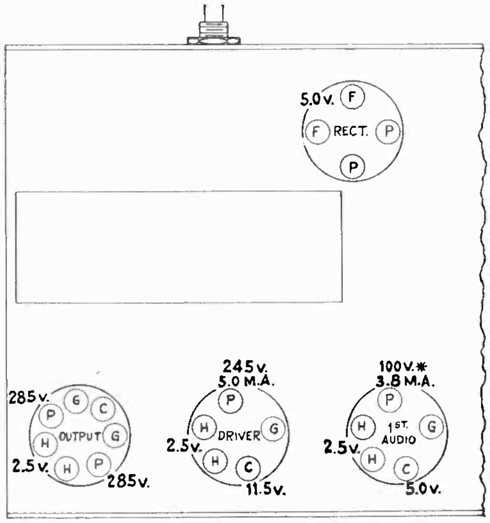


Figure 3—Voltage Readings at Radiotron Sockets

RADIOTRON SOCKET VOLTAGES

Radiotron No.	Cathode to Ground, Volts	Plate to Ground, Volts	Plate Current, M. A.	Heater Volts
RCA-56—1st A. F.	5.0	100*	3.8	2.5
RCA-56—2nd A. F.	11.5	245	5.0	2.5
RCA-53—Power	—	285	30.0	2.5
RCA-80—Rectifier	Total Rectified Voltage—290 Volts			5.0

*Calculated—High Resistance Circuit.

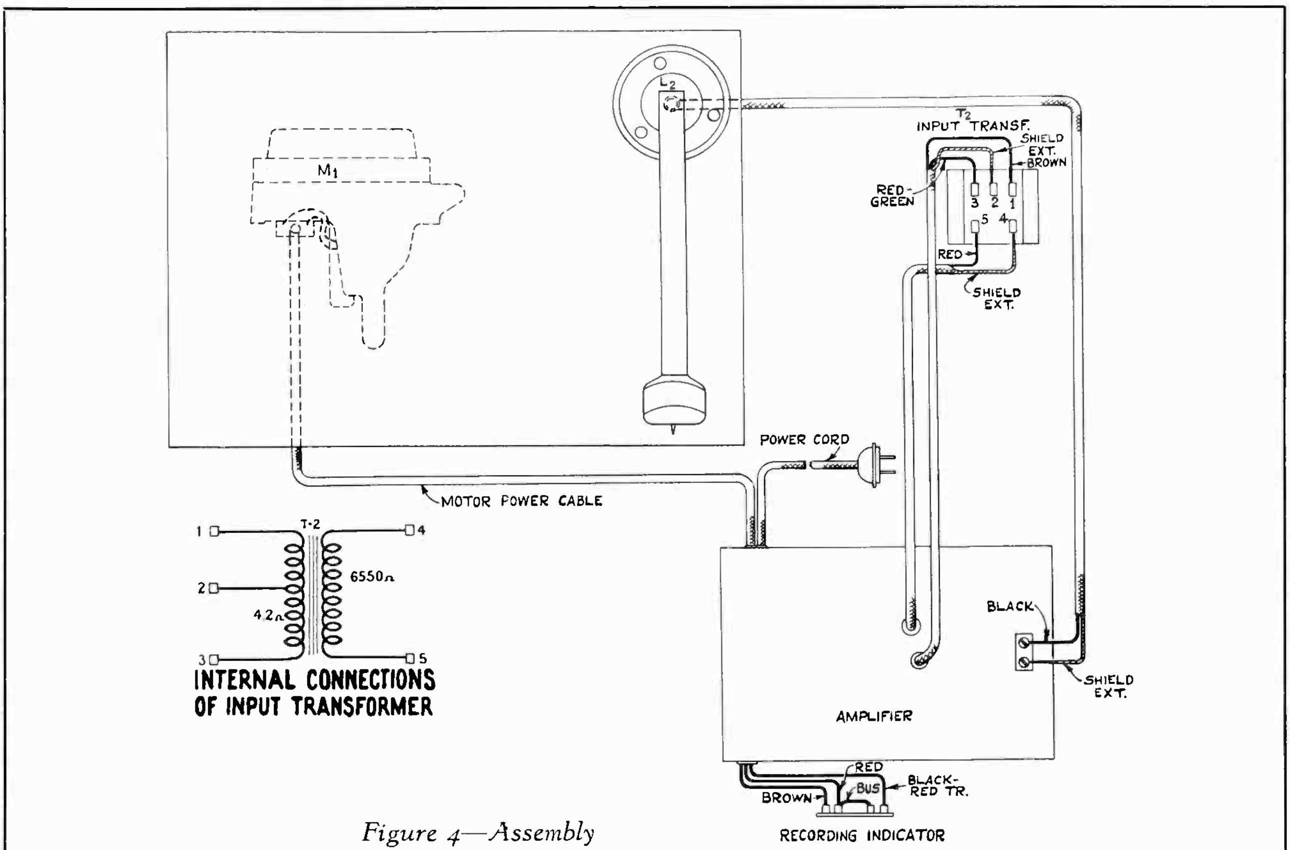


Figure 4—Assembly

(d) Remove screws A and B, Figure 6, and then remove the mechanism assembly from the pole pieces.

(e) The coil or the front pivot rubber may now be removed and replaced. If it is desired to replace the rear pivot rubber, then the end of the armature soldered to the mechanism support must be unsoldered and the damping block removed. The rear pivot rubber now may be replaced. After putting the pivot rubbers in place a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block.

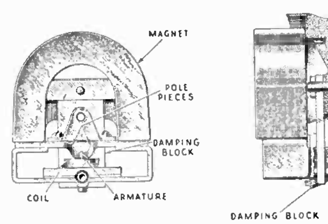


Figure 5

(f) The mechanism should now be reassembled, except for the magnet, which must be magnetized. After being magnetized, the mechanism—with the pole pieces upward—should be placed so that the magnet may be slid from the magnetizer onto the pole pieces without breaking physical contact. After placing the pole pieces on the magnet, the entire assembly should be remagnetized thoroughly, being careful not to change the polarity obtained by the initial magnetization.

(g) After assembling to the mechanism, the entire assembly should be fastened to the back plate by means of the screws provided, making sure the damping block is securely clamped. At the same time, the metal dust cover must be placed in position.

(h) After remagnetizing, it is necessary to correctly center the armature. This may be done quite accurately by feeling its play after the needle is inserted. A little practice will quickly show which way an adjustment is necessary to have the armature centered properly. The adjustment is made by loosening screws A and B (Figure 6), and sliding the mechanism slightly in relation to the pole pieces.

(i) The cover may be now replaced over the entire assembly, and the pickup returned to the tone arm.

In assembling, it may be desirable to check the armature air gap by means of a small Feeler Gauge. This air gap should be .009" on each side of the armature. However, a little practice with the needle in place will quickly disclose whether or not the armature is centered.

(4) Replacing the Damping Block

If it is desired to replace the damping block, it may be done in the following manner:

(a) Disassemble the pickup as described under the preceding section.

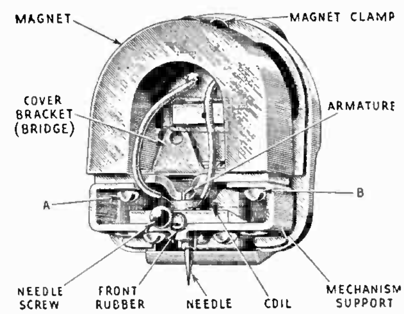


Figure 6

(b) Remove the armature entirely by unsoldering it at its joint with the mechanism support.

(c) Remove the damping block from the armature and clean the bushing for holding the damping block with emery paper.

(d) Insert the armature through the new block so that it occupies the same position as that of the old. Also ascertain that the block is in correct vertical alignment with the armature. It will be noted that the hole in the damping block is somewhat smaller than the diameter of the armature. This is done so that a snug fit will be obtained.

(e) After properly locating the damping block, a soldering iron should be applied to the armature so that the block will melt slightly at its point of contact with the armature. A special tip, constructed as shown in Figure 7, will prove desirable for fusing the block in place. The iron should be applied long enough to slightly melt the block and cause a small bulge on both sides, but should not be applied long enough to cause any bubbling. The pickup should then be reassembled as described in the preceding section.

Only rosin core solder should be used for soldering the coil leads in the pickup. Also rosin core solder should be satisfactory for resoldering the end of the spring in the hole in the mechanism, since both these parts have been previously tinned. In case the parts are not well tinned, it will be necessary to scrape the end of the spring and the hole in the mechanism until bright. These parts may now be tinned by using as a flux a water solution of zinc chloride (commonly

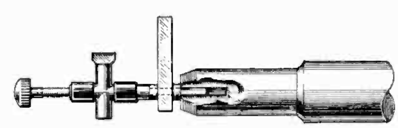


Figure 7

called acid flux). After tinning, dip the parts in water to wash off the acid flux and thereby prevent serious subsequent corrosion. After making sure that the pivot rubbers and damping block are properly in place, as described under (e) above, the armature may now be soldered in place in the mechanism by using rosin core solder, since the parts are now tinned. Care must be exercised to get the needle hole perfectly square with respect to the mechanism, or otherwise it will be difficult if not impossible to center the armature in the air gap as explained under (h).

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	AMPLIFIER ASSEMBLIES	
3787	Capacitor—0.01 mfd. (C5)	$0.30
6648	Capacitor—0.25 mfd. (C3)	.42
3772	Capacitor—0.5 mfd. (C2)	.32
4498	Capacitor—8.0 mfd. (C7)	1.25
7590	Capacitor—10.0 mfd. (C6)	1.40
6824	Capacitor pack—Comprising two 5.0 mfd. (C1, C4)	.94
6552	Reactor—Filter reactor (L1)	1.04
3114	Resistor—50,000 ohms—Carbon type—¼ watt (R8, R9, R10)—Package of 5	1.00
4396	Resistor—500 ohms—Carbon type—½ watt (R12)—Package of 10	2.00
3047	Resistor — 1500 ohms — Carbon type — ½ watt (R2)—Package of 5	1.00
3526	Resistor — 2000 ohms — Carbon type — ½ watt (R6)—Package of 5	1.00
6303	Resistor—20,000 ohms—Carbon type—½ watt (R3, R4)—Package of 5	1.00
3594	Resistor—50,000 ohms—Carbon type—½ watt (R7)—Package of 5	1.00
3252	Resistor—100,000 ohms—Carbon type—½ watt (R5)—Package of 5	1.00
4398	Resistor—10,000 ohms—6.5 watts (R13)	.74
4400	Resistor—8800 ohms—10.5 watts (R11)	.68
4399	Socket—4-contact socket	.44
6300	Socket—4-contact Radiotron socket	.35
7484	Socket—5-contact Radiotron socket	.35
3719	Socket—7-contact Radiotron socket	.30
6551	Transformer—Driver transformer (T3)	1.48
6556	Transformer—Output transformer (T4)	1.50
9026	Transformer—Power transformer (T1)	4.80
4401	Volume control (R1)	1.10
	MICROPHONE ASSEMBLIES	
4403	Cord—Microphone cord	.62
3216	Cushions—Microphone rubber cushions—Package of 6	.24
4500	Housing—Microphone housing	3.15
4499	Mechanism—Microphone mechanism	6.80
4501	Microphone complete	7.50
4402	Plug—Microphone cord plug	.28
	RECORDING INDICATOR ASSEMBLIES	
4381	Escutcheon—Recorder indicator escutcheon	.72
4161	Lamp—Neon lamp	.56
4164	Screen—Recording indicator lamp screen	.18
4382	Screw—Screen escutcheon and terminal board mounting screw assembly—Comprising two screws, two spacers, two nuts and two lockwashers	.20
	PICKUP AND ARM ASSEMBLIES	
4496	Arm—Pickup arm complete	4.70
3417	Armature—Pickup armature	.72
3733	Back—Pickup housing back	.60
3385	Coil—Pickup coil	$0.50
4383	Cover—Pickup cover	.34
3836	Cover—Pickup back cover	.34
4497	Pickup—Magnetic pickup unit complete (L2)	4.60
4384	Plate—Pickup lifter adjustment plate, spring and screw—Located in arm	.20
3387	Screw—Pickup mounting screw assembly—Comprising one screw, one nut and one washer—Package of 10	.40
3388	Screw—Pickup needle holding screw—Package of 10	.60
3419	Screw—Pickup cover holding screw—Package of 10	.40
	TURNTABLE ASSEMBLIES	
3346	Bushing—Speed shifter lever bushing—Package of 4	.66
3344	Cover—Grease retainer cover—Package of 2	.70
4394	Lever—Speed shifter lever	.38
3341	Pin—Groov-pin—Package of 2	.56
3338	Ring—Clamp ring assembly—Comprising spring, latch lever and stud	.50
3343	Sleeve—Sleeve complete with ball race	2.86
3347	Spring—Speed shifter lever spring—Package of 2	.30
7668	Turntable—Complete less shift lever	8.34
3340	Washer—Thrust washer—Package of 2	.56
	MOTOR ASSEMBLIES	
4395	Mounting assembly—Motor mounting assembly—Comprising 3 studs, 9 washers, 3 cushions	.38
9510	Motor—105-120 volt 60-cycle motor complete	27.44
8942	Rotor and shaft for motor	7.00
8945	Spindle—Turntable spindle and fibre gear for motor	4.68
	MISCELLANEOUS ASSEMBLIES	
4391	Box—Needle box	.70
3261	Bushing—Record drive bushing—Package of 5	.40
4392	Knob—Volume control knob—Package of 5	.75
4385	Lifter—Pickup lifter mechanism complete	3.00
4387	Screw—No. 6-32-¼″ headless set screw for pickup lifter cam—Package of 10	.25
4388	Screw—No. 6-32-5/16″ headless set screw for pickup lifter cam—Package of 10	.25
4389	Screw—No. 6-32-3/16″ headless set screw for pickup lifter cam—Package of 10	.25
4390	Screw—No. 6-32-⅛″ headless set screw for pickup lifter cam—Package of 10	.25
4393	Screw—No. 8-32-5/16″ headless set screw for volume control knob—Package of 10	.25
4386	Spring—Pickup lifter spring—Package of 10	.20
6226	Transformer—Input transformer (T2)	2.75

RCA Victor
DUO JUNIOR R-93

SERVICE NOTES

SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

A RADIO CORPORATION OF AMERICA SUBSIDIARY

REPRESENTATIVES IN PRINCIPAL CITIES

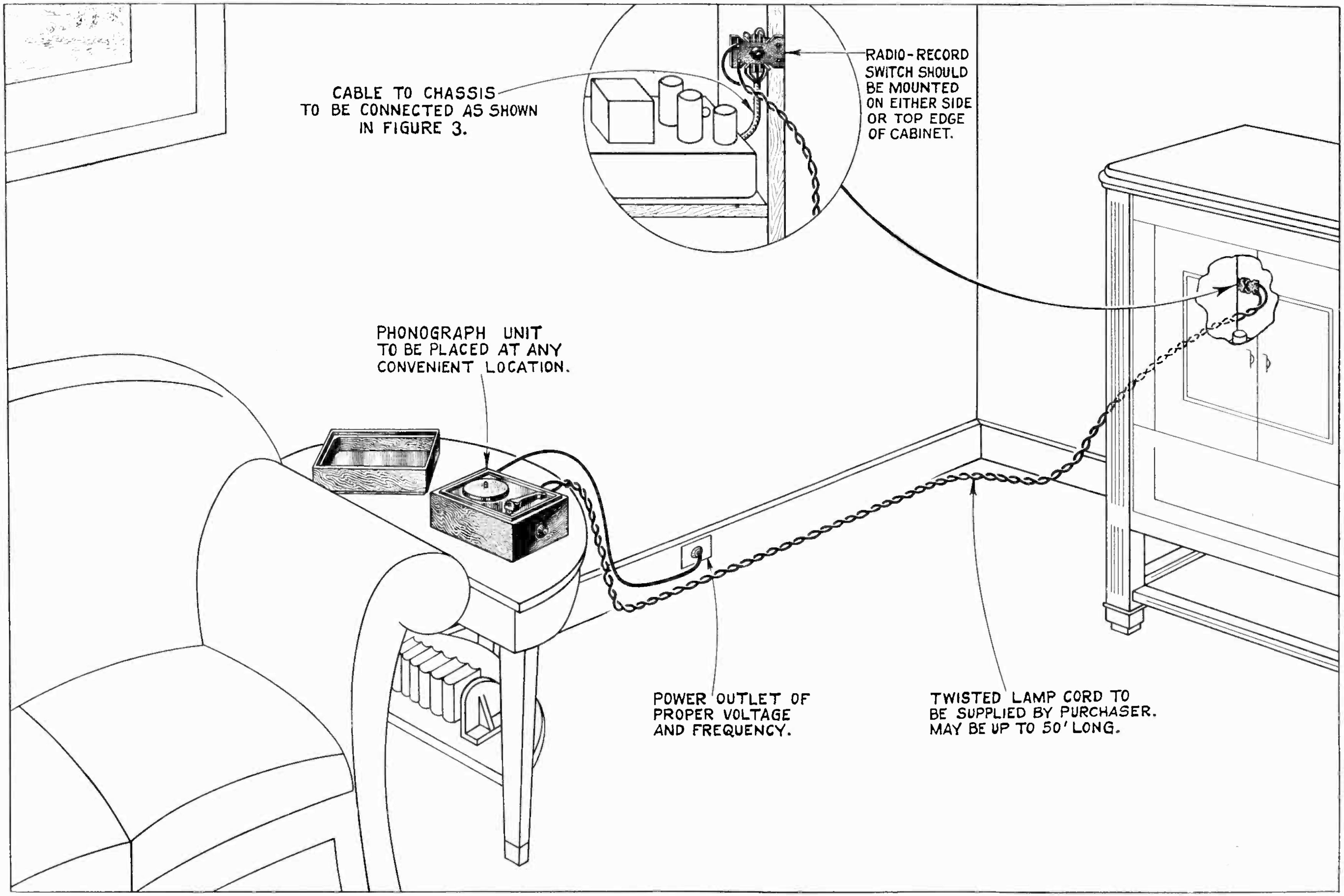


Figure 1—Typical Layout and Connections for Model R-93

RCA VICTOR DUO JUNIOR MODEL R-93

SERVICE NOTES

Electrical Specifications

Voltage Rating....................105–125 Volts	Turntable Speed......................78 R.P.M.
Frequency Rating............25, 50 and 60 Cycles	Pickup Impedance at 1000 Cycles.......2450 Ohms
Power Consumption....................4 Watts	Pickup Output Voltage.....0.4 Volt at 400 Cycles
Type of Motor............Synchronous Reaction	Volume Control Resistance..........20,000 Ohms

Physical Specifications

Turntable Diameter.....................7 Inches	Width...............................11 Inches
Height..............................5 Inches	Depth...............................8 Inches

This phonograph turntable and pickup assembly is designed to provide record reproduction to the owner of a modern radio receiver. Use of the audio amplifying system and loudspeaker of the radio receiver provides a quality of reproduction equal to or better than that obtained from radio stations. A switch is provided for changing from radio to record reproduction, or vice-versa. Simplicity, compact size and ease of connections are outstanding features of this instrument.

Electrically, the instrument consists of a magnetic pickup—for transforming the mechanical variations of the record grooves to voltage variations—a volume control for adjusting the output voltage to any desired level and a radio-record switch for shifting the connections to the receiver so that either radio or record reproduction may be obtained as desired by the user.

Figure 1 shows a typical layout for an ideal installation. Figure 2 shows the proper connections to be made between the pickup unit and the switch assembly. Figure 3 shows the schematic diagram, while Figures 4 and 5 show the chassis and cable wiring diagrams respectively.

Connecting Phonograph to the Radio Receiver

When connecting a phonograph unit to a radio receiver, there are a few fundamental facts to be considered. First, the output of the pickup must be connected to the receiver at a point where sufficient audio gain between it and the speaker is available to give normal sound output. Second, when doing this some attention should be given to the possibilities of introducing hum and other undesired noise, both in the audio and in the radio circuits.

In general, it will be found that the grid or cathode circuits of the second detector of a super-heterodyne circuit are suitable for phonograph input. On tuned R. F. receivers, either the detector cathode or the first audio transformer primary circuit may be employed, depending upon the amount of audio gain and the type of detector used.

It is fairly common to find radio receivers employing a volume control located in the audio circuit. In these cases, it is advisable to run the phonograph volume control at maximum and use the radio receiver volume control for adjusting the phonograph output. In circuits using aurally compensated volume controls, advantage of this feature is not taken unless the radio receiver volume control is used.

Investigation of a large number of receivers has shown that four general types of connections, all of which may be made without removing the chassis from the cabinet, cover practically every type of receiver. These connections are as follows:

(1) Receivers having phonograph input jacks and Radio-Record Switches. With these receivers the cable and switch supplied with the R-93 is not used. The phonograph output is connected direct to the phonograph input jack and the Radio-Record Switch on the Receiver is used for changing from Record to Radio reproduction. The 1929 Victor Receiver and numerous Stromberg-Carlson Receivers are typical examples of this type of connection.

(2) Receivers having phonograph terminal board connections. Such connections are made in accordance with the instructions pertaining to that particular instrument.

(3) Receivers using the 2B7 or 6B7 Second Detectors. With receivers of this type, the yellow and green leads are connected in series with the grid cap connection of this tube.

(4) Receivers not having any of the foregoing features. On receivers of this type, an adaptor having a split cathode connection is necessary. Stock No. 4611, five-prong adaptor, or Stock No. 4612, six-prong adaptor, may be used. In such cases, the yellow and green leads are connected in series with the cathode, which is placed under the tube used in the second detector socket of the receiver.

It will be noted that red and blue leads are brought out from the switch for "killing" the radio during record reproduction. With most receivers, these may be connected in series with the antenna lead. However, in event this does not work satisfactorily, then one of the split cathode adaptors must be used in the oscillator socket and the leads connected in series with the cathode. This will effectually "kill" the radio on any super-heterodyne receiver. On the following page, a list of numerous receivers and their proper connections are given.

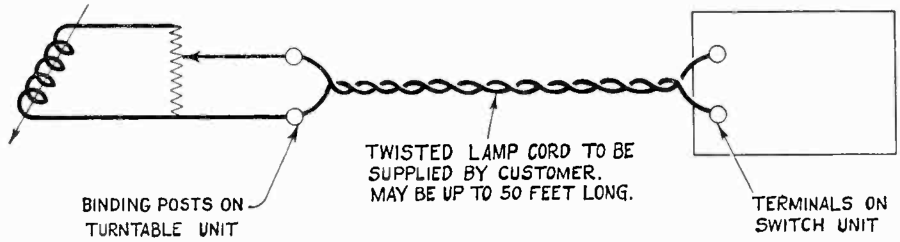


Figure 2—Connections from Pickup to Switch Unit

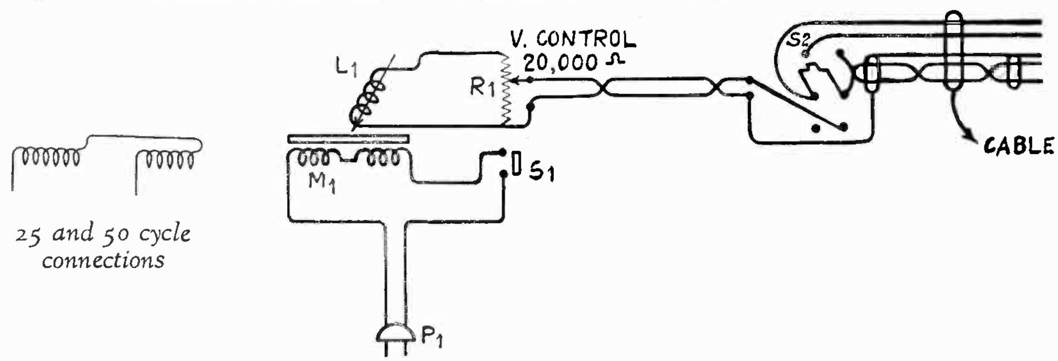


Figure 3—Schematic Diagram

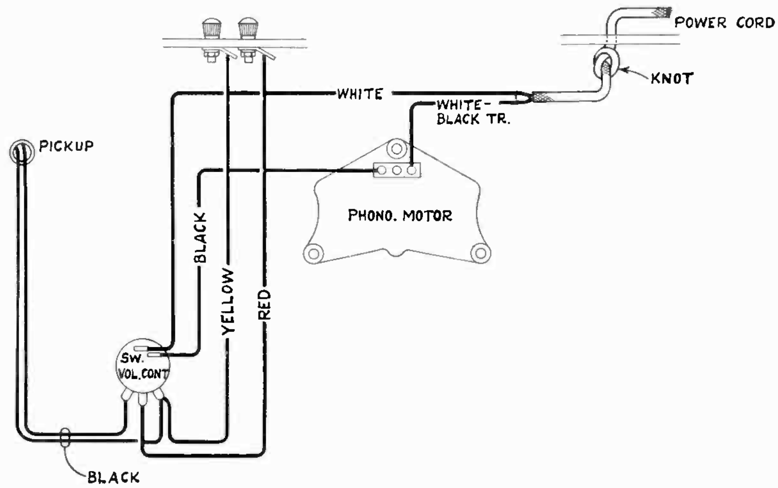


Figure 4—Wiring Diagram

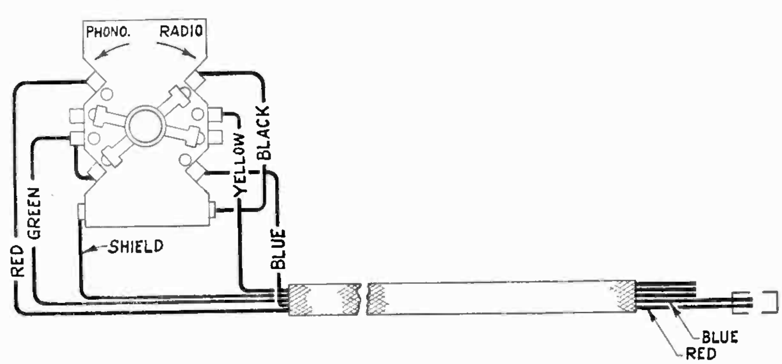
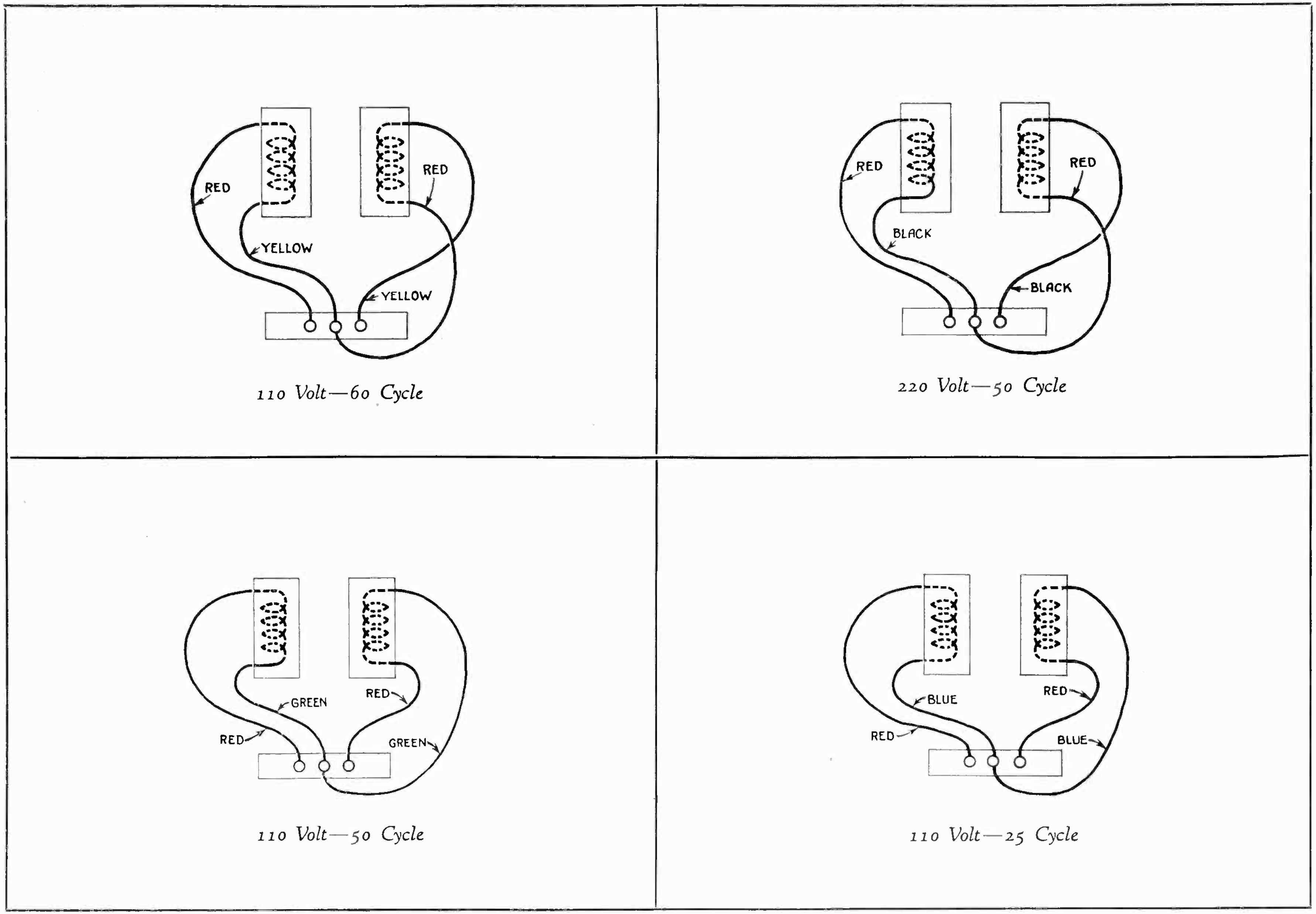


Figure 5—Cable Connections

RCA VICTOR RECEIVERS — DETAILS OF LEAD CONNECTIONS

Model	*Method of Connection*	*Green*	*Yellow*	*Red*	*Blue*	*Shield*
R-4, 6	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Chassis
R-5	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Det. Cathode (Yellow)
R-7	2. Term. Board	Term. 2 (Open Link)	Term. 1	Ant.	Ant. Lead	Term. 4
R-7A	2. Term. Board	Term. 2 (Open Link)	Term. 1	Ant.	Ant. Lead	Term. 4
R-8, 10, 12	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Chassis
R-11	2. Term. Board	Term. 2 (Open Link)	Term. 3	Term. 4	Term. 5	Term. 6
R-17M	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Det. Cathode (Yellow)
R-18W	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Det. Cathode (Yellow)
R-21	2. Term. Board	Term. 2 (Open Link)	Term. 3	Term. 4	Term. 5	Term. 6
R-22	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Det. Cathode (Yellow)
RO-23	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Chassis
R-27	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Det. Cathode (Yellow)
R-28	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Chassis
R-37, 38	3. Grid Clip	Grid Cap of Tube	Grid Clip Contact	Ant.	Ant. Lead	Chassis
Rad. 48	2. Term. Board	Term. 4 (Open Link)	Term. 5	Term. 2	Term. 3	Term. 5
R-50, 55	2. Term. Board	Term. 3 (Open Link)	Term. 4	Term. 1 (Open Link)	Term. 2	Term. 6
R-70	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Chassis
R-71, 72	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Chassis
R-73, 75	3. Grid Clip	Grid Cap of Tube	Grid Clip	Ant.	Ant. Lead	Chassis
R-73A, 75A	3. Grid Clip	Grid Cap of Tube	Grid Clip	Ant.	Ant. Lead	Chassis
R-74, 76, 77	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Chassis
R-78	2. Term. Board	Term. 7 (Open Link)	Term. 8	Term. 1	Term. 2	Chassis
Rad. 80	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Bind. Post	Chassis
Rad. 82	2. Term. Board	Term. 2 (Open Link)	Term. 3 (Tie-in Term. 1 to Term. 3)	Term. 1	Term. 3	Term. 3
R-90, 260, 261	4. Adaptor	Det. Cathode	Cathode Socket Contact	Osc. Cathode *	Osc. Cathode Socket Contact	Chassis
110, 111, 115, 210	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead or Bind. Post	Cathode Socket Contact
114	4. Adaptor	Det. Cathode	Cathode Socket Contact	Ant.	Ant. Lead	Det. Cathode (Yellow)
120, 124, 220	3. Grid Clip	Grid Cap of Tube	Grid Clip	Ant.	Ant. Lead on Bind. Post	Chassis
121, 122, 221	3. Grid Clip	Grid Cap of Tube	Grid Clip	Ant.	Ant. Lead on Bind. Post	Chassis
140, 141, 240	2. Term. Board	Term. 3	Tape	Term. 1	Term. 2	Term. 1
280	4. Adaptor	Det. Cathode	Cathode Socket Contact	Osc. Cathode *	Osc. Cathode Socket Cont.	Chassis

*Use a second adaptor.



110 Volt—60 Cycle

220 Volt—50 Cycle

110 Volt—50 Cycle

110 Volt—25 Cycle

Figure 6—Motor Wiring Connections

PHONOGRAPH MOTOR SERVICE DATA

The synchronous motor used in this instrument is of simple design and fool-proof construction. Among its many features are low power consumption, single moving part, ease of starting, oilless main bearing, resilient bumper, and long life with freedom from service repairs.

Figure 7 shows the main parts of the motor and the points that may require attention.

Operation:

The two stator coils are connected as shown in Figure 2 and the motor is started by giving it a clockwise spin with the hand. If it is found to be difficult of starting, or if it runs at a sub-synchronous speed such as at 70 R.P.M., such action may result from one of the following causes:

Difficult to Start—This may be due to the stator failing to rotate on the outer bearing. This can be caused by the lug being bent and rubbing in the slot, or sticking to the resilient bumper. The outer bearing not being properly lubricated may also cause this condition. It is important that the ball bearing be at the bottom of the main bearing assembly.

Slow Speed—If the turntable is jarred or slowed down, the motor may run at a sub-synchronous speed, such as 70 R.P.M. This is remedied by merely lifting the tone arm from the turntable, thereby removing the load. The turntable speed will then immediately increase to normal.

Excessive Vibration and Hum:

A small amount of hum when starting, decreasing to a negligible amount while running, is normal. If excessive vibration occurs either at starting or running, it may be due to one of the following:

(1) Insufficient lubricant in outer bearing or any other failure that will cause the stator to bind.

(2) Metal washer not above the leather washer at the bottom of the main bearing.

(3) Motor not properly supported from motor board. Unless the motor is properly supported from the motor board, normal vibration will be excessive.

Removing Rotor from Stator:

The rotor which includes the turntable may be removed by loosening the screw shown in Figure 7 until it clears the rotor and then lifting the turntable. Be careful not to lose the ball end-bearing when this is removed. After replacing the rotor, tighten the retaining screw securely to eliminate the possibility of rattle in operation.

Power Consumption:

The motor consumes 4 watts. It should never be turned on when the rotor is removed, as in this condition excessive current will be drawn with consequent increase in temperature.

Note—The above values of power consumption are average for a 60-cycle motor at 125 volts. At lower voltages the power consumption will be less.

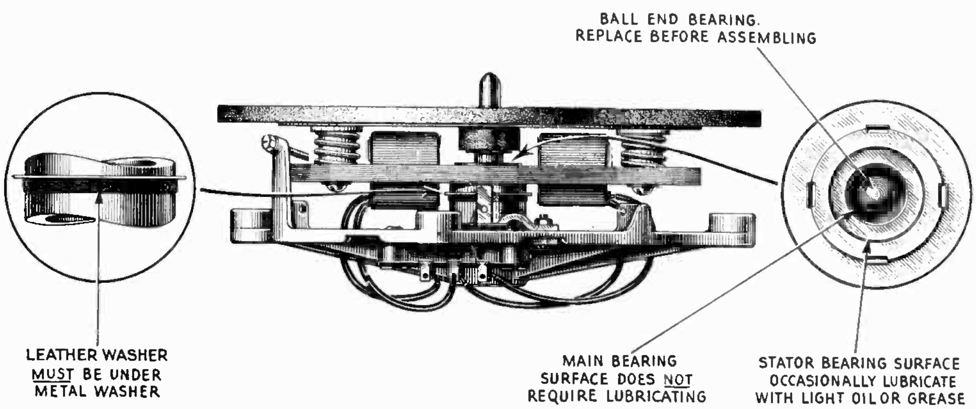


Figure 7—Details of Motor

PICKUP UNIT SERVICE DATA

The magnetic pickup and tone arm assembly of this instrument is of new design and unique construction. Service work will consist of centering the armature and replacing the rubber pivots, damping block and replacing the magnet coil.

Disassembling the Pickup:

The pickup may be disassembled in the following manner:

(a) Unsolder the two cable connections to the terminal strip.

(b) Remove the needle screw and screws "A" and "B."

(c) Remove the pickup assembly from the arm and housing.

(d) Unsolder the two magnet coil leads attached to the terminals and then remove screw E. This will allow the removal of the terminal board.

(e) If centering the pickup armature is the only adjustment required, such centering can be done without removing the terminal board indicated in (d). The armature is centered by loosening screw F, accessible through the hole shown, and holding the armature with the finger in proper position while screw F is tightened. "Feeling" the armature while deflecting it between its two extremes is the best manner of ascertaining proper centering. When centering, after work has been done or the magnet removed, it is important that the magnet be remagnetized while in place.

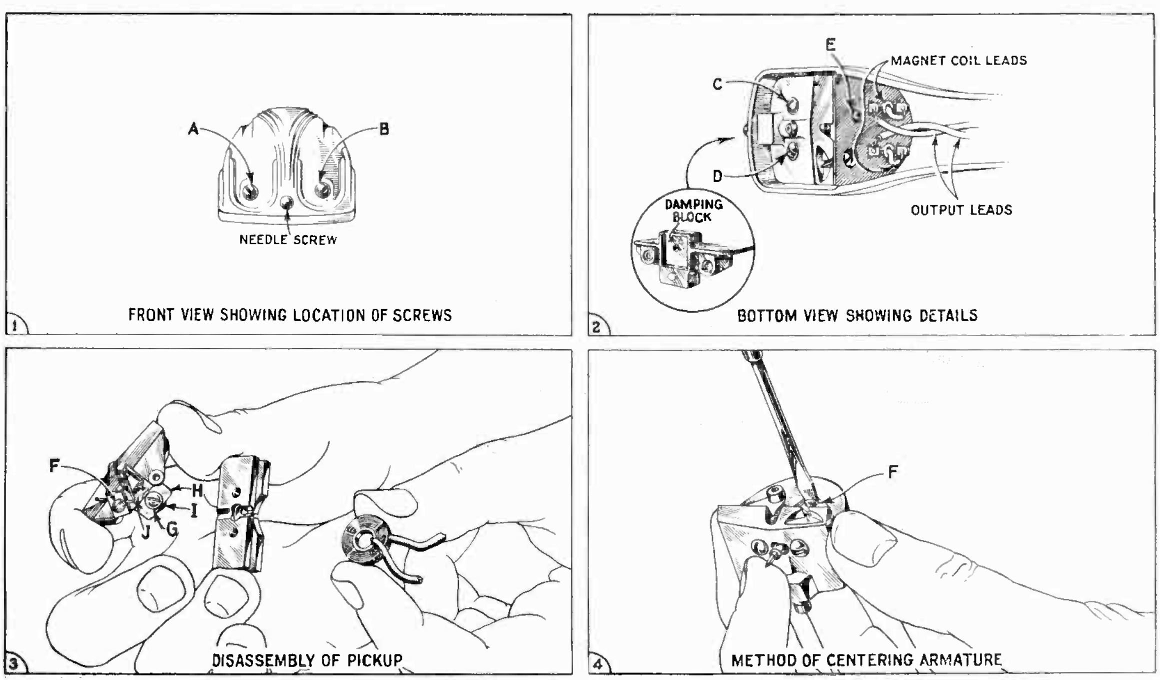
(f) If the coil or pivot rubbers are to be replaced, the pickup must be further disassembled. This is done by removing the magnet and then removing screws C and D. The pole piece may now be removed and the old coil and sleeve disassembled. Acetone will be found helpful for dissolving the old cement that holds the coil in place. The new coil, with its sleeve, may now be replaced and cemented in a similar position to that occupied by the old coil. Duco household or Ambroid cement may be used to hold the coil in place. Be careful to center the coil with its paper sleeve before cementing. Only rosin core solder should be used for soldering the coil leads in the pickup.

(g) The pivot rubbers are replaced by loosening the armature adjusting screw F and removing screw G, clamp H and washer I and removing the armature from its bracket. Damping block J must be removed from the armature. After putting the new pivot rubbers in place, a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block. The rubbers can then be removed by slipping them from each end of the pivot shaft.

Replacing the Damping Block

If it is desired to replace the damping block, it may be done in the following manner:

(a) Disassemble the pickup as described under the preceding section.



1 FRONT VIEW SHOWING LOCATION OF SCREWS

2 BOTTOM VIEW SHOWING DETAILS

3 DISASSEMBLY OF PICKUP

4 METHOD OF CENTERING ARMATURE

Figure 8—Details of Pickup Assembly

(b) Remove the damping block from the armature and clean the armature shaft with emery paper.

(c) Insert the armature through the new block so that it occupies the same position as that of the old. Also ascertain that the block is in correct vertical alignment with the armature. It will be noted that the hole in the damping block is somewhat smaller than the shaft diameter. This is done so that a snug fit will be obtained.

(d) After properly locating the damping block, a soldering iron should be applied to the armature so that the block will melt slightly at its point of contact with the armature. A special tip, constructed as shown in Figure 9, will prove desirable for fusing the block in place. The iron should be applied only long enough to melt the block sufficiently to cause a small bulge on each side, and must be removed before any bubbling occurs. The pickup should then be reassembled.

It is important to remember that in all operations after reassembling but before placing in the tone arm,

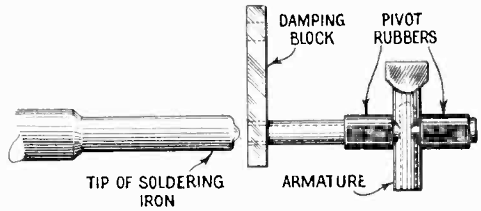


Figure 9—Replacing Damping Block

the pickup should be magnetized and the armature centered after remagnetizing. Magnetizing should be done by placing the pickup magnet on the magnetizer and sliding it onto the pole pieces, after magnetizing being careful not to break the magnetic circuit.

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	MOTOR ASSEMBLIES	
10194	Ball—Steel ball bearing—Package of 20	$0.25
7657	Base—Motor base and bearing assembly—50–60 cycle—105–125/200–250 volt operation	1.20
9523	Base—Motor base and bearing assembly—25 cycle operation	1.20
9519	Coil—Stator assembly—Comprising coil and laminations—105-125 volt, 60 cycle operation	2.50
9521	Coil—Stator assembly—Comprising coil and laminations—105-125 volt, 50 cycle operation	2.35
9524	Coil—Stator assembly—Comprising coil and laminations—105-125 volt, 25 cycle operation	2.25
9529	Coil—Stator coil assembly—Comprising coil and laminations—50 cycle, 200–250 volt operation	2.50
9515	Motor—105–125 volts—60 cycle motor	8.80
9516	Motor—105–125 volts—50 cycle motor	8.42
9517	Motor—105–125 volts—25 cycle motor	9.00
9528	Motor—200–250 volts—50 cycle motor	9.60
4456	Motor accessories—Comprising 3 nuts, 1 shield and 1 screw	.10
3813	Motor suspension assembly—Comprising one screw, one metal bushing, two rubber bushings, one flat washer, one lockwasher and one nut—Package of 3	.56
4457	Spring, screw and washer assembly—Used to mount rotor laminations to turntable—Comprising 3 springs, 3 screws and 9 washers	.15
9520	Turntable — Turntable assembly complete with rotor laminations—60 cycle operation	4.45
9525	Turntable — Turntable assembly complete with rotor laminations—25 cycle operation	4.85
9522	Turntable — Turntable assembly complete with rotor laminations—105–125/200–250 volt—50 cycle operation	$4.25
4083	Washer—Leather washer—Package of 10	.20
4084	Washer—Metal washer—Package of 10	.26
	PICKUP AND ARM ASSEMBLIES	
3812	Armature—Pickup armature	.32
4462	Cable—Pickup cable	.20
3810	Coil—Pickup coil	.32
4543	Damper — Damper block complete with damper clamp, washer	.10
4503	Pickup and arm assembly complete	4.95
3811	Screw—Needle holding screw—Package of 10	.46
	CABINET ASSEMBLIES	
X-249	Bottom—Lower section of wood cabinet	2.95
X-248	Cover—Top half of wood cabinet	3.00
	MISCELLANEOUS ASSEMBLIES	
4611	Adaptor—Five-prong split cathode adaptor	1.00
4612	Adaptor—Six-prong split cathode adaptor	1.00
4461	Cable — 5-conductor—Radio-Record switch cable	.28
4459	Bracket—Volume control mounting bracket	.10
4463	Foot—Felt foot for bottom cover—Package of 10	.20
3829	Knob—Radio-Record switch knob—Package of 5	1.10
3961	Knob—Volume control knob—Package of 5	.60
4458	Post—Binding post—Package of 10	2.50
4507	Rest—Pickup rest—Package of 5	.60
4119	Screw—No. 8-32-¼-inch headless set screw for knob—Package of 20	.38
4460	Switch—Radio-Record switch	.40
4502	Volume control (R1)	1.16

Instructions for

RCA Victor 102

Four-Tube, 115-Volt AC/DC (Universal) Receiver

INSTALLATION

Location—The receiver should be located so that its power cord is within reach of an electrical outlet or lamp socket. Because of its light weight and small size, the instrument may be mounted upon a convenient shelf or upon an article of furniture (such as a piano or end-table) if desired. In any installation, however, care should be taken to avoid restriction of natural ventilation as would occur with the set resting upon or placed close to a radiator or other heating device.

Antenna—The proper length of antenna for use with the receiver should be determined by trial in each installation. In general, it is advisable always to use the shortest length which provides the desired signal pickup. The attached antenna (flexible black lead approximately 20 feet in length) when fully extended will provide satisfactory pickup in the majority of installations. In many cases, improved selectivity will be obtained by recoiling a portion of the lead.

Improved pickup for distant reception may be obtained by connecting the end of the antenna wire to a piping system (water, gas or heating), to a large-area conducting surface or to an external antenna system of from 25 to 75 feet in length. If the receiver is installed in a building of metallic construction, the shielding effect of that structure will greatly impede the passage of radio waves; hence, far better results ordinarily will be obtained with the attached wire either dropped out of a nearby window or connected to an outdoor antenna.

Power Supply—Connect the power cord to an electrical outlet upon which is impressed a supply voltage (either A. C.—alternating current or D. C.—direct current) between the limits specified on the rating label attached to the bottom of the cabinet. Never operate the instrument from any voltage exceeding the maximum limit (125 volts). Consult your local power company if you are in doubt as to the actual voltage available.

> NOTE—The power cord is of special construction and should not be shortened, tampered with, bent sharply or replaced with standard cord. It is normal for this cord to become slightly warm during operation of the receiver. If, at any time, the receiver fails to operate and the cord does not become properly warm, return the complete instrument to your dealer for installation of a new cord of the same type.

Tubes—The instrument is equipped and tested at the factory with RCA Radiotrons and is shipped with the tubes in their sockets. The set therefore is ready to operate when it is removed from the carton and external connections are made as heretofore described.

If, when first installed, the receiver either performs imperfectly or fails to operate, it is probable that one or more of the tubes or dome terminal (grid) clips have been jarred loose in shipment. Remove the cabinet rear panel (held in place by screws at the edges), then refer to the tube location diagram printed on the rating label and make certain that all tubes are pressed down firmly in their respective sockets and that the three grid clips are tightly attached to the dome terminals of the proper tubes.

OPERATION

Two operating controls only are used, both appearing upon the cabinet front panel. The left-hand knob is a combined volume control and power switch and the knob at the right is the station selector. The instrument should be operated as follows:

1. Apply power to the receiver by turning the left-hand knob clockwise from the "off" position of the switch. A definite "snap" should be heard at first, further rotation of the knob serving to increase the volume as required.

2. Allow approximately 30 seconds for the tube filaments to heat. Then, with the volume control fully advanced, proceed to rotate the station selector slowly until a signal is heard. Stations in the standard broadcast band (540–1500 kilocycles) will be received between dial settings of "100" and "10," approximately; police calls transmitted at frequencies up to 1712 kilocycles will be received near the "0" end of the scale.

> IMPORTANT: When operating from a D. C. power supply, reception will be possible only with the connector plug inserted in that position which provides the correct polarity to the set. If no sound is heard from the loudspeaker (signal or static interference), reverse the position of the connector plug in the outlet and repeat the above procedure.

3. Upon receiving a signal, reduce the volume level if necessary and then adjust the station selector (for best reproduction) to a position midway between the points where the signal disappears.

> NOTE—When tuned to a strong local station with the volume control fully advanced, a condition may be observed where a certain amount of counter-clockwise rotation of the control will improve the quality of reproduction and actually increase the volume. This condition is caused by "overloading" and may be corrected simply by setting the volume control below the readily-apparent critical point.

4. When through operating, turn the power "off" by rotating the volume control counter-clockwise until the "snap" of the power switch is heard.

CAUTION: DISCONNECT INSTRUMENT FROM POWER SUPPLY BEFORE TOUCHING CHASSIS, TUBES OR METAL PARTS INSIDE CABINET.

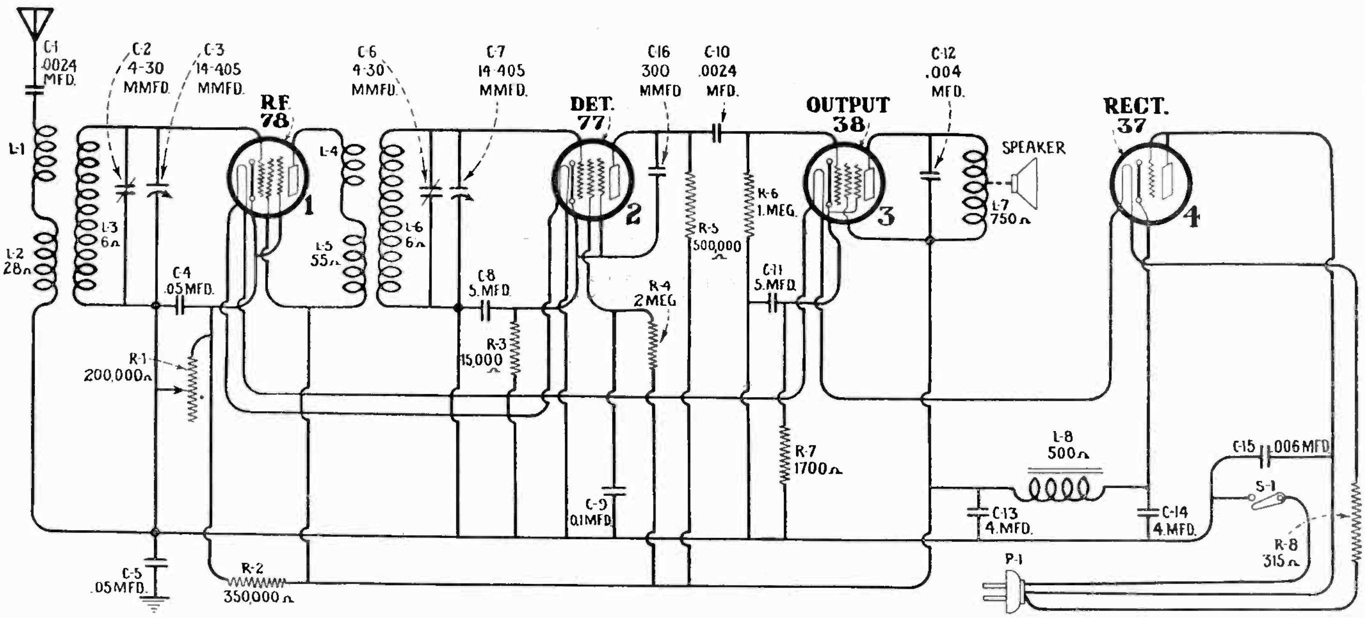


Figure A—Schematic Circuit Diagram

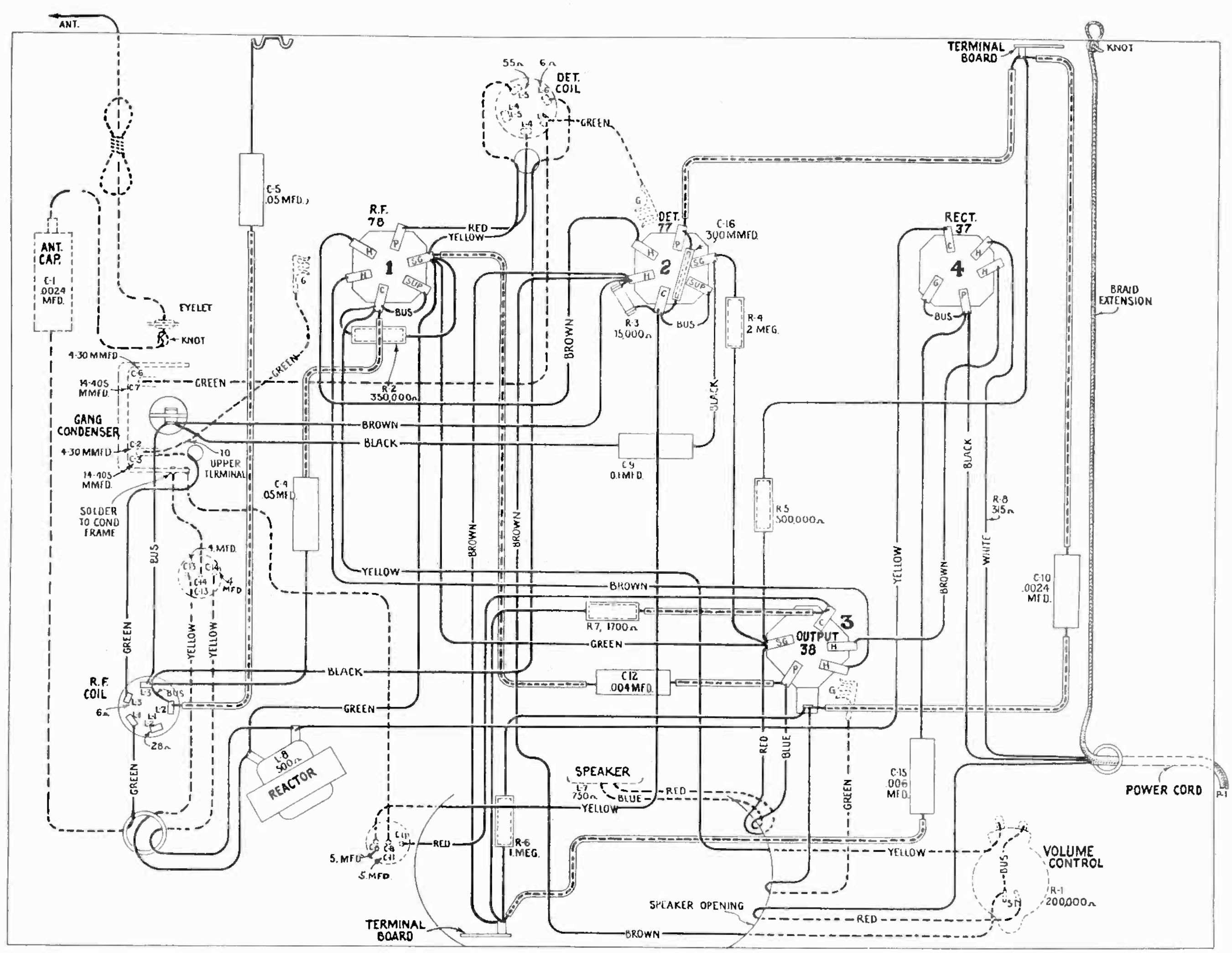


Figure B—Wiring Diagram

.0775

SERVICE DATA

Electrical Specifications

Voltage Rating. . 105–120 Volts, 25–133 Cycles A. C. or D. C.
Power Consumption . . . . .40 Watts
Frequency Range . . . . .540 K. C.–1712 K. C.
Type and Number of Radiotrons—
1 RCA-77, 1 RCA-37, 1 RCA-38, 1 RCA-78—Total 4
Undistorted Output . . . . .0.18 Watts

This receiver is an A. C.–D. C. table model tuned R. F. broadcast receiver. Features such as universal operation on both A. C. and D. C., wide tuning range, excellent performance and compact construction characterize this instrument. Figures A and B show the schematic and wiring diagrams respectively. The voltage readings and replacement parts are given below.

The receiver is aligned at 1400 K. C. by means of the two trimmer capacitors located on the main tuning capacitor. The proper alignment is made by adjusting the trimmers for maximum output after tuning in a 1400 K. C. signal. This adjustment should be made when they are near their extreme minimum position. After alignment a check to make sure that a 1712 K. C. signal can be heard when the main tuning capacitor is near its extreme minimum position should be made. Stock No. 9050 Test Oscillator and Stock No. 7065 non-metallic screwdriver are desirable for making this adjustment.

RADIOTRON SOCKET VOLTAGES

Measured at Maximum Volume—115 Volt A. C. Line
All Voltages on D. C. will be slightly lower

Radiotron No.	Cathode or Filament to Control Grid Volts	Cathode or Filament to Screen Grid, Volts	Cathode or Filament to Plate, Volts	Plate Current M. A.	Filament or Heater Volts
1. RCA-78 R. F.	2.5	105	105	7.0	6.0
2. RCA-77 Det.	*2.0	17.0*	*40	0.1	6.0
3. RCA-38 Output	10.0	100	95	5.5	6.0
4. RCA-37 Rect.	—	—	115 RMS	16.0	6.0

* Impossible to measure on ordinary voltmeter.
Note—Above voltages will be approximately 5% lower on 115 volts D. C. except for heater voltages which will be the same.

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
	CHASSIS ASSEMBLIES	
2747	Cap—Contact Cap—Package of 5	$0.50
3048	Resistor—500,000 ohms—Carbon type—½ watt (R5)—Package of 5	1.00
3076	Resistor—1 megohm—Carbon type—½ watt (R6)—Package of 5	1.00
3537	Reactor—Filter reactor (L8)	1.10
3542	Volume control (R1, S1)	1.18
3713	Capacitor—0.05 mfd. (C4, C5)	.32
3860	Socket—5-contact Radiotron socket	.32
3932	Capacitor—2400 mmfd. (C10)	.30
3998	Resistor—15,000 ohms—Carbon type—¼ watt (R3)—Package of 5	1.00
4007	Capacitor—2400 mmfd. (C1)	.35
4046	Resistor—2 megohm—Carbon type—½ watt (R4)—Package of 5	1.00
4068	Lead—Antenna lead	.30
4069	Capacitor—0.1 mfd. (C9)	.36
4070	Capacitor—0.004 mfd. (C12)	.42
4071	Capacitor—0.006 mfd. (C15)	.42
4072	Capacitor—300 mmfd. (C16)	.26
4073	Resistor—350,000 ohms—Carbon type—½ watt (R2)—Package of 5	1.00
4074	Resistor—1700 ohms—Carbon type—1 watt (R7)—Package of 5	1.10
6819	Cord—Power cord—315 ohms (R8, P1)	$1.00
6820	Coil—RF coil (L1, L2, L3)	.86
6821	Coil—Detector coil (L4, L5, L6)	.96
6822	Condenser—2-gang variable tuning condenser (C2, C3, C6, C7)	2.34
6823	Capacitor—Two 4. mfd. capacitors (C13, C14)	1.14
6824	Capacitor—Two 5. mfd. capacitors (C8, C11)	.94
7485	Socket—6-contact Radiotron socket	.40
	REPRODUCER ASSEMBLIES	
7712	Support—Cone support	.50
7713	Mechanism—Speaker mechanism complete (L7)	3.72
9470	Reproducer—Complete	4.62
9471	Cone—Speaker cone—Package of 5	3.50
	MISCELLANEOUS PARTS	
4076	Escutcheon—Volume control escutcheon—Package of 2	.26
4077	Escutcheon—Station selector escutcheon—Package of 2	.26
4078	Knob—Station selector knob—Package of 5	.75
4079	Foot—Rubber foot—Package of 4	.22
4096	Knob—Volume control knob—Package of 5	.75

RCA Victor M-105

Automobile Receiver

Superheterodyne

INSTRUCTIONS

RCA Victor Company, Inc.

CAMDEN, N. J., U. S. A.

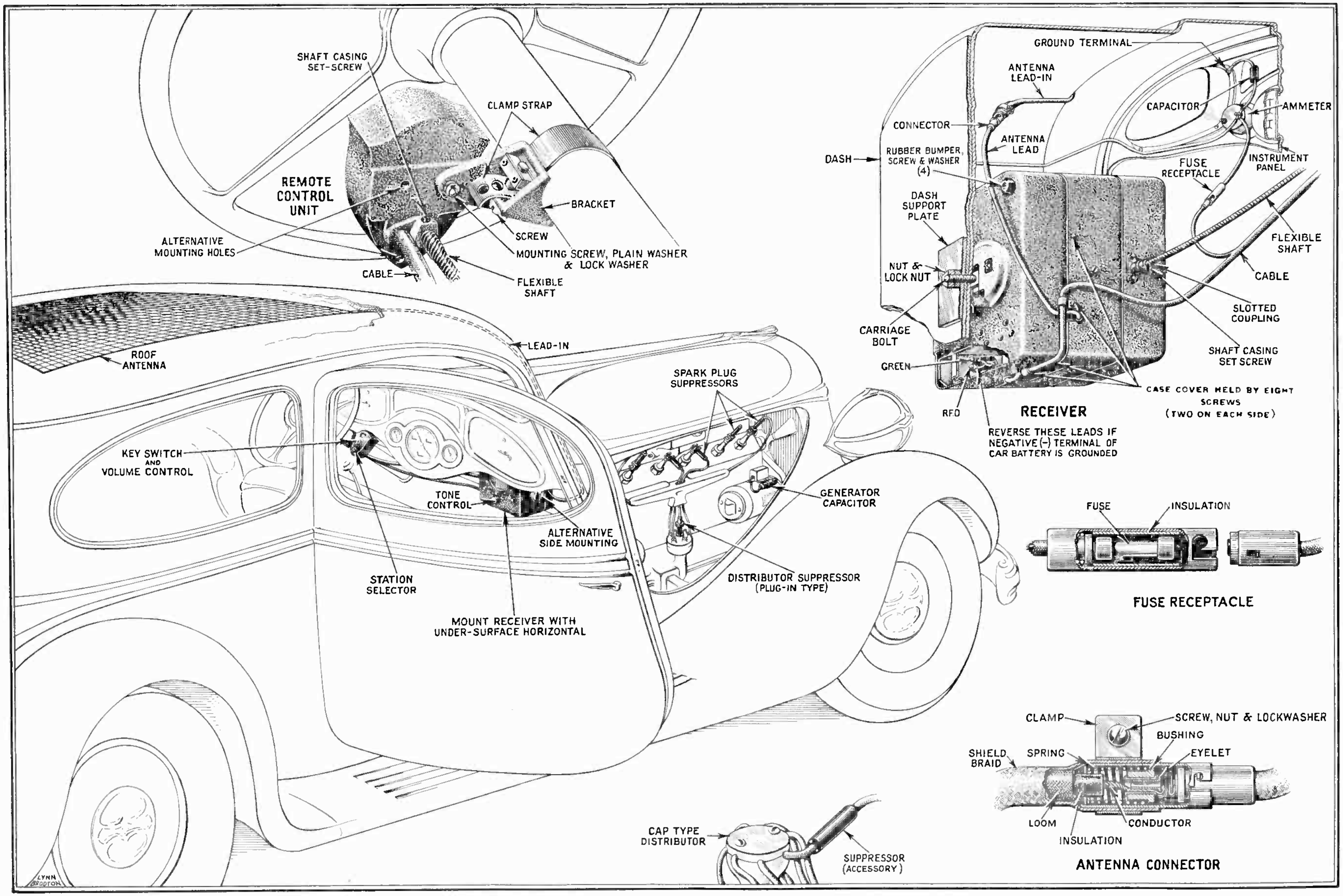

SHAFT CASING SET-SCREW
CLAMP STRAP
REMOTE CONTROL UNIT
BRACKET
ALTERNATIVE MOUNTING HOLES
SCREW
MOUNTING SCREW, PLAIN WASHER & LOCK WASHER
CABLE
FLEXIBLE SHAFT
ROOF ANTENNA
LEAD-IN
SPARK PLUG SUPPRESSORS
KEY SWITCH AND VOLUME CONTROL
TONE CONTROL
ALTERNATIVE SIDE MOUNTING
GENERATOR CAPACITOR
STATION SELECTOR
DISTRIBUTOR SUPPRESSOR (PLUG-IN TYPE)
MOUNT RECEIVER WITH UNDER-SURFACE HORIZONTAL
CAP TYPE DISTRIBUTOR
SUPPRESSOR (ACCESSORY)
GROUND TERMINAL
ANTENNA LEAD-IN
CAPACITOR
AMMETER
CONNECTOR
ANTENNA LEAD
DASH
RUBBER BUMPER, SCREW & WASHER (4)
FUSE RECEPTACLE
INSTRUMENT PANEL
DASH SUPPORT PLATE
FLEXIBLE SHAFT
NUT & LOCK NUT
CABLE
SLOTTED COUPLING
CARRIAGE BOLT
SHAFT CASING SET SCREW
GREEN
CASE COVER HELD BY EIGHT SCREWS (TWO ON EACH SIDE)
RFD
RECEIVER
REVERSE THESE LEADS IF NEGATIVE (-) TERMINAL OF CAR BATTERY IS GROUNDED
FUSE
INSULATION
FUSE RECEPTACLE
CLAMP
SCREW, NUT & LOCKWASHER
BUSHING
SHIELD BRAID
SPRING
EYELET
LOOM
CONDUCTOR
INSULATION
ANTENNA CONNECTOR

Figure 1

Instructions for

RCA Victor M-105

Automobile Receiver

INTRODUCTION

Mechanical simplicity and high-quality performance are keynotes of this automobile radio receiver. The instrument consists of a superheterodyne chassis, a loudspeaker, and a vibrator-type "B" battery eliminator mounted in a single case. It is operated from the car storage battery.

A remote control unit, mounted on the steering column and connected to the receiver through a flexible shaft and cable, places all controls convenient to the driver. This unit contains the station selector control, a glare-proof illuminated dial (calibrated in station channels) and a combined volume control and "key-lock" power switch.

Equipment for the suppression of ignition interference is provided. The use of a roof (built-in or interior type) antenna is recommended.

PART I—INSTALLATION

Procedure

1. Unpack the set from carton and check equipment. (See "**Equipment Furnished**"—page 4.)
2. CHECK POLARITY OF AUTOMOBILE STORAGE BATTERY SUPPLY. If the negative (—) side is grounded to car frame, remove case cover and make changes to chassis connections shown in Figure 1. *Do not disturb these connections if positive* (+) *side is grounded.* (See details under "**Mounting of Units**"—page 5.) Replace case cover.
3. Determine most satisfactory mounting position (see details under "**Location of Units**"—page 4), spot mounting-bolt location and drill ½" diameter hole. Insert bolt through dash and assemble support plate and nuts on engine side. Install the four rubber bumpers on side of case chosen for mounting, then hang receiver over bolt head and tighten nuts. (See Figure 1 and details under "**Mounting of Units**"—page 5.)
4. Attach remote control unit to steering column by means of mounting bracket and strap. (See Figure 1 and details under "**Mounting of Units**"—page 5.)
5. Assemble flexible shaft to receiver and remote control unit. (See Figure 1 and details under "**Mounting of Units**"—page 6.) *Make sure that the set-screws are tightened firmly against both ends of shaft casing.*
6. Connect metal-shielded lead from receiver to antenna by means of coupling connector. (See notes on antennas under "**Location of Units**"—pages 4 and 5—and details of lead-in under "**Connections**"—pages 6 and 7.)
7. Connect terminal at end of *black* lead from cable to binding-post of automobile ammeter (see Figure 1 and details under "**Connections**"—page 7). The ignition by-pass capacitor (equipped with two leads) should be installed at this time. (See Figure 1 and paragraph 4 under "**Suppression of Ignition Interference**"—page 7.)
8. Install spark-plug and distributor suppressors; also generator by-pass capacitor (see Figure 1 and paragraphs 1, 2 and 3 under "**Suppression of Ignition Interference**"—page 7).
9. Push knob over shaft protruding through front of remote control unit. Observing the dial scale, rotate knob slowly—first to stop position slightly beyond "150" and then reverse to other stop position slightly beyond "55."
10. Insert key in lock on remote control unit and turn to extreme clockwise position. Dial should become illuminated immediately but the tubes will not reach proper operating temperature until after approximately 45 seconds. (See details under "**PART II—OPERATION**" and "**PART III—MAINTENANCE.**")

Equipment

A. Equipment Furnished:

1. *Receiver Package*—Includes the receiver and remote control units joined by the wiring cable:

(a) The receiver contains one each of the following Radiotrons installed in sockets: RCA-78, RCA-6A7, RCA-6B7, RCA-41.

(b) The remote control unit contains one dial lamp (6–8 volts).

(c) The wiring cable includes one fuse (20 amperes) installed in attached fuse receptacle.

2. *Outfit Package*—Containing:

(a) Flexible shaft (33⅞ inches long).

(b) Receiver unit mounting bolt (7/16 inch diameter), dash support plate, and nuts (2).

(c) Self-tapping screws, washers and rubber bumpers (4 each).

(d) Steering column bracket for remote control unit with strap, screws (2), plain washer (1) and lockwasher (1).

(e) Shield clamp for antenna lead-in wire with screw (1), lockwasher (1) and nut (1).

(f) Key (1) and knob (1) for remote control unit and eyelets (2) for antenna connector packed in small envelope.

(g) Ignition Interference Suppression Equipment:

6 Spark plug type suppressors (additional obtainable from your dealer).

1 Distributor type suppressor.

2 Capacitors.

(h) Instruction Book.

B. Additional Equipment Required:

1. *Antenna*—One of the following types:

(a) Roof (built-in) type—recommended.

(b) Roof (interior) type for attachment to head-lining inside car—also recommended. A special antenna of this type complete with pin-hooks and lead-in wire may be purchased from your dealer.

(c) Plate (sub-mounted) type for attachment to channel members of car chassis—alternative. An efficient plate antenna completely equipped for mounting and a specially-designed shielded lead-in wire also are obtainable from the dealer.

Location of Units

Receiver and Remote Control Units—The arrangement of units shown in Figure 1 is recommended and will be found applicable to the majority of automobiles. Consideration should be given to the possibility of interference of the receiver with other equipment beneath the instrument panel or of the mounting bolt with apparatus on the engine side of the dash. By placing the receiver unit toward the right-hand side of the dash, the flexible shaft will be of correct length as furnished in practically all cases. This position, however, may be considered impractical because of its universal preference for heating devices, necessitating installation of the receiver unit either near the center or at the extreme left-hand side of the dash and the use of a shorter flexible shaft. In such cases, the shaft may be either shortened (as described under "Mounting of Units") or exchanged for one of proper length by the dealer.

NOTE—Two support brackets are attached to the receiver case, one on the rear surface and the other on the right-hand side viewing the loudspeaker opening. The side bracket must be used when the unit is mounted at the extreme left-hand end of the dash in order to avoid sharp bends in the flexible shaft and resultant unsatisfactory operation.

As furnished, the remote control unit is equipped for attachment to the steering column of the car. Its clamp bracket is so designed that the driver may select from a wide variety of possible mounting positions for maximum accessibility. The associated bracket strap will be found to accommodate practically any diameter steering column. If considered desirable, however, the remote control unit may be supported upon the instrument panel by means of an accessory bracket procurable from the dealer.

Antenna:

(a) *Roof (Built-in) Type*—Best results will be obtained by use of a built-in roof antenna. The majority of modern automobiles (closed body types only) are already equipped with such an antenna installed at the factory, the lead-in wire from which will usually be found coiled-up beneath the instrument panel. Many other earlier cars employ a piece of metallic screen—for top material support—which, if ungrounded (not in electrical contact with the metallic frame), may be readily utilized as an antenna.

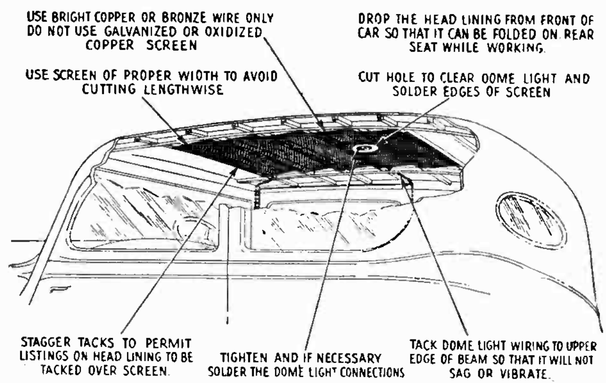


Figure 2

NOTE—The presence of a top support screen and of grounds in that screen may be determined without removing any portion of the inside fabric (head-lining). First procure any sharp-pointed metallic tool, push the point through the fabric (at several points if necessary) and feel around in an attempt to scrape the screen surface—being careful not to puncture the weather-proof top. If a screen is found, connect an ordinary dash or head-lamp between either terminal of the automobile ammeter and the tool, re-insert the tool through the head-lining and make contact with the screen. If the lamp lights, however dimly, it shall be assumed that the screen is grounded.

In order to use an ungrounded support screen, first release the head-lining at the front corner nearest the receiver. Then connect a flexible rubber-insulated lead to the corner of the screen and solder the joint. Feed the free end of the lead down the adjacent pillar-post of the car into the driving compartment and replace the head-lining.

If the top support screen is grounded, or if no screen is present, it will be necessary to drop the entire head-lining (see Figure 2). In the former case, the screen may be insulated by removal of a strip several inches from all edges and from the dome light fixture. The possibility of subsequent shifting may be eliminated by tacking the screen to one or more of the ribs and by lacing the sides with cord. Where no support screen is used, a copper screen having a total area of at least ten square feet should be inserted. It should be located as far to the rear as possible and insulated from all metallic parts grounded to the frame of the car. The antenna finally should be tested for grounds (see the foregoing "NOTE" for test procedure). If satisfactory, attach the lead-in wire and replace the head-lining of the car.

> NOTE—Since a degree of skill—only acquired by experience—is necessary in removing and replacing the top fabric material, such work should be allotted to a competent "trim" man.

(b) *Roof (Interior) Type*—The accessory interior-type roof antenna also will provide very satisfactory performance and, in addition, is extremely simple to install. It may be quickly attached to the head-lining inside the car (preferably as far to the rear as possible) by means of pin-hooks, thereby precluding removal of the fabric. An antenna of this type, however, should not be used in any automobile having a *grounded* top material support screen since the proximity of that screen would seriously reduce its efficiency. Before purchase, therefore, it will be advisable to check this possibility, following the test procedure described under "*Roof (Built-in) Type.*"

As furnished, the interior-type antenna is equipped with a sufficient length of lead-in wire ready-attached. The effective antenna wire is enclosed by long-wearing paper procurable either in "gray" or "tan" finish as desired to harmonize with the car upholstery.

(c) *Plate Type*—For those cases where the installation of a built-in roof antenna is considered too costly and the interior roof antenna impractical, good reception from local or semi-distant powerful stations may be procured with the special plate-type antenna also obtainable as an accessory. This unit should be clamped to the frame of the chassis as far to the rear as possible. It is adjustable in length and may be mounted either lengthwise or crosswise of the chassis, which position should be selected with due regard to the prevention of over-crowding. The plate must be placed as close to the ground as possible, but not below the lowest portion of the chassis at the desired location, as sufficient road clearance must be retained. It is also important to avoid any position in which the plate will impede free motion of chassis parts such as springs, drive shaft, or axles in order to prevent damage to the antenna.

Mounting of Units

Details of mounting the various units are shown in Figure 1. The following procedures are recommended:

Receiver Unit—It is necessary first to determine the electrical polarity of the storage battery supply. This may be done most conveniently by making an examination of the battery connections and ascertaining which terminal is grounded (that is, connected to the frame of the car). The positive terminal is usually marked (+) and tends to form corrosion far more rapidly than the negative (—). If the positive terminal is grounded, no change in the electrical connections of the receiver unit will be required. However, if the opposite is true, the cover of the receiver case must be removed and the *red* and *green* leads (attached by spade-type connectors to the two terminals nearest the bottom of the chassis terminal board) shown in Figure 1 must be reversed.

Now replace the case cover and support the assembled unit against the dash in the chosen position. Allowing a clearance of at least two inches above the top surface, where possible, to permit subsequent removal of the case from the mounting bolt head, mark with a pencil or crayon on the dash four points corresponding to the corners of the adjacent case surface. Then determine the exact center of the area bounded by those four points (by drawing diagonal lines between opposite corners) and mark that position with a center-punch. Next drill a ½ inch hole at the center-punch mark and insert the mounting bolt. The support plate and the two nuts then should be assembled upon the bolt from the engine side of the dash as shown but should not be tightened. Attach the four rubber bumpers, by means of the washers and self-tapping screws, at the four small holes on the selected mounting surface of the case. Finally hang the receiver over the bolt head, align sides vertically and tighten the nuts in place.

Remote Control Unit—In attaching the remote control unit to the steering column of the car, it will be advisable first to examine the detailed view (in Figure 1) showing the assembly of its mounting bracket. Four small holes are contained in the associated flexible strap at distances proper for use with steering columns of the most common diameters (1½, 1⅝, 1¾, 1⅞ inches) but the strap length will be found sufficient to permit the insertion of an additional hole if necessary to accommodate a 2 inch column. The proper hole may be determined by wrapping the clamp strap tightly around the column, inserting the machine screw furnished through that hole found to be nearest in alignment with the tapped hole in the clamp bracket. Three tapped holes are provided in the back of the remote control unit, permitting support of that unit either at the right- or left-hand side or above the steering column.

Flexible Shaft—Insert that end of the flexible shaft to which is attached the slotted coupling through the bushed opening in the left side of the receiver unit. Then rotate the shaft from the free end until the coupling slot is felt to engage over the pin contained in the tuning mechanism and slide the shaft forward to the full depth of the slot. With the shaft held in this position, insert the opposite end of the shaft through the bushing at the rear of the remote control unit and push forward until the flatted portion of the shaft protrudes through the front cover. Then proceed to tighten the external set-screw (located at the bottom of the case—see Figure 3) adjusting the shaft position as necessary until the screw is felt to engage in the groove. Tighten the screw fully to the bottom of the slot and then loosen it approximately one-quarter of a turn. Finally, secure the flexible casing in place by tightening the set-screws at each end *firmly*, so as to provide good electrical contact as well as solid mechanical support.

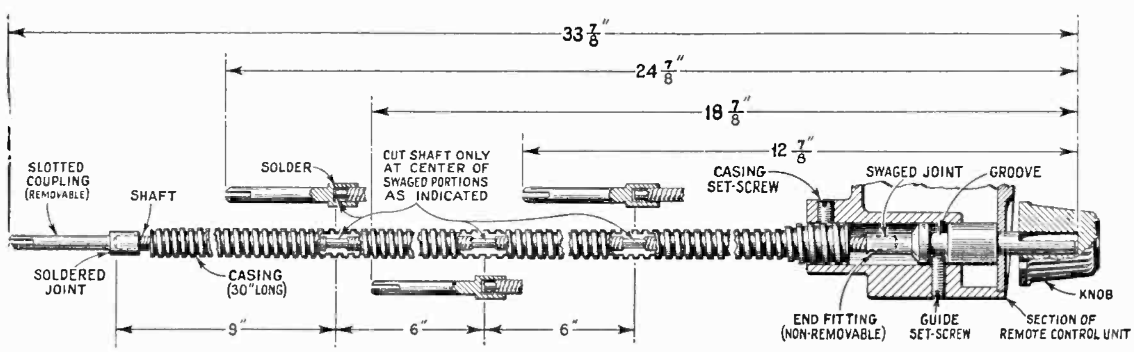


Figure 3

NOTE—In many installations it will be found necessary or desirable to use a flexible shaft of shorter length than 33⅞ inches. While it is simplest to procure a shaft of proper length from the dealer as mentioned heretofore, very little difficulty should be experienced in shortening the original part if deemed expedient. To shorten the shaft, refer to Figure 3 and proceed as follows:

1. Determine the minimum shaft length permissible for the installation.
2. Remove the slotted coupling (using a soldering iron) and withdraw the shaft from its casing.
3. Cut the shaft only at the center of a swaged joint, selecting that joint which allows at least the required length.
4. Cut from the shaft casing a length equal to the amount of shaft removed. (This operation may be simplified by placing the casing between wooden blocks in a vise so that the block ends will serve to guide the hack saw blade.)
5. Replace the shaft in its casing and solder the slotted coupling to the end of the shaft.

Connections

Refer to Figure 1 and make connections as follows:

Antenna to Receiver—For least ignition interference, any portion of the antenna lead-in wire which extends behind the instrument panel or into the engine compartment of the car should be fully shielded and cut to eliminate excessive slack when attached to the receiver antenna connector. Before connecting the antenna to the receiver, the following comments applying to the particular type of antenna adopted should be observed:

(a) *Roof Antenna* (Built-in Type)—The lead-in wire from a factory-installed built-in roof antenna usually is unshielded and often is of insufficient length to reach the receiver. If necessary, an extra length of insulated wire may be spliced to the existing lead-in, in which case the joint must be soldered and wrapped with tape. In general, it will be advisable to shield the exposed length of lead-in wire, procuring for this purpose from your dealer a length of shield braid and an equivalent length of insulating loom (or rubber tubing) sufficient to extend between the end of the lead-in wire and its point of entrance from the body pillar post. Slip the loom over the lead-in wire and the shield braid over the loom.

(b) *Roof Antenna* (*Interior Type*)—If an interior type antenna is used, the lead-in wire should be brought down the outside of that front pillar post nearest the receiver.

(c) *Plate Type Antenna*—With the plate type antenna, the full-shielded end of the special cable should be brought into the automobile driving compartment through a ½ inch hole drilled in the toe-board (if no other opening is available). This end is to be connected to the receiver unit antenna lead (as explained in following paragraphs) and the opposite (unshielded) end then cut off as required to eliminate excessive slack upon connection to the plate. The pigtail extension from the end of the shield must be soldered or bonded to the frame of the car.

Refer to the detailed view of the antenna connector shown in Figure 1 and proceed to attach the lead-in wire (if shielded) as follows: First, cut the end of the lead-in so that the internal insulated wire and loom (if present) are flush with the end of the shield covering and push back the shield approximately 1½ inches. Cut the loom to the end of the shield and then remove sufficient insulation to expose one inch of clean bare-conductor. Now disconnect the female portion of the connector attached to the receiver antenna lead and remove the small internal bushing and spring.

To assemble, slip the bared conductor through the female portion of the connector and then through the spring and bushing, making certain that the insulation enters the end of the connector. Bend over and spread the strands of the conductor against the forward end of the bushing and then force one of the eyelets (packed in small envelope in outfit package) into the bushing to hold the conductor in position. Cut off the ends of the conductor strands approximately 1/8 inch beyond the edge of the eyelet and bend the strands over toward the center of the eyelet. The assembly may be now attached to the receiver portion of the connector and the shield covering on the lead-in wire pushed forward to cover the adjacent end of the female portion. Finally, bond the shield to the connector by means of the small clamp furnished. **No soldering operations are required.**

NOTE—An unshielded lead-in wire (as in the case of the interior-type antenna) may be attached to the antenna connector as described above except that all references to the shield braid and loom may be neglected.

Power Supply to Receiver—The power input lead (*black* wire with fuse receptacle and terminal, extending from the receiver cable) must be connected electrically to the ungrounded side of the car storage battery. This connection preferably may be made at the battery terminal of the ammeter (usually the terminal with only one lead attached—consult wiring diagram in instruction book for automobile) and any slack length remaining should be taped securely behind the instrument panel.

Suppression of Ignition Interference

1. Disconnect all wires from the spark plugs. Fasten one spark plug suppressor to the top of each plug and re-attach the wires to the free ends of the suppressors. These suppressors may be mounted either in line with or at right angles to the plugs (as shown in Figure 1) in order to avoid interference with metallic parts grounded to the engine or frame.

2. If the distributor is of the plug-in type, disconnect the center wire from the head. Plug the distributor suppressor into the distributor head and insert the wire in the free end of the suppressor.

NOTE—For cap-type distributors, exchange the distributor suppressor at your dealer's for one of a special type. Cut the wire leading from the distributor to the coil and screw the suppressor into the end attached to the distributor. Screw the other end of the wire (leading to the coil) into the opposite end of the suppressor.

3. Clamp the generator by-pass capacitor against the generator frame. The screw holding the cut-out ordinarily may be utilized for securing this unit. Connect the capacitor lead to the terminal on the generator side of the cut-out switch. (In some cases, interference will be reduced by connecting the capacitor lead to the opposite side of the cut-out. The most suitable position for this lead must be determined by trial.)

4. The other by-pass capacitor must be connected between the battery terminal of the ammeter and any convenient screw on the instrument panel. In certain cases, interference will be reduced still further by connecting an additional capacitor (obtainable from your dealer) between the battery side of the ignition coil and the car frame.

PART II—OPERATION

The instrument should be operated as follows:

1. Insert the key in the lock on the remote control unit and turn it clockwise to the extremity of its rotation.

NOTE—This key serves to operate both the power switch and the volume control. A slight rotation clockwise will turn the power "on" and the remainder of the range permits adjustment of volume. The dial scale should become illuminated when the power is "on."

2. Rotate the Station Selector knob in either direction until a desirable station program is heard.

NOTE—The dial scale is calibrated in channels to aid in station identification. Add one cipher to the scale marking to obtain the actual frequency in kilocycles.

3. After receiving a signal, turn the Volume Control counter-clockwise until the volume is reduced to a low level. Now, readjust the Station Selector to the position midway between the points where the quality becomes poor or the signal disappears. **This operation insures the best quality of reproduction.**

4. Finally, advance the Volume Control (clockwise) until the desired level is obtained. Except on weak signals, the automatic volume control will maintain the volume substantially at the latter level, thereby precluding further manual adjustments. (Fading of the signal may be experienced in extreme cases, as when passing under bridges or other metallic structures, since such structures almost completely shield the antenna.)

5. Set the Tone Range Switch (located on the front of the receiver unit) for the preferred tone quality. This switch has two positions. In the counter-clockwise position, high-frequency (treble) response and static interference (when present) are decreased.

6. When through operating, turn the key to the "off" position, counter-clockwise. The instrument is then locked by removing the key.

PART III—MAINTENANCE

Noisy or weak reception, or failure to operate, may be due to one of the following causes:

Radiotrons—If the set fails to operate (particularly when first installed), remove the case cover and make certain that all Radiotrons are in the proper sockets and that the control grid clips are pressed down firmly over the respective dome terminals as shown by the diagram printed on the label affixed to the inside of the cover.

The Radiotrons should be tested periodically and replaced if necessary in order to maintain best performance. The efficiency of each Radiotron may be checked by comparison with a new one of the same type in its place. Spare Radiotrons of each type should be kept on hand.

Fuses—This installation is protected by one fuse (rated 20 amperes) which is mounted in the fuse receptacle contained in the power input lead. If the set fails to operate and the dial lamp does not light, this fuse should be removed for examination. If found to be burned out, the wiring should be inspected for short-circuits or grounds and all tubes tested prior to insertion of a new fuse. **The replacement fuse must be of the same ampere rating.**

"B" Battery Eliminator—With the key switch turned to the "on" position, a slight buzz should be noticed to emanate from the receiver. This buzz should be taken as indicative of proper operation of the "B" Battery Eliminator vibrator. Failure to observe this buzz, accompanied by repeated necessary replacement of the fuse, will denote a faulty condition, and, in such cases, the complete receiver should be taken to the dealer for inspection. **Do not attempt to adjust the vibrator yourself!**

Antenna—A properly installed roof antenna of the built-in or interior-type should require no attention. When the plate antenna is employed, the insulator bushings should be cleaned occasionally to prevent grounding.

Ignition System—The ignition system of the car must be kept in good condition. Fouled plugs or plugs with improperly adjusted gaps will affect the operation of the receiver as well as of the automobile. Burned or improperly adjusted breaker points will also impair the performance. It will be advisable to advance the generator charging rate in order to compensate for the additional drain on the car storage battery imposed by this instrument.

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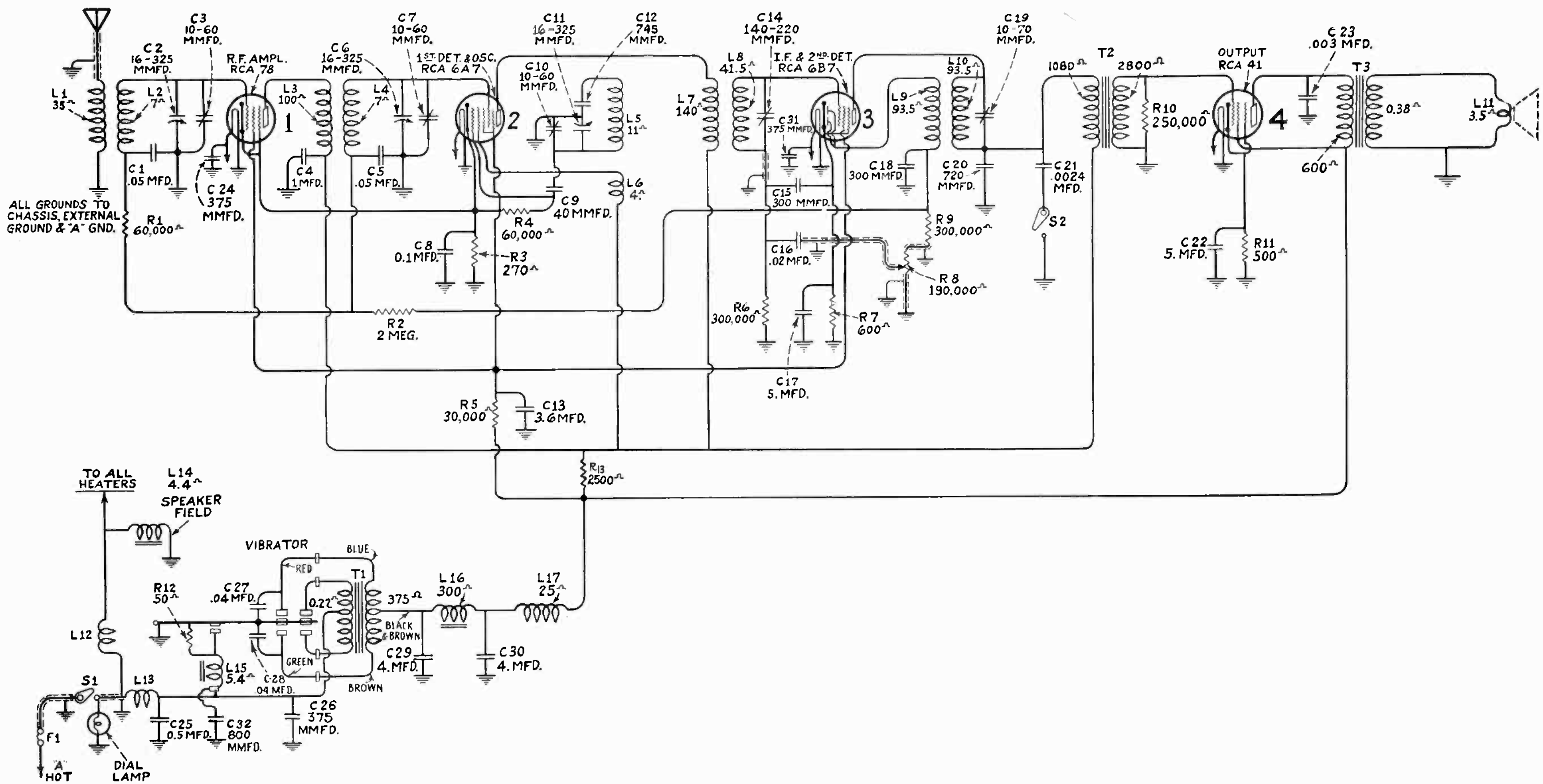

Figure A—Schematic Diagram

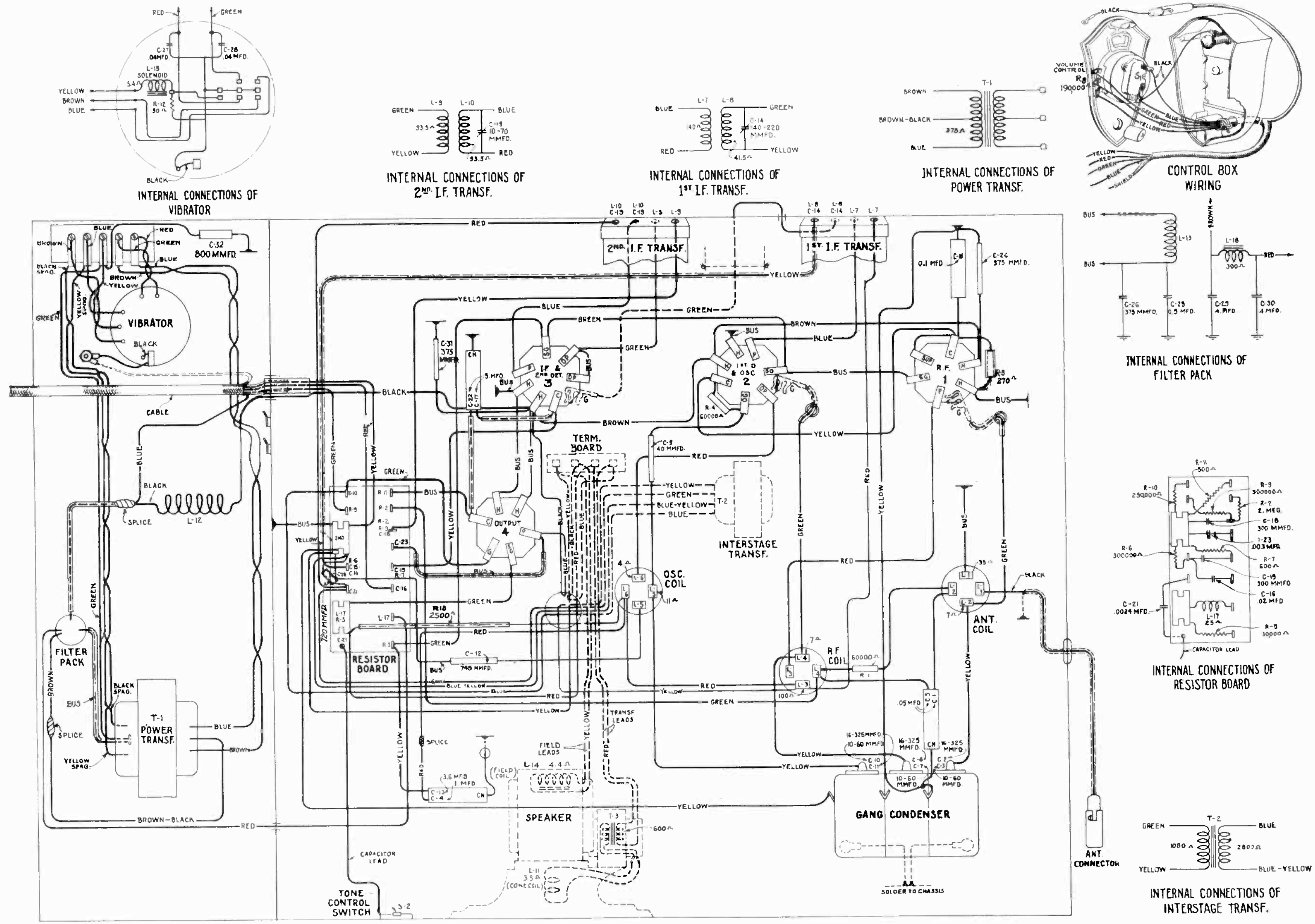

Figure B—Wiring Diagram

PART IV—SERVICE DATA

Type and Number of Radiotrons Used .... 1 RCA-41, 1 RCA-78, 1 RCA-6A7, 1 RCA-6B7—Total, 4

Total Battery Current (With 6.3 volts between chassis and A (hot) terminal) 5.35 Amperes

Undistorted Output .... 1.35 Watts

Loudspeaker Field Current .... 1.35 Amperes

Filtered D. C. Voltage from Rectifier .... 227 Volts

Total Plate Current .... 47.5 M. A.

This four tube Superheterodyne Automobile Receiver is of compact construction and gives excellent performance. Features such as unit construction (one unit contains the receiver, "B" battery eliminator and loudspeaker), ease of installation, freedom from ignition noise and excellent sensitivity, selectivity and tone quality characterize this instrument.

"B" Battery Eliminator

This receiver uses a vibrator-type Inverter-Rectifier that provides a source of direct current voltage for use as plate and grid supply for all Radiotrons. *This unit is accurately adjusted and sealed at the factory and service adjustments should not be attempted.*

Line-up Capacitor Adjustments

The three R. F. line-up capacitors and two I. F. tuning capacitors are accessible and may require adjustments. The R. F. adjustments are made at 1400 K. C. and the I. F. adjustments at 175 K. C. The R. F. adjustments can be made with the receiver in its case, access to the adjusting screws being obtained through a slot in the bottom of the case. For the I. F. adjustments, however, it is necessary to remove the rear cover in order to couple the oscillator to the first detector. The following procedure should be used for these adjustments:

R. F. Adjustment

A satisfactorily accurate and rapid adjustment of the three R. F. line-up capacitors can be made by ear, although, for optimum results, the use of an output meter connected across the loudspeaker voice coil is recommended. The latter method however, involves removal of the rear cover to connect the meter, thus in turn eliminating the shielding effect of the case. Temporary shielding for the bottom and Radiotron sides of the chassis and for the transformer therefore must be provided to prevent vibrator interference.

(a) Procure a modulated oscillator giving a signal at 1400 K. C. and a non-metallic screw driver.

(b) Couple the output of the oscillator from antenna to ground, set the dial at 140, and the oscillator at 1400 K. C.

(c) Place the oscillator and receiver in operation and adjust the oscillator output so that a weak signal is obtained in the loudspeaker when the volume control is at its maximum position.

(d) Then adjust the three line-up capacitors until maximum sound in the speaker or maximum deflection of the output meter is obtained. Readjust these capacitors a second time as there is a slight interlocking of adjustments.

I. F. Adjustments

In order to make the I. F. adjustments, it is necessary to remove the rear cover, due to the fact that the external oscillator must be connected between the control grid of the first detector and ground. Proceed as follows:

(a) Procure a modulated oscillator giving a signal at 175 K. C., a non-metallic screw driver and an output meter.

(b) Remove the receiver from its case, shield the transformer and Radiotrons as described under R. F. adjustments, place the receiver in operation and connect the oscillator output between the first detector grid and ground. Connect the output meter across the voice coil of the loudspeaker. Then connect the antenna lead to ground and adjust the tuning capacitor so that no signal except the I. F. oscillator is heard at maximum volume. With the volume control at maximum, reduce the external oscillator output until a small deflection is obtained. Unless this is done, the action of the A. V. C. will make it impossible to obtain correct adjustments.

(c) Each transformer has but one winding that is tuned by means of an adjustable capacitor, the other windings being untuned. The capacitors should be adjusted for maximum output.

At the time I. F. adjustments are made it is good practice to follow this adjustment with the R. F. adjustments, due to the interlocking that always occurs. The reverse of this, however, is not always true.

Practical Hints on Installation

The following suggestions may prove useful when making installations on the particular cars mentioned.

Chevrolet 1933—Mount chassis on left side, end against car bulkhead and use short flexible shaft. Use both capacitors, one on the ammeter and one on the generator. Use all suppressors. Place a copper screen under the toe board on right side, 10" x 10" to prevent the body from radiating ignition interference which may be picked up by the antenna. This screen must be grounded.

Plymouth 1933—Mount chassis on left side, back against car bulkhead and use 33⅞" flexible shaft. Use both capacitors, one on the ammeter and one on the generator. Use all suppressors.

Ford V-8 1932 or 1933—Mount chassis on left side, end against car frame and use short flexible shaft. Use one capacitor, connected to the generator. Install eight spark plug type suppressors only, no distributor suppressor being necessary.

The majority of cars will be found to be entirely free from ignition noise when the standard equipment is used. Usually mounting the chassis on the right side of the bulkhead will be found most desirable, although if a heater is used, the left side will be preferable.

RADIOTRON SOCKET VOLTAGES

6.3 Volt Battery—No Signal

Radiotron No.		Cathode to Ground	Cathode to Screen Grid Volts	Cathode to Plate Volts	Cathode Current M. A.	Heater Volts
RCA-78 R. F.		4.42	83	222	5.25	6.0
RCA-6A7	First Detector	4.42	83	222	11.0	6.0
	Oscillator	4.42	—	223	Tota	
RCA-6B7 Second Detector		3.22	84	218	5.25	6.0
RCA-41 Power		13.0	214	200	26.0	6.0

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REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

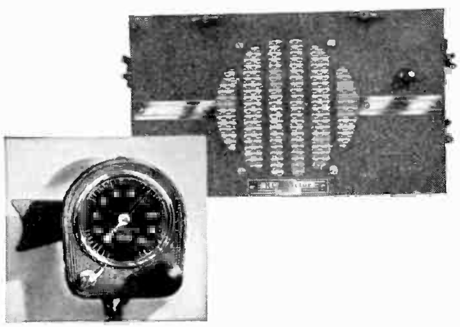
Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
2240	Resistor—30,000 ohms—Carbon type—1 watt (R5)	$0.22
2747	Cap—Contact cap—Package of 5	.50
3218	Resistor—600 ohms—Carbon type—¼ watt (R7)—Package of 5	1.00
6844	Capacitor—Comprising two 5.0 mfd. capacitors (C17, C22)	1.10
3572	Socket—Radiotron 7-contact socket	.38
3584	Ring—Antenna R. F. or oscillator coil retaining ring—Package of 5	.40
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R1, R4)—Package of 5	1.00
3616	Capacitor—300 mmfd. (C15, C18)	.34
3617	Capacitor—0.005 mfd. (C21)	.38
3618	Capacitor—0.02 mfd. (C16)	.38
3621	Coil—Choke coil—Located on resistor board (L17)	.35
3623	Shield—Antenna R. F. or oscillator coil shield	.30
3632	Resistor—500 ohms—Carbon type—1 watt (R11)—Package of 5	1.10
3636	Transformer—First intermediate frequency transformer (L7, L8, C14)	1.74
3637	Transformer—Second intermediate frequency transformer (L9, L10, C19)	1.65
3641	Capacitor—0.1 mfd. (C8)	.35
3645	Knob—Tone control knob—Package of 5	.90
3695	Capacitor—375 mmfd. (C24, C31)	.22
3696	Capacitor—40 mmfd. (C9)	.22
3699	Capacitor—720 mmfd. (C20)	.40
3744	Resistor—250,000 ohms—Carbon type—¼ watt (R10)—Package of 5	1.00
3745	Capacitor—745 mmfd. (C12)	.34
3746	Capacitor—800 mmfd. (C32)	.34
3920	Capacitor—.003 mfd. (C23)	.25
3921	Mounting screws, washer and bushing assembly—For 3-gang variable tuning condenser—Comprising three spacers, three screws, three washers and three lockwashers	.34
3922	Resistor—300,000 ohms—Carbon type—¼ watt (R6, R9)—Package of 5	1.00
3932	Capacitor—2400 mmfd. (C21)*	.30
4091	Resistor—80 ohms—Carbon type—¼ watt (R3)*—Package of 5	1.00
4208	Resistor—2500 ohms—Flexible type (R13)—Package of 5	.75
6135	Resistor—270 ohms—Carbon type—¼ watt (R3)—Package of 5	1.00
6192	Spring—Tuning condenser drive cord tension spring—Package of 10	.30
6242	Resistor—2 megohm—Carbon type—¼ watt (R2)—Package of 5	1.00
6298	Cord—Tuning condenser drive cord—Package of 5	.60
6471	Coil—Oscillator coil assembly (L5, L6)	.74
6490	Tone control switch	.35
6492	Capacitor—Comprising one 3.6 mfd. and one 1.0 mfd. capacitor (C4, C13)	1.08
6493	Drum—Tuning condenser drive drum	.40
6514	Capacitor—Comprising two 0.05 mfd. capacitors (C1, C5)	.28
6515	Cable—Shielded cable with antenna connector	.32
6516	Connector—Fuse connector	.16
6517	Cable—Main cable complete with fuse connector	1.40
6540	Coil—R. F. coil assembly (L3, L4)	.94
6731	Coil—Antenna coil (L1, L2)	.88
6732	Transformer—Interstage audio transformer (T2)	2.00
7485	Socket—Radiotron 6-contact socket	.40
7600	Filter pack—Comprising one reactor, one choke coil, one 0.5 mfd., two 4.0 mfd. and one 375 mmfd. capacitors (L13, L16, C25, C26, C29, C30)	4.06
7601	Condenser—3-gang variable tuning condenser	2.84
9049	Transformer—Power transformer (T1)	3.75

Stock No.	DESCRIPTION	List Price
	CONTROL BOX ASSEMBLIES	
3649	Key—Volume control and switch key	$0.18
3650	Screw—Self locking No. 10–32–$\frac{9}{16}$″ fulldog point set screw—Package of 10	.32
3651	Screw—Self locking No. 10–32–$\frac{3}{16}$″ cupped point set screw—Package of 10	.32
3652	Screw—Self locking No. 10–32–¼″ cupped point set screw—For flexible drive shaft—Package of 10	.32
3690	Strap and bracket assembly—Comprising one bracket, two screws, one lockwasher and one strap	.40
3718	Bracket—Control box dash mounting bracket	.25
3757	Coupling—Slotted coupling for end of flexible drive shaft—Package of 5	.40
3758	Connector—For control box end of flexible drive shaft—Package of 5	.68
6161	Knob—Station selector knob—Package of 5	.90
6496	Shaft—Flexible drive shaft complete with connectors—Approximately 24⅞″ long	1.60
6497	Shaft—Flexible drive shaft complete with connectors—Standard length—Approximately 33⅞″ long	1.75
6499	Volume control—Combination volume control and switch (R8)	1.36
6500	Nut—Volume control and switch lock nut	.24
6531	Shaft—Flexible drive shaft complete with connectors—Approximately 12⅞″ long	.85
6532	Shaft—Flexible drive shaft—Complete with connectors—Approximately 18⅞″ long	1.24
6784	Scale—Dial scale	.58
7695	Box—Control box complete	3.70
7698	Cover—Control box cover	.44
	MISCELLANEOUS PARTS	
3466	Connector—Antenna lead-in connector	.16
3646	Fuse—20 amperes—Package of 5	.40
3647	Nut—Cap nut and lock washer—Package of 10	.35
3648	Screw—No. 10–32–$\frac{5}{16}$″ cap screw and lockwasher—Package of 10	.32
3689	Bracket—Receiver mounting bracket, bolt and nut assembly—One set	.30
3791	Bushing and plate assembly—Flexible drive shaft bushing with plate, mounting screws, rubber bushings, and washers—Located on main case	.30
3827	Cable—From fuse connector to ammeter	.10
3856	Clip—Spring clip—Grounds receiver chassis to metal housing—Package of 10	.30
3884	Clamp—Cable clamp—Package of 10	.20
4051	Bumper—Rubber bumper used in mounting receiver chassis—Package of 4	.20
4138	Screw—Housing and cable clamp cap screw No. 10–32–$\frac{7}{16}$″—Package of 10	.15
4139	Screw—Housing cap screw No. 10–32–$\frac{5}{16}$″—Package of 10	.15
6151	Suppressor—Spark plug suppressor	.56
6152	Suppressor—Distributor suppressor	.56
6175	Suppressor—Distributor splice-in suppressor	.56
6494	Capacitor—Ammeter capacitor—0.5 mfd.	.46
6495	Capacitor—Generator capacitor—0.5 mfd.	.72
6670	Suppressor—Spark plug suppressor—"Elbow type"	.56
7065	Screw-driver—For R. F. and I. F. adjustments	.80
7621	Antenna—Roof antenna—Paper type (Brown)	1.50
7622	Antenna—Roof antenna—Paper type (Gray)	1.50
7686	Housing—Front section of housing complete with mounting screws	3.48
7689	Vibrator Complete	7.20
7699	Housing—Rear section of housing complete with mounting screws	1.92
9050	Oscillator—Test oscillator—150-25,000 K. C.	29.50†
	REPRODUCER ASSEMBLIES	
3688	Transformer—Output transformer (T3)	1.50
7607	Screen—Metal screen	.44
7608	Coil assembly—Comprising field coil, magnet and cone support (L14)	2.40
9023	Cone—Reproducer cone complete (L11)—Package of 5	5.00

† Full discount not allowed.
* C21—2400 mmfd. some models.
* R3—80 ohms some models.

RCA Victor
Automobile Radio M-107

SERVICE NOTES



SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

A RADIO CORPORATION OF AMERICA SUBSIDIARY

REPRESENTATIVES IN PRINCIPAL CITIES

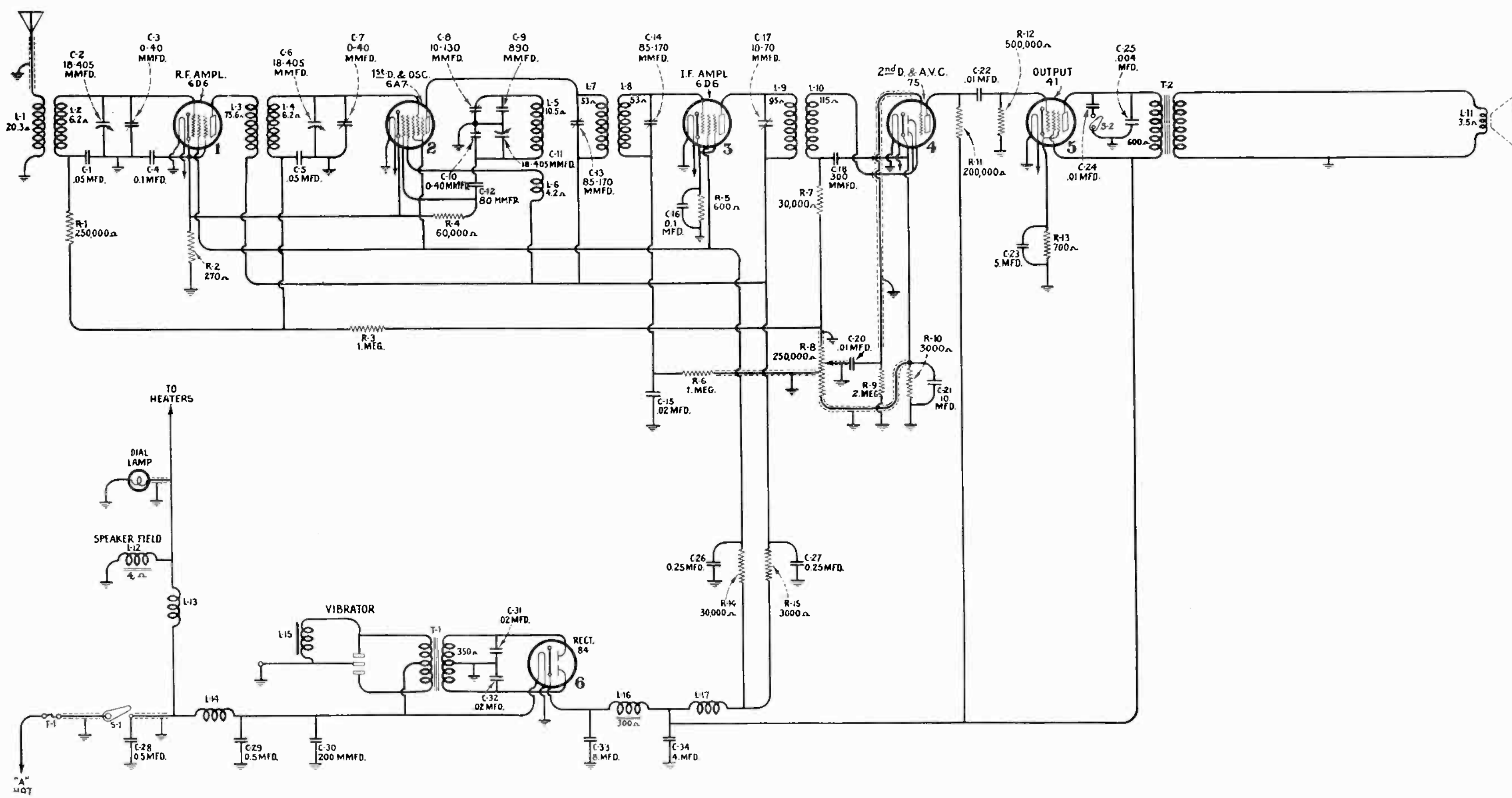


Figure 1—Schematic Circuit Diagram

RCA Victor Model M-107

Six-Tube Automobile Receiver

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Type and Number of Radiotrons Used—2 RCA-6D6, 1 RCA-6A7, 1 RCA-75, 1 RCA-41, 1 RCA-84	—Total, 6
Battery Current (6.3-Volt Battery):	
Speaker Field (Cold)	1.35 Amperes
Tubes	2.1 Amperes
Dial Lamp	0.15 Ampere
Power Supply (No Signal)	3.15 Amperes
Total (No Signal)	6.75 Amperes
Tuning Frequency Range	540 K. C.–1600 K. C.
Maximum Undistorted Output	1.9 Watts
Maximum Output	3.35 Watts
Line-up Frequencies	175 K. C.–600 K. C.–1400 K. C.

PHYSICAL SPECIFICATIONS

Height	7½ Inches
Width	12 Inches
Depth (Case Alone)	7 Inches

This six-tube automobile receiver incorporates the latest mechanical and electrical refinements for furnishing a rugged, fool-proof, mobile-type receiver having performance equivalent to that of a high-quality home receiver. Ease of installation, accessibility for servicing and ruggedness of construction are features of unusual interest.

In performance the receiver is characterized by unusual tone quality, adequate output, high sensitivity and excellent selectivity. Full control of all features is made possible by having the station selector, volume control and operating switch accessible on the steering column control and two-point tone control on the front of the receiver proper.

The construction of the unit embodies several new features of particular interest to the service man. The receiver case is mounted to the dash of the car by means of a single bolt. The case of the receiver is made in two sections so that the chassis may be dropped down for inspection or tube replacement, merely by removing and loosening several thumb nuts and screws. The receiver proper is divided into three units, the power supply including a plug-in type vibrator, a loudspeaker unit including the output transformer, and the receiver chassis. Each of these several units may be removed for replacement or repair merely by the use of a screwdriver and soldering iron.

ELECTRICAL DESCRIPTION OF CIRCUIT

The circuit is of the superheterodyne type, having features such as automatic volume control, diode second detector, two-point tone control and a Pentode output stage. The power supply consists of a plug-in type vibrator-inverter and tube rectifier and a specially designed filter system which eliminates all traces of vibrator R. F. interference from the power supply.

Examining the circuit closely we find the following functions taking place while the receiver is in operation.

The signal enters the receiver through the shielded antenna lead-in and the antenna coupling coil. The signal voltage is applied to the grid of the first R. F. tube by means of the secondary coupling coil, which is tuned by means of the first unit of the three-gang tuning capacitor. The R. F. tube is a Radiotron RCA-6D6, which is a super-control R. F. amplifying Radiotron which gives a minimum amount of cross modulation, hum modulation and modulation distortion. This tube has the general characteristics of the RCA-58.

The output of the R. F. stage is fed to the Radiotron RCA-6A7, which is a combined oscillator and first

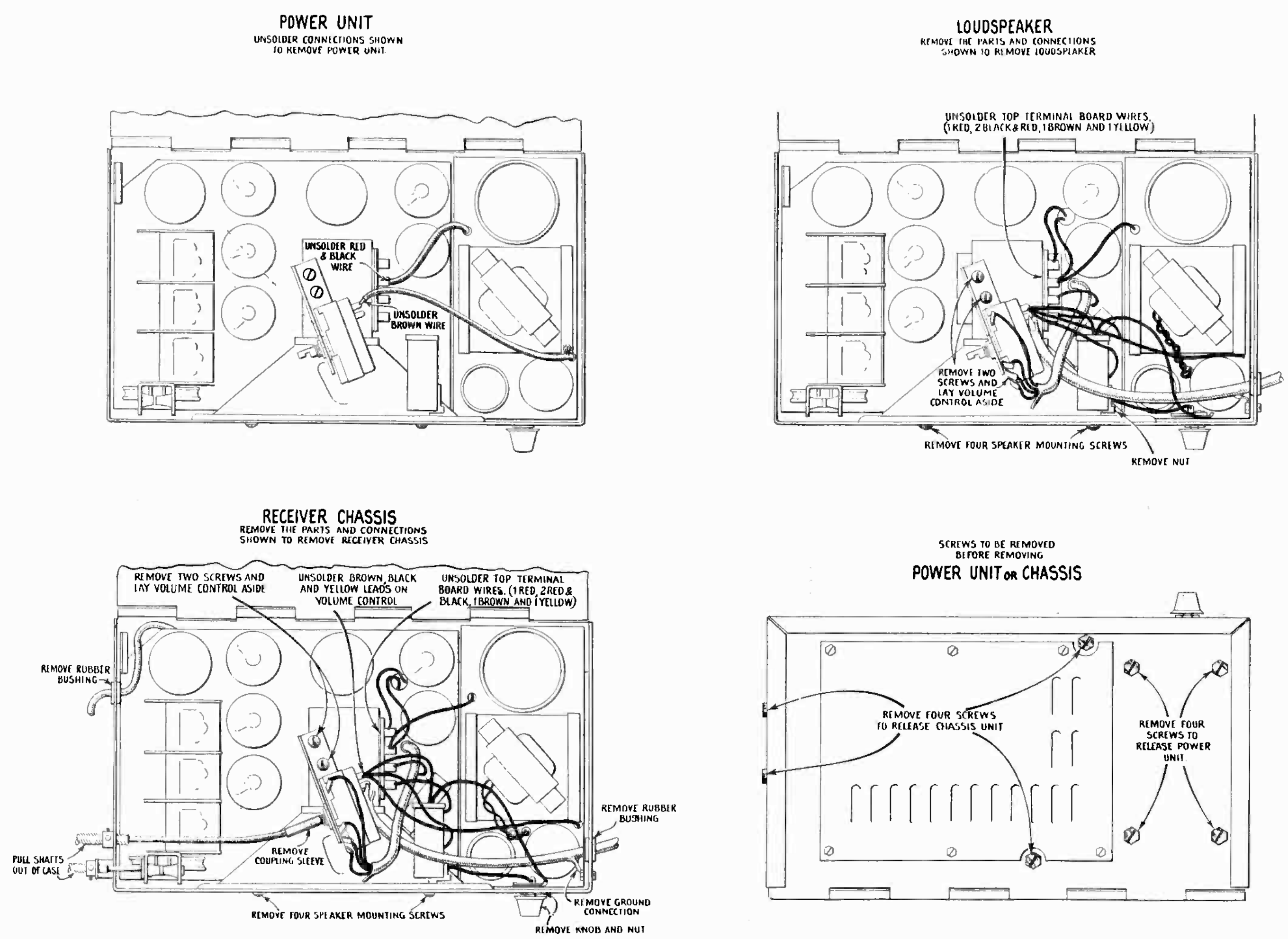


Figure 2—Details of Removing Units from Chassis

detector. The detector grid circuit is tuned to the signal, whereas the oscillator grid circuit is tuned to a frequency 175 K. C. higher than the signal. The use of a suitable bridge circuit provides a method whereby the tuning capacitor maintains this same frequency difference throughout its tuning range. The output of the detector is the difference or beat frequency provided by combining the signal and oscillator frequency and is the I. F. frequency of the receiver. A single I. F. stage using Radiotron RCA-6D6 and two I. F. transformers. Three tuned circuits are provided for selecting and amplifying the I. F. signal. The output of this stage is applied to the second detector.

The next tube is an RCA-75, which is a combined second detector, automatic volume control and audio amplifier. The signal is applied to the diode sections of this tube, which act as a two-element rectifier. The direct current component of the rectified signal produces a voltage drop across resistor R-8. This voltage drop constitutes the automatic bias voltage for the R. F., 1st detector and I. F. amplifier which gives the automatic volume control action of the receiver. The volume control selects the amount of audio voltage that is applied to the grid of the RCA-75 and thereby regulates the audio output of this tube and of the entire receiver.

The output of the audio section of the RCA-75 is resistance coupled to the grid circuit of the RCA-41, which is the power output stage.

The tone control, comprising a switch and capacitor, is connected from plate of the RCA-41 output stage to ground. Maximum attenuation of the high frequencies is obtained when the switch is closed. The plate circuit is coupled through a step-down transformer to the cone coil of the reproducer unit.

Field excitation power is obtained by connecting the loudspeaker field directly across the car battery. Filament power is obtained in a similar manner, all Radiotrons having 6.3-volt heaters. Plate and grid voltage for all tubes is obtained through the vibrator inverter unit and its associated rectifier, transformer and filter circuits. An RCA-84 rectifier tube is used in the power supply unit for rectifying the alternating current output from the step-up transformer.

SERVICE DATA

(1) Removing Units from Chassis:

The three major units, the power unit, the loudspeaker and the receiver chassis, are easily removed independently without disturbing the other units not removed. To do this, the use of a screwdriver and soldering iron are the only tools required. Figure 2 shows the details of the screws and terminals to be removed in each individual case.

(2) Line-Up Capacitor Adjustments:

Adjustable capacitors are provided in the R. F. oscillator and intermediate frequency amplifier to provide a means of properly aligning the receiver. A modulated R. F. oscillator such as Full-Range Test Oscillator, type TMV-97-B (Stock No. 9050), a non-metallic screwdriver such as alignment wrench Stock No. 4160 and an output meter are required for properly aligning this receiver. Refer to Figure 3 for the location of the line-up capacitors

I. F. Tuning Adjustments:

Two transformers comprising three tuned circuits (the secondary of the second transformer is untuned) are used in the intermediate amplifier. These are tuned to 175 K. C. and the adjustment screws are accessible from beneath the chassis as shown in Figure 3. Proceed as follows:

(a) Procure a modulated oscillator giving a signal at 175 K. C., a non-metallic screwdriver such as Stock No. 4160 and an output meter.

(b) Short-circuit the antenna and ground leads and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the chassis.

(c) Connect the oscillator output between the first detector control grid and chassis ground. Connect the output meter across the voice coil of the loudspeaker and adjust the oscillator output so that with the receiver volume control at maximum, a slight deflection is obtained in the output meter.

(d) Adjust the primary of the second, and the primary and secondary of the first I. F. transformers, until a maximum deflection is obtained. Keep the oscillator output at a low value so that only a slight deflection is obtained on the output meter at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. adjustments.

R. F. and Oscillator Adjustments:

The three-gang capacitor trimmer screws are located on the main tuning capacitor, accessible at the top of the chassis. Proceed as follows:

(a) Procure a modulated oscillator giving a signal at 1400 K. C. and 600 K. C., a non-metallic

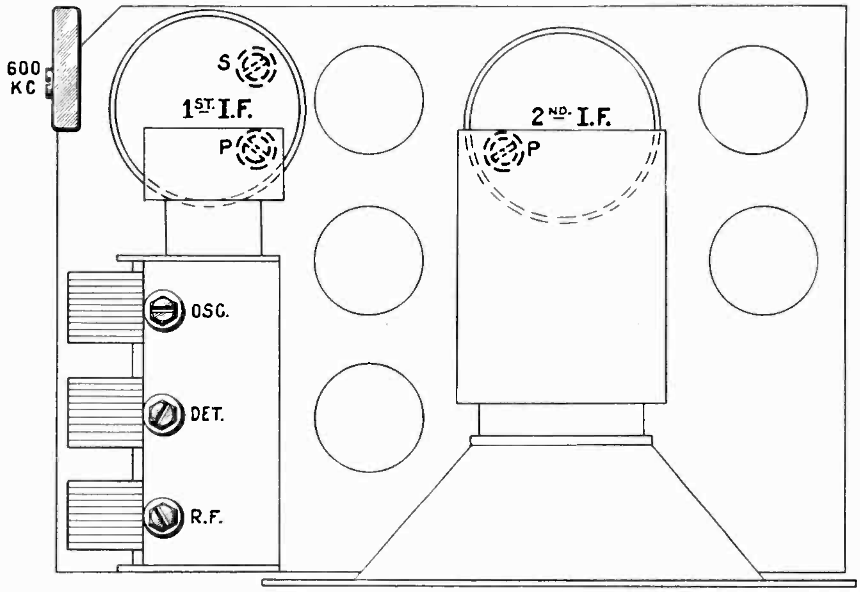


Figure 3—Location of Line-Up Capacitors

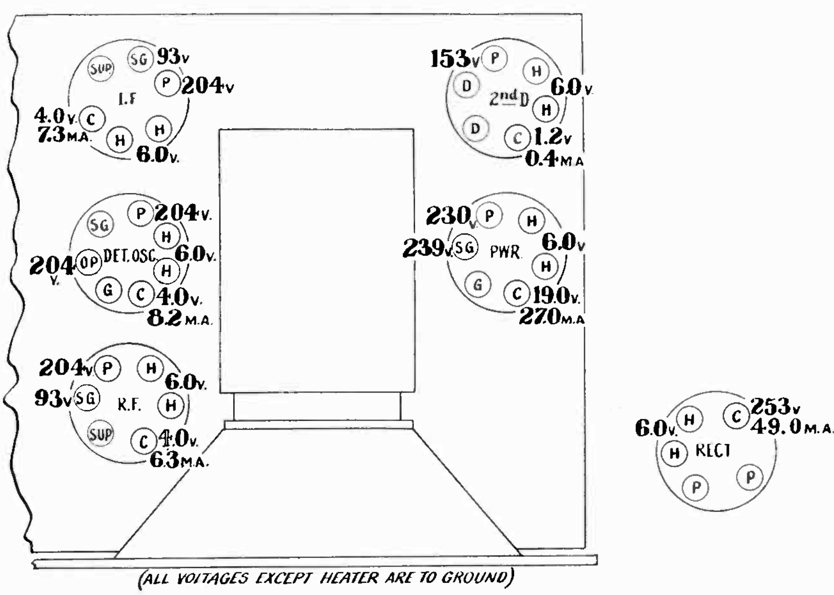


Figure 4—Voltages at Individual Socket Contacts

screwdriver such as Stock No. 4160 and an output meter.

(b) Connect the output of the oscillator to the antenna and ground lead of the receiver. Place the receiver in operation and attach the control box as in normal operation. Turn the tuning control until the tuning capacitors are fully meshed. Then set the indicator on the dial at the 530 K. C. reading. Turn the tuning control until the dial reads 1400. Then set the oscillator at 1400 K. C. and connect the output meter across the cone coil. Adjust the three-gang capacitor trimmer screws until maximum output is obtained. Be careful not to disturb the relation of the control box to the receiver after setting the dial.

(c) After making the 1400 K. C. adjustment, shift the oscillator to 600 K. C. and tune in the signal. Adjust the 600 K. C. trimmer, accessible from the side of the chassis for maximum output while rocking the gang-capacitor back and forth. Then again check the adjustment described in (b).

When making both the I. F. and R. F. adjustments, the important point to remember is that the receiver volume control must be at its maximum position and the minimum input signal necessary from the oscillator must be used.

(4) R. F. Interference from Vibrator with Shielded Lead-In Disconnected from Antenna:

In event R. F. interference originating with the vibrator inverter-rectifier unit is encountered, check the following points:

(a) Vibrator not properly seated. The vibrator must be pushed tight against its socket at all times.

(b) The various by-pass capacitors, such as C-28, C-29 and C-30 and chokes L-13, L-14 and L-16, must be properly connected, and in operating condition. It is well to remember that some of the interference produced by the vibrator is of a frequency as high as one meter and any replacement of capacitors must always be made with one of similar mechanical as well as electrical construction.

(5) Voltage Readings:

The following voltages are those at the tube socket while the receiver is in operating condition. No allowance has been made for currents drawn by the meter and if low resistance meters are used, such allowances must be made.

(6) Vibrator Inverter:

The Vibrator Inverter unit used in this receiver is of advanced design and construction. It is adjusted by means of special equipment at the factory and then sealed to prevent tampering. The unit is provided with a special plug-in base so that in event of suspected failure it may be easily interchanged with one of known condition.

With the seals unbroken, the Vibrator carries the standard ninety-day guarantee, which also applies to all parts of the receiver. Vibrator defects should be remedied by replacement, not by attempted adjustment.

RADIOTRON SOCKET VOLTAGES

6.3 Volt Battery—No Signal—Minimum Volume

Radiotron No.	Cathode to Ground Volts, D. C.	Screen Grid to Ground Volts, D. C.	Plate to Ground Volts, D. C.	Cathode Current, M. A.	Heater Volts, D. C.
RCA-6D6—R. F.	4.0	93	204	6.3	6.0
RCA-6A7 1st Det.	4.0	93	204	8.2	6.0
RCA-6A7 Osc.	—	—	204		
RCA-6D6—I. F.	4.0	93	204	7.3	6.0
RCA-75—2nd Det.	1.2	—	153*	0.4	6.0
RCA-41—Pwr.	19.0	239	230	27.0	6.0
RCA-84—Rect.	253	—	—	49.0	6.0

* Voltage impossible to measure with ordinary voltmeter.

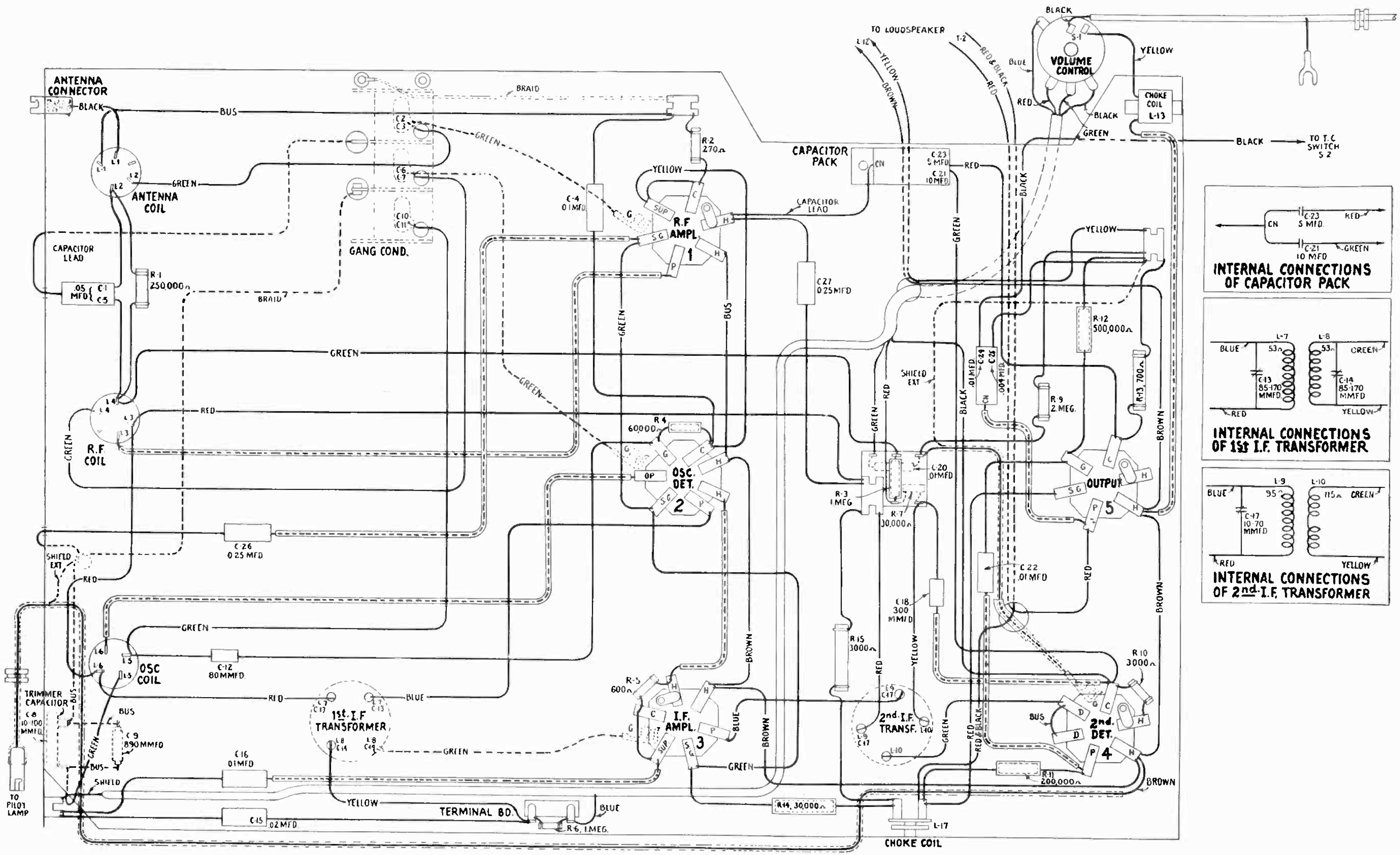


Figure 5—Receiver Assembly Wiring Diagram

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4305	Bracket—Tuning condenser drive bracket assembly	$0.45
6981	Cable—4-conductor shielded volume control cable	.42
4300	Cable—Single-conductor—Power input cable	.56
4301	Cable—Single-conductor—Dial lamp cable	.38
3861	Capacitor—Adjustable trimmer capacitor (C8)	.78
4246	Capacitor—80 mmfd. (C12)	.24
4248	Capacitor—300 mmfd. (C18)	.22
4245	Capacitor—890 mmfd. (C9)	.26
3639	Capacitor—.02 mfd. (C15)	.25
3701	Capacitor—.01 mfd. (C20, C22)	.30
3877	Capacitor—0.1 mfd. (C4, C16)	.32
3597	Capacitor—.25 mfd. (C26, C27)	.40
4304	Capacitor—0.5 mfd. (C28)	.72
6979	Capacitor pack—Comprising one .01 and one .004 mfd. (C24, C25)	.28
6963	Capacitor pack—Comprising one 5. mfd. and one 10 mfd. capacitor (C21, C23)	1.10
4243	Capacitor pack—Comprising two .05 mfd. capacitors (C1, C5)	.35
6965	Coil—Antenna coil (L1, L2)	.70
4299	Coil—Choke coil (L13)	.35
4298	Coil—Choke coil (L17)	.28
6967	Coil—Oscillator coil (L5, L6)	.52
6966	Coil—R. F. coil assembly (L3, L4)	.80
7768	Condenser—3-gang variable tuning condenser (C2, C3, C6, C7, C10, C11)	4.75
4306	Cord—Tuning condenser drive cord—Package of 10	1.05
6493	Drum—Tuning condenser dial drum and hub with set screws	.40
3584	Ring—Antenna, R. F. or oscillator coil retaining ring—Package of 5	.40
4307	Roller—Tuning condenser idler roller—Package of 5	.25
6135	Resistor—270 ohms—Carbon type—¼ watt (R2)—Package of 5	1.00
3218	Resistor—600 ohms—Carbon type—¼ watt (R5)—Package of 5	1.00
4242	Resistor—3,000 ohms—Carbon type—¼ watt (R10)—Package of 5	1.00
3152	Resistor—30,000 ohms—Carbon type—¼ watt (R7)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R4)—Package of 5	1.00
3116	Resistor—200,000 ohms—Carbon type—¼ watt (R11)—Package of 5	1.00
3744	Resistor—250,000 ohms—Carbon type—¼ watt (R1)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R12)—Package of 5	1.00
3033	Resistor — 1 megohm — Carbon type — ¼ watt (R3, R6)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R9)—Package of 5	1.00

Stock No.	Description	List Price
4302	Resistor—700 ohms—Carbon type—1 watt (R13)—Package of 10	$2.00
2240	Resistor—30,000 ohms—Carbon type—1 watt (R14)	.22
4239	Resistor—3,000 ohms—Carbon type—3 watt (R15)	.25
3623	Shield—Antenna, R. F. or oscillator coil shield	.30
4233	Shield—Detector oscillator or output Radiotron shield	.22
4236	Shield—I. F. or R. F. amplifier Radiotron shield	.22
4232	Socket—6-contact Radiotron socket	.35
3572	Socket—7-contact Radiotron socket	.38
6192	Spring—Tuning condenser drive cord tension spring—Package of 10	.30
6960	Transformer—First intermediate frequency transformer (L7, L8, C13, C14)	1.80
6962	Transformer—Second intermediate frequency transformer (L9, L10, C17)	1.85
6978	Volume control (R8)	1.20
	CONTROL BOX ASSEMBLIES	
6976	Back—Control box back	.75
7769	Box—Control box complete	3.90
3690	Bracket and strap assembly—Comprising one bracket, two screws, one lockwasher and one strap	.40
7770	Cover—Control box front cover	.86
4259	Cover—Station selector dial cover—Transparent celluloid—Package of 5	.92
4261	Dial—Station selector dial	.15
4258	Key—Volume control key	.20
4340	Lamp—Dial lamp—Package of 5	.60
4260	Pointer—Station selector indicator	.18
4257	Ring—Station selector dial cover ring (escutcheon)	.75
4262	Screen—Dial light screen—Package of 5	.26
4255	Screw—No. 4-40-¼ inch oval head machine screw for holding cover to control box back—Package of 10	.16
4252	Screw—No. 10-32-11/32-inch fillister head set screw for holding condenser drive and pinion gear and volume coupling control shaft—Package of 10	.32
3652	Screw—No. 10-32-¼-inch cupped point set screw for holding station selector or volume control flexible drive shaft to control box—Package of 10	.32
4254	Shaft—Volume control coupling shaft	.36
4250	Shaft and gear—Station selector pointer shaft and gear	.56
4251	Shaft and gear—Station selector drive shaft and pinion gear	.20
4253	Spring—Volume control key holding spring—Package of 10	.32

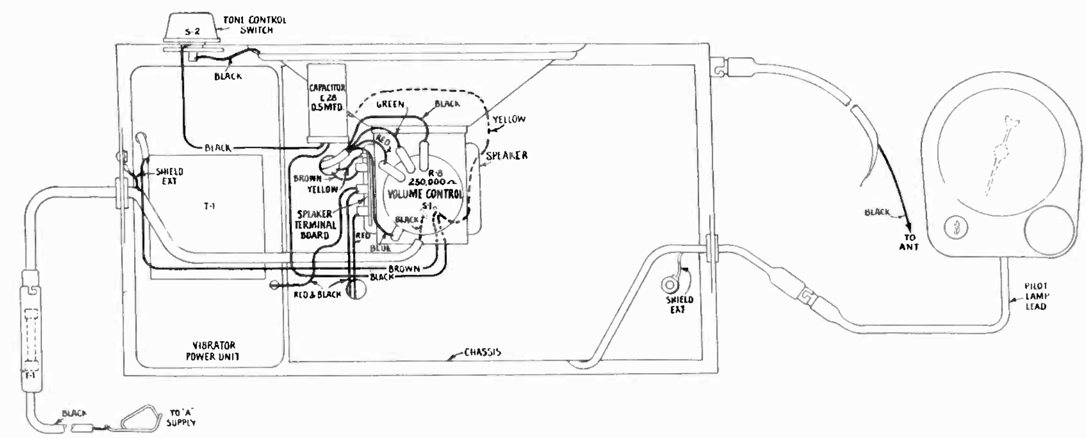


Figure 6—Assembly Wiring Diagram

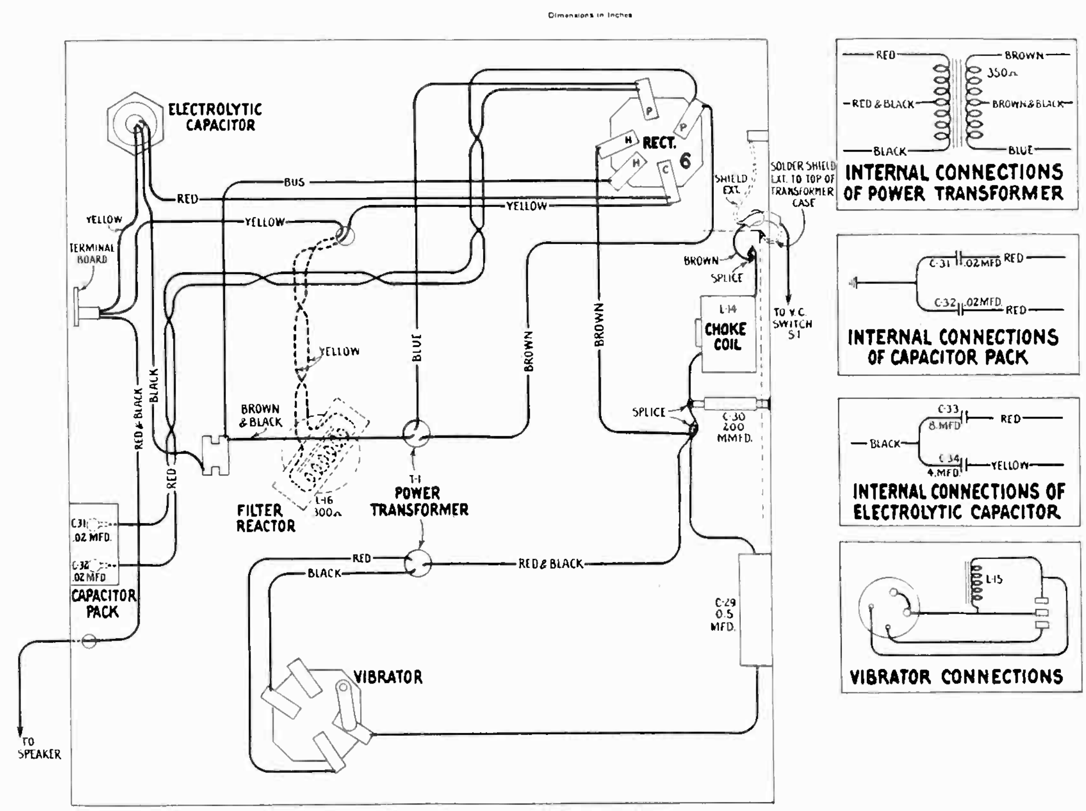


Figure 7—Power Unit Wiring Diagram

REPLACEMENT PARTS—Continued

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	FLEXIBLE SHAFT AND CABLE ASSEMBLIES	
7762	Cable—Dial lamp cable with socket and section of connector	$0.76
4264	Clamp—Metal clamp for holding flexible shafts—Package of 10	.35
4295	Screw—No. 10-32-¼-inch cupped point set screw—Fastens flexible shaft housing to metal case—Package of 10	.20
7771	Shaft—Station selector flexible drive shaft approximately 28 inches long	1.44
7773	Shaft—Station selector flexible drive shaft approximately 23 inches long	1.32
7772	Shaft—Volume control flexible drive shaft approximately 32 inches long	1.68
7774	Shaft—Volume control flexible drive shaft approximately 27 inches long	1.56
4265	Sleeve—Coupling sleeve for volume control shaft—Package of 5	.15
4263	Socket—Dial lamp socket	.20
	POWER SUPPLY UNIT	
4013	Capacitor—200 mmfd. (C30)	.30
4293	Capacitor—0.5 mfd. (C29)	.60
7779	Capacitor—Comprising two .02 mfd. capacitors (C31, C32)	.96
7776	Capacitor—Comprising one 8. mfd. and one 4 mfd. capacitors (C33, C34)	1.90
3956	Clamp—Capacitor mounting clamp—Package of 5	.32
7778	Coil—Filter reactor choke coil (L14)	.45
7777	Reactor—Filter reactor (L16)	1.14
4308	Screw—Binder head No. 6-32-¼-inch screw for mounting capacitor pack—package of 10	.18
6980	Socket—4-contact vibrator socket	.20
7484	Socket—5-contact Rectifier socket	.35
7775	Transformer—Vibrator transformer (T1)	3.78
7780	Vibrator complete (L15)	4.96
	REPRODUCER ASSEMBLIES	
9496	Coil—Field coil, magnet and cone support (L12)	2.95
9492	Cone—Reproducer cone (L11)—Package of 5	3.70
6982	Transformer—Output transformer (T2)	1.35
9494	Reproducer complete	5.65
4277	Screw—No. 8-32-⅜-inch binder head reproducer mounting screw—Package of 10	.22
	HOUSING ASSEMBLIES	
4322	Bracket assembly—Station selector drive shaft bracket and bushing	.28
4321	Cloth—Grille cloth	.22
7781	Housing—Front section of housing complete—Less hinge pin	3.38
7782	Housing—Rear section of housing complete—Less hinge pin	$2.68
4320	Nut—Wing nut—Package of 10	.38
4266	Pin—Hinge pin—Package of 5	.42
4318	Screw—Wing screw—Package of 10	.98
4319	Screw—No. 6-¼-inch slotted hex head self tapping—Fastens case bottom to front section of housing—Package of 10	.50
4295	Screw—No. 10-32-¼-inch headless set screw—Used to fasten drive shafts to housing—Package of 10	.20
	MISCELLANEOUS ASSEMBLIES	
4287	Body—Antenna connector body—Package of 10	.40
4289	Body—Fuse connector body—Package of 10	.35
3689	Bracket—Receiver mounting bracket, bolt and nut assembly	.30
4283	Cable — Antenna lead-in cable — Approximately 35 inches long	.80
4288	Cap—Antenna or fuse connector cap—Package of 10	.36
4293	Capacitor—Ammeter capacitor—.5 mfd.	.60
6495	Capacitor—Generator capacitor—.5 mfd.	.72
4291	Clip—"A" supply clip—Package of 10	.70
4286	Ferrule—Antenna or fuse connector ferrule and bushing—Package of 10	.38
3646	Fuse—20 ampere (F1)—Package of 5	.40
4290	Insulator—Fuse connector insulator—Package of 10	.35
4323	Knob—Tone control switch knob—Package of 5	.70
4282	Knob—Station selector knob—Package of 5	.65
7766	Lead—Power lead with female section of fuse connector—From power cable to battery	.30
4492	Plate—Ornamental plate located on housing front—Package of 2	.58
4494	Plate—RCA Victor name plate	.94
4493	Screw—No. 4 self-tapping screw for mounting ornamental plates—Package of 10	.56
4495	Screw—No 8 self-tapping screw for mounting station selector drive shaft and bushing—Package of 10	.52
4294	Screw—No. 10-32-5/16-inch hex head used to mount receiver chassis to housing—Package of 10	.45
4303	Screw—No. 10-32-7/16-inch hex head used to mount power unit to housing—Package of 10	.22
4284	Spring—Antenna or fuse connector spring—Package of 10	.30
6152	Suppressor—Distributor suppressor	.56
6151	Suppressor—Spark plug suppressor	.56
6669	Switch—Tone control switch (S2)	.50
4285	Washer—Antenna or fuse connector insulating washer—Package of 10	.22

Model 112A
220-Volt AC/DC Radio Broadcast Receiver
Five-Tube Superheterodyne Table Model
—INSTRUCTIONS—

INSTALLATION

Location—The receiver should be supported upon a level surface such as a table or shelf, convenient to an electrical outlet and to the antenna lead-in and ground wires. In any installation, care should be taken to avoid restriction of natural ventilation through the cabinet as would occur with the back of the set placed too close to a wall or other plane surface. To prevent damage to the cabinet finish and possibly more serious internal injury, the instrument should not be placed upon or close to a radiator or other heating device.

Antenna and Ground—An outdoor antenna having a length of from 25 to 75 feet, including the lead-in and ground connections, is recommended. In many cases, however, an indoor antenna of short or medium length will be found satisfactory in buildings of non-metallic construction. The antenna should be well insulated from all objects and run neither close nor parallel to electrical circuits inside or outside the building.

A good ground connection is essential for best performance. The ground lead should be as short as possible and preferably attached to a cold water pipe. The pipe surface should be scraped clean and an approved ground clamp used to insure a tight and permanent connection.

Two flexible leads are provided at the rear of the receiver for connection to the antenna and ground. Connect the *black* lead to the antenna wire or lead-in and the *yellow* lead to the ground wire. Both joints should be soldered and wrapped with insulating tape.

Power Supply—Connect the power cord to an electrical outlet upon which is impressed a supply voltage (either AC or DC) within the limits specified on the license label attached to the rear panel of the instrument. Never operate the instrument from a supply voltage exceeding the maximum limit (230 volts). Consult your local power company if in doubt as to the actual voltage available.

Radiotrons—The instrument is equipped and tested at the factory with RCA Radiotrons and is shipped with the tubes in their sockets. The set therefore is ready to operate when it is removed from the carton and external connections are made as heretofore described.

If, when first installed, the receiver either performs imperfectly or fails to operate, it is probable that one or more of the tubes, shields or dome terminal clips have been jarred loose in shipment. Remove the cabinet rear panel (held in place by screws at the edges), then refer to the tube location diagram printed on the license label and *make certain:*

(a) That all tubes are in the proper sockets and pressed down firmly. Never apply power to the instrument unless all Radiotrons are in place.

(b) That all shields are rigidly in place over the Radiotrons represented by double circles on the diagram.

(c) That the spring connectors of the short flexible (grid) leads shown on the diagram are securely attached to the dome terminals of the proper Radiotrons and are not bent to an extent where contact with any tube shield is established.

NOTE—The grid lead for Radiotron RCA-6A7 must be suspended over the notched support as illustrated, in order to insure proper operation.

OPERATION

Controls—The instrument has two operating controls located on the front panel of the cabinet as follows:

(1) ***Volume Control—Combined with Power Switch*** (Left-hand Knob)—In the extreme counter-clockwise position, the power is "off." A slight clockwise rotation turns the power "on," as indicated by illumination of the dial; further rotation increases the volume.

(2) ***Station Selector*** (Right-hand Knob)—This control is provided with a dial calibrated to facilitate the location and identification of stations (add one cipher to scale markings to obtain the frequency in kilocycles).

Procedure—To operate the receiver, proceed as follows:

1. Turn the power "on" and set the Volume Control fully clockwise for maximum volume—reduce the setting if too noisy after allowing a few seconds for the tubes to heat.

2. Rotate the Station Selector slowly over the range of the dial until a desirable station program is heard.

IMPORTANT—If no sounds (station signals or static) are heard on DC supply, reverse the prongs of the power plug in the receptacle.

3. For best reproduction, reduce the Volume Control setting and adjust the Station Selector accurately for loudest volume. Always use the Volume Control—never the Station Selector—for regulation of volume.

4. When through operating, turn the Volume Control knob fully counter-clockwise, thus switching "off" the power.

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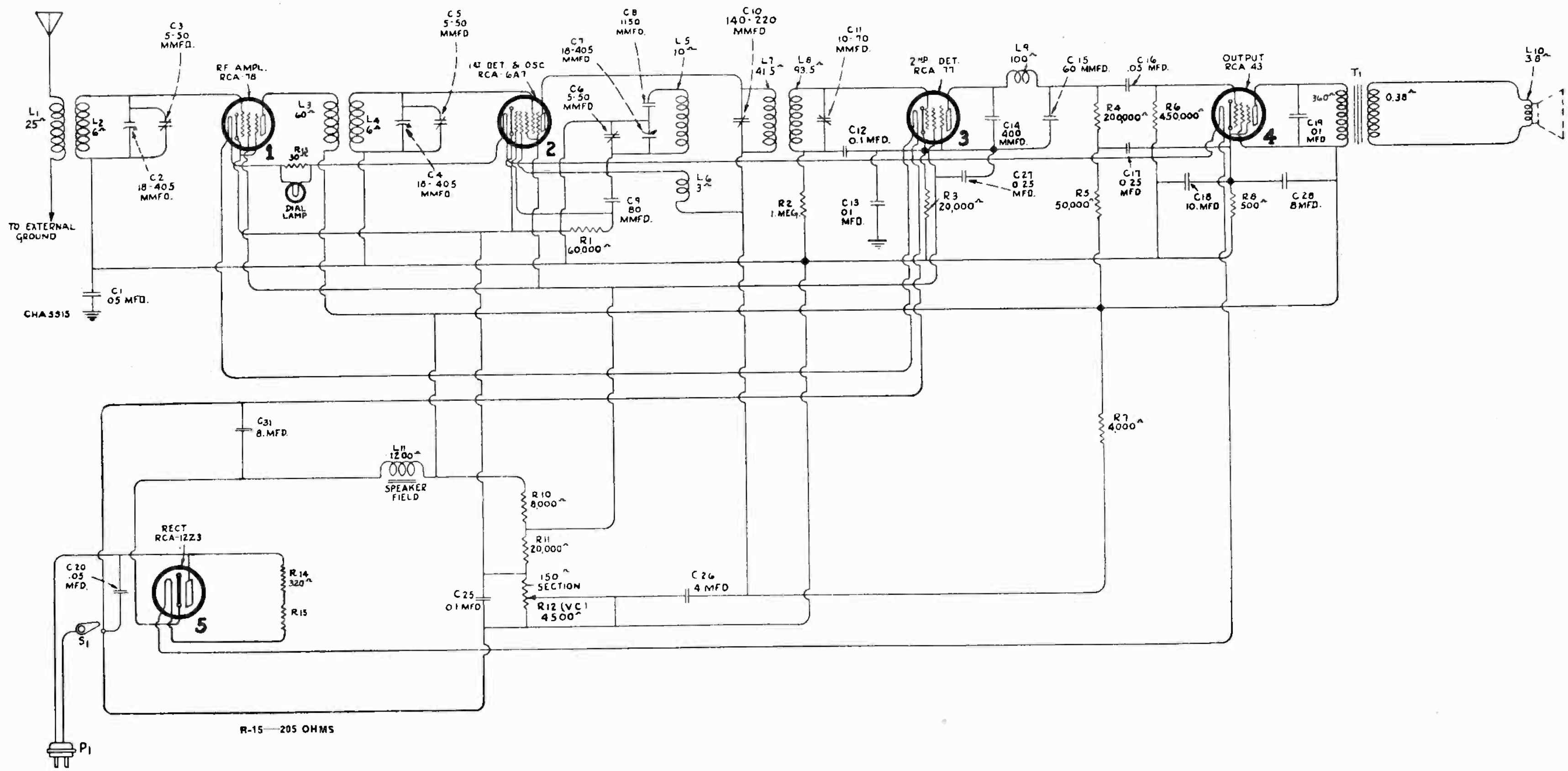
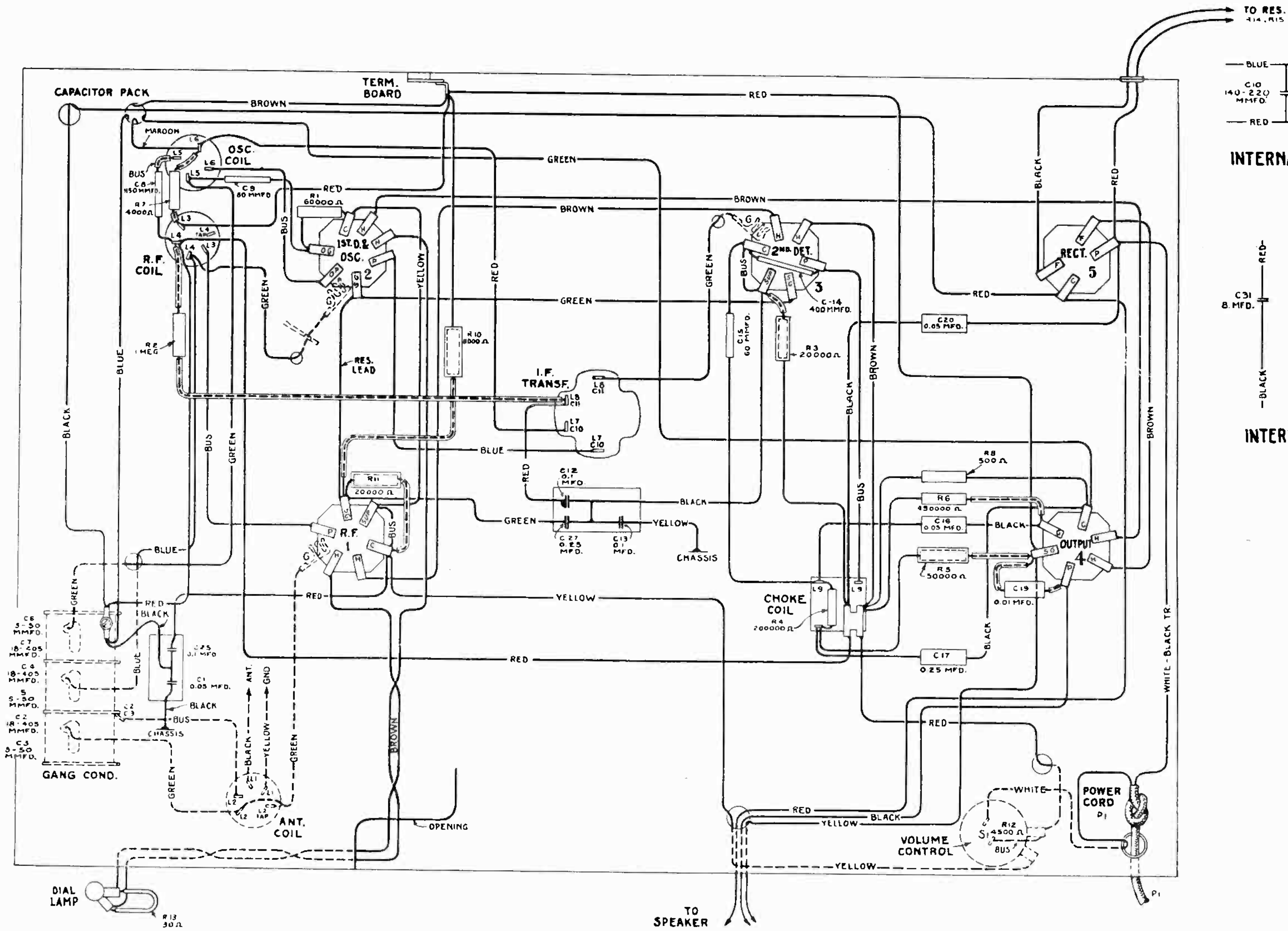
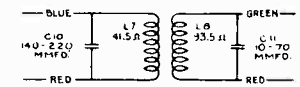
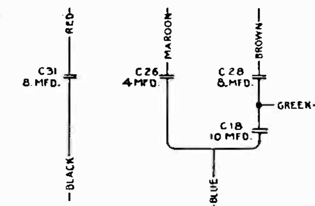


Figure A—Schematic Diagram





INTERNAL CONNECTIONS OF I.F. TRANSF.



INTERNAL CONNECTIONS OF CAPACITOR PACK

Figure B—Wiring Diagram

SERVICE DATA

Electrical Specifications

Voltage Rating .... 200–230 AC or DC
Frequency Rating (AC) .... 50–60 Cycles
Power Consumption .... AC 60 Cycles–105 Watts—DC–85 Watts
Number and Types of Radiotrons .... 1 RCA-78, 1 RCA-6A7, 1 RCA-77, 1 RCA-43, 1 RCA-12Z3—Total, 5
Undistorted Output .... 1.5 Watts
Frequency Range .... 540 KC–1500 KC

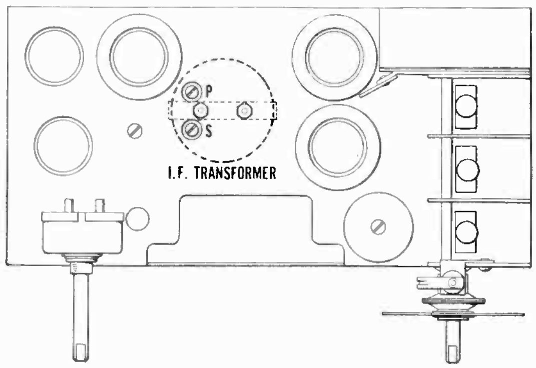


Figure C—Location of Line-Up Capacitors

This receiver is a five-tube Super-Heterodyne designed to operate on AC or DC over the voltage and frequency range indicated. Features such as compact construction, dynamic speaker, single Pentode Output tube and the inherent sensitivity, selectivity and tone quality of the Super-Heterodyne are included in this instrument.

The circuit consists of an R. F. stage using Radiotron RCA-78, a combined oscillator and first detector using Radiotron 6A7, an I. F. transformer using two tuned circuits, a second detector using Radiotron RCA-77 and a power stage using Radiotron RCA-43. The rectifier is Radiotron RCA-12Z3, which is used in a half-wave circuit.

Line-Up Capacitor Adjustments

The line-up capacitor adjustments for the I. F. stage and for the R. F. circuits should be made in the following manner:

(a) Procure a modulated oscillator giving a signal at 175 KC and 1400 KC. An output meter and non-metallic screw driver are also necessary. The Stock No. 9050 test oscillator and Stock No. 7065 screw driver are suitable for this purpose. Figure C shows the location of the I. F. capacitors.

(b) The I. F. line-up capacitors should be first adjusted. This is done by placing the oscillator in operation at 175 KC, coupling its output between the control grid of the first detector and grounds connecting the output meter across the cone coil of the loudspeaker and adjusting the two I. F. line-up capacitors until maximum output is obtained.

(c) After the I. F. circuits are aligned, the R. F. and oscillator circuits are adjusted at 1400 KC. Prior to making the adjustment, however, the dial should be checked. This is done by making sure the dial indicator reads 530 (indicator in center position) when the tuning capacitor rotor plates are fully meshed with the stator plates. The adjustments are then made in similar manner as that of the I. F. except that the oscillator is set at 1400 KC, its output is connected from antenna to ground of the receiver, and the dial is set at 140. The adjustment is made with the trimming capacitors located on top of the gang capacitor and each capacitor is adjusted for maximum output.

RADIOTRON SOCKET VOLTAGES

*Measured at 220 Volts A. C., 60 cycles (Maximum Volume Control)

Radiotron No.	Cathode to Control Grid, Volts DC	Cathode to Screen Grid, Volts DC	Cathode to Plate, Volts DC	Plate Current M. A.	Heater Volts
RCA-78 R. F.	3.0	100	165	5.5	6.0
RCA-6A7 Oscillator 1st Detector	—	—	145	1.7	6.0
	3.0	100	145	2.5	—
RCA-77 2nd Detector	Plate and Bias Supply 165 Volts			—	6.0
RCA-43 Power	21.0	140	130	35.0	25.0
RCA-12Z3 Rectifier	220 RMS			—	12.0

*Voltages with 220 Volts D. C. supply will be approximately 10 per cent less than tabulated values

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
2747	Cap—Contact cap—Package of 5	$0.50
3710	Capacitor—60 mmfd. (C15)	.36
3711	Capacitor—80 mmfd. (C9)	.40
3712	Capacitor—400 mmfd. (C14)	.40
3754	Capacitor—1150 mmfd. (C8)	.50
3701	Capacitor—0.01 mfd. (C19)	.30
3888	Capacitor—0.05 mfd. (C16)	.25
3916	Capacitor—0.05 mfd. (C20)	.32
3917	Capacitor—0.25 mfd. (C17)	.40
3755	Capacitor—Comprising two 0.1 mfd. and one 0.25 mfd. (C12, C13, C27)	.60
6621	Capacitor—Comprising one 0.05 and one 0.1 mfd. (C1, C25)	.46
6728	Capacitor—Comprising one 4.0 mfd., one 10.0 mfd. and two 8.0 mfd. (C18, C26, C28, C31)	2.94
6726	Coil—Choke coil (L9)	.62
6519	Coil—Antenna coil (L1, L2)	.88
6521	Coil—Oscillator coil (L5, L6)	.60
6520	Coil—R. F. coil (L3, L4)	.94
6723	Condenser—3-gang variable tuning condenser (C2, C3, C4, C5, C6, C7)	4.15
4701	Dial—Tuning condenser dial and drive assembly	1.50
4703	Escutcheon—Station selector escutcheon	.35
4449	Knob—Volume control or station selector knob—Package of 5	.60
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R1)—Package of 5	1.00
3033	Resistor—1 megohm—Carbon type—¼ watt (R2)—Package of 5	1.00
6250	Resistor—4000 ohms—Carbon type—½ watt (R7)—Package of 5	1.00
6303	Resistor—20,000 ohms—Carbon type—½ watt (R3)—Package of 5	1.00
3594	Resistor—50,000 ohms—Carbon type—½ watt (R5)—Package of 5	1.00

Stock No.	DESCRIPTION	List Price
6228	Resistor—200,000 ohms—Carbon type—½ watt (R4)—Package of 5	$1.00
3700	Resistor—150,000 ohms—Carbon type—½ watt (R6)—Package of 5	1.00
3632	Resistor—500 ohms—Carbon type—1 watt (R8)—Package of 5	1.10
2963	Resistor—8,000 ohms—Carbon type—1 watt (R10)—Package of 5	1.10
6114	Resistor—20,000 ohms—Carbon type—1 watt (R11)—Package of 5	1.10
3914	Resistor—30 ohms—Flexible type (R13)	.28
4718	Resistor—205 ohms—Porcelain type—(R15)	.90
3915	Resistor—320 ohms—Porcelain type—(RR14)	.88
3584	Ring—Antenna R. F. or oscillator coil retaining ring—Package of 5	.40
3993	Screw—No. 6-32 square head set screw for condenser dial and drive assembly—Package of 10	.25
7065	Screwdriver—Insulated screwdriver and socket wrench—For I. F., R. F. and oscillator condenser adjustment	1.00
3623	Shield—Antenna R. F. or oscillator coil shield	.30
3950	Shield—Radiotron shield	.26
4700	Socket—Dial lamp socket	.35
3859	Socket—4-contact Radiotron socket	.30
6676	Socket—6-contact Radiotron socket	.40
7185	Socket—6-contact Radiotron socket—Second detector	.40
6727	Transformer—Intermediate frequency transformer (L7, L8, C10, C11)	1.68
4702	Volume control (R12, S1)	1.30
	REPRODUCER ASSEMBLIES	
7845	Coil—Field coil magnet and cone support (L11)	2.50
9492	Cone—Reproducer cone (L10)—Package of 5	3.70
7847	Reproducer complete	6.30
7846	Transformer—Output transformer (T1)	1.65

Radio-Receptor para C. A. o C. C. de 220 Voltios

Superheterodino de Cinco Tubos, Modelo de Mesa

—INSTRUCCIONES—

INSTALACIÓN

Sitio para el Aparato—Este receptor debe colocarse sobre una superficie plana, como por ejemplo una mesa o un tablero, y cerca de las entradas de la antena y tierra, así como próximo a un toma-corriente. Cualquiera que sea la instalación que se haga, debe tenerse mucho cuidado de no impedir la ventilación natural del mueble, como ocurriría si se colocara su parte posterior muy junto a una pared o contra cualquier otra superficie vertical plana. Para evitar daño al acabado del mueble y posiblemente al circuito que contiene, no debe colocarse este radio sobre un aparato de calefacción ni demasiado cerca de cualquier artículo que produzca calor.

Antena y Tierra—Se recomienda una antena exterior de 7.5 a 22.5 metros de longitud, incluyendo el hilo de entrada y el hilo a tierra. Sin embargo, en muchos casos una antena interior de longitud corta o mediana dará resultados satisfactorios en edificios que no sean de construcción metálica. La antena debe aislarse perfectamente de todo objeto y no debe instalarse ni cerca ni paralelamente a circuitos eléctricos dentro o fuera del edificio.

Sólo haciéndose una *buena* conexión a tierra podrá conseguirse un funcionamiento superior. La conexión a tierra debe ser lo más corta y directa posible y con preferencia debe hacerse a la tubería de agua fría. La superficie de la tubería debe limarse para que quede absolutamente limpia, y recomendamos el uso de una pinza especial para que la conexión resulte apretada y permanente.

Se han provisto dos hilos flexibles en la parte de atrás del receptor para las conexiones a la antena y a tierra. Conéctese el hilo *negro* al hilo de entrada de la antena y el *amarillo* al hilo a tierra. Ambas conexiones deben soldarse y cubrirse con tira de aislar.

Suministro de Energía—Conéctese el cordón de la energía a un toma-corriente que indique un voltaje (sea C.A. o C.C.) que esté dentro de los límites especificados en la etiqueta de licencia, pegada en el panel de atrás del instrumento. Este instrumento no debe hacerse funcionar nunca con una corriente cuyo voltaje exceda del límite máximo (230 voltios). En caso de duda sobre el voltaje exacto de la corriente, consulte este particular con la Compañía de Electricidad de la localidad.

Radiotrons—Este instrumento se ha equipado y probado en la fábrica con Radiotrons RCA y se despacha con los tubos en sus respectivos enchufes. Por lo tanto, este receptor estará listo para funcionar cuando se haya desempacado cuidadosamente y las conexiones externas se hayan hecho conformes a las instrucciones que anteceden.

Si, al instalarse, el receptor no funciona bien o deja de funcionar, uno o más tubos, corazas o contactos de tope se habrán aflojado durante el transporte. Sáquese el panel de atrás del mueble (sostenido en su posición por medio de tornillos en los bordes), luego consúltese el diagrama de la distribución de tubos que aparece en la etiqueta de graduación y *cerciórese* de lo siguiente:

(a) Que cada tubo esté en el enchufe que le corresponde y que todos hayan sido introducidos firmemente hasta el fondo. Nunca aplique la corriente al aparato hasta que todos los tubos estén en sus lugares respectivos.

(b) Que todas las corazas o pantallas metálicas tubulares estén firmemente colocadas encima de los tubos que protegen (estos tubos están indicados por un círculo doble en el diagrama).

(c) Que los conectadores de resorte de los hilos cortos y flexibles (rejilla), que se muestran en el diagrama, estén firmemente unidos a los contactos o terminales de tope de los Radiotrons respectivos, y que los mismos no estén torcidos de tal modo que haya un contacto con cualquiera de la corazas tubulares.

> NOTA—El hilo de rejilla para el Radiotron RCA-6A7 debe quedar suspendido sobre el soporte ranurado, según se ilustra, a fin de obtener un funcionamiento satisfactorio.

FUNCIONAMIENTO

Controles—Este instrumento tiene dos controles para su funcionamiento, los cuales se hallarán en el panel de enfrente del mueble, y son como sigue:

(1) *Control de Volumen—Combinado con el Interruptor de la Energía* (Perilla de la Izquierda)—Girada hasta el fin hacia la izquierda, esta perilla desconectará toda la energía. Haciéndola girar levemente hacia la derecha, se aplicará energía, según lo indicará la iluminación del cuadrante. Haciéndola girar más se aumentará gradualmente el volumen.

(2) *Selector de Estaciones* (Perilla de la Derecha)—Este control está provisto de un cuadrante debida mente calibrado, el cual facilita la sintonización e identificación de las estaciones (agréguese un cero a los numerales de la escala para obtener la frecuencia en kilociclos).

Modo de Proceder—Para hacer funcionar este receptor, hágase lo siguiente:

1. Aplíquese la corriente y hágase girar hacia la derecha la perilla del Control de Volumen para conseguir un volumen máximo. Redúzcase esta graduación si la reproducción es demasiado potente (déjense pasar unos segundos para el calentamiento de los tubos).

2. Hágase girar el Selector de Estaciones, poco a poco en todo el recorrido del cuadrante, hasta que se oiga el programa de la estación que se desee.

> **MUY IMPORTANTE—Si no se oye nada que venga del altoparlante (sea señal de radio o interferencia de la estática) al hacer funcionar el aparato con Corriente Continua, cámbiese en sentido contrario la posición del tapón conector en el toma-corriente.**

3. Para obtener una reproducción perfecta, redúzcase la graduación del Control de Volumen y ajústese con todo cuidado el Selector de Estaciones para el volumen máximo. Úsese siempre el Control de Volumen—nunca el Selector de Estaciones—para regular el volumen.

4. Cuando se desee que el instrumento cese de funcionar, córtese la corriente, haciendo girar la perilla del Control de Volumen hacia su posición máxima de la izquierda.

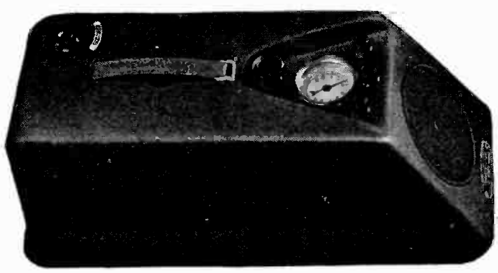
Printed in U. S. A.

RCA Victor M-116

"Portette" Superheterodyne Receiver

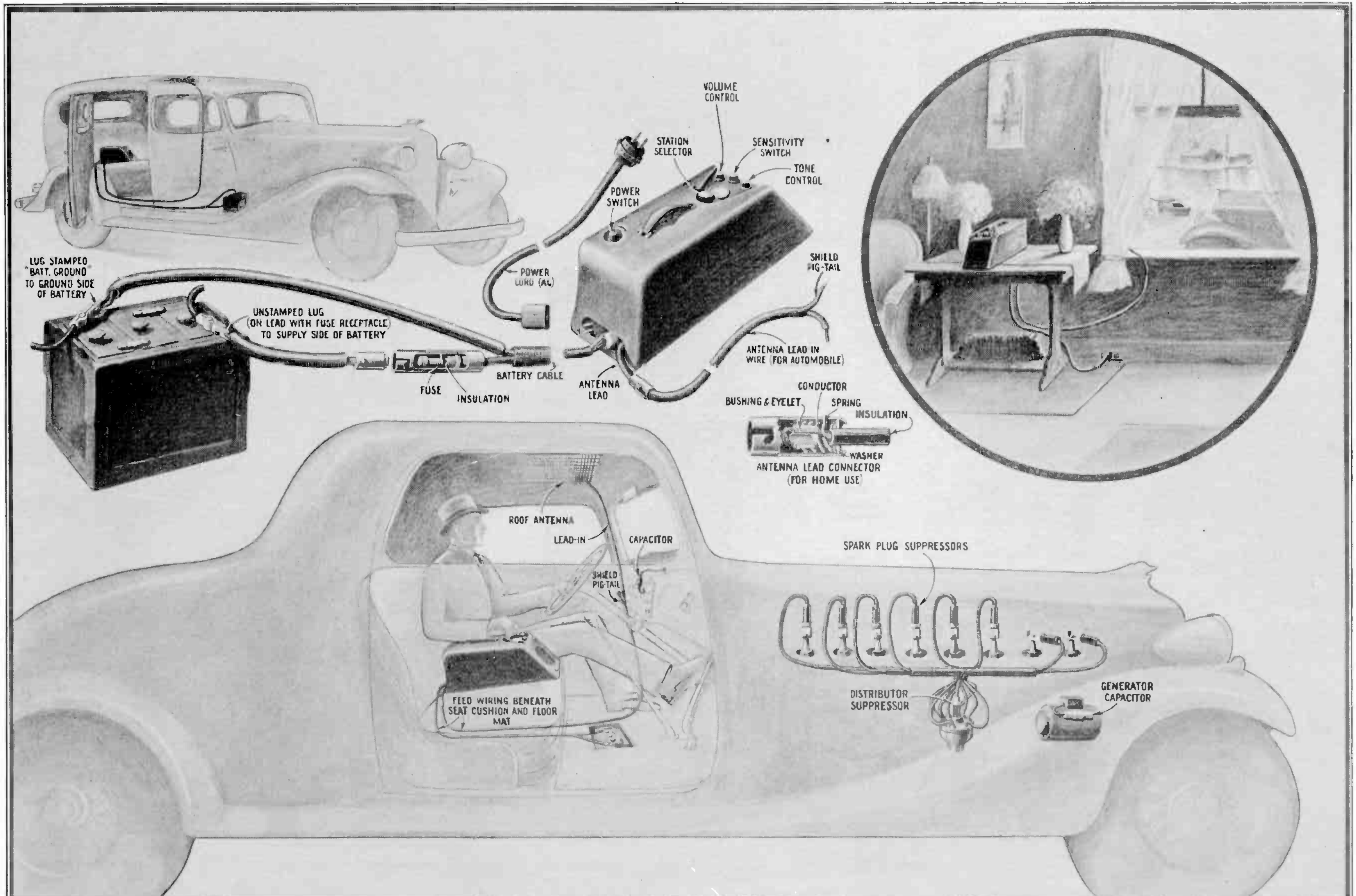
For Auto and Home

INSTRUCTIONS



RCA Victor Company, Inc.

CAMDEN, N. J., U. S. A.



VOLUME CONTROL
STATION SELECTOR
SENSITIVITY SWITCH
TONE CONTROL
POWER SWITCH
POWER CORD (AC)
SHIELD PIG-TAIL
LUG STAMPED "BATT. GROUND" TO GROUND SIDE OF BATTERY
UNSTAMPED LUG (ON LEAD WITH FUSE RECEPTACLE) TO SUPPLY SIDE OF BATTERY
BATTERY CABLE
FUSE
INSULATION
ANTENNA LEAD
ANTENNA LEAD IN WIRE (FOR AUTOMOBILE)
CONDUCTOR
BUSHING & EYELET
SPRING
INSULATION
WASHER
ANTENNA LEAD CONNECTOR (FOR HOME USE)
ROOF ANTENNA
LEAD-IN
CAPACITOR
SHIELD PIG-TAIL
SPARK PLUG SUPPRESSORS
FEED WIRING BENEATH SEAT CUSHION AND FLOOR MAT
DISTRIBUTOR SUPPRESSOR
GENERATOR CAPACITOR

Figure 1

Instructions for

RCA Victor M-116

Portable "Arm Rest" Automobile-and-Home Receiver

INTRODUCTION

This radio receiver was conceived by the motoring public. It has been designed to meet the growing demand for a portable set equally useful in the automobile or home; that is, operable from either the car battery or the alternating-current house-lighting circuit. Because of its versatility as to power requirements, this instrument will find especial favor among tourists and commercial travelers; it also should appeal strongly, however, to a large number of persons living more or less permanently in hotels or furnished apartments.

In achieving such utility, no sacrifice of performance in either mode of operation has been introduced. Excellent sensitivity and selectivity, realistic reproduction, abundant reserve power for use in congested traffic districts and automatic volume control are features worthy of mention. Transfer of installation, whether to the car or home, is extremely simple, electrical connections only to the power source and antenna being required. In automobile service, the current drawn from the storage battery approximates that used by a single headlight bulb.

The distinctive metallic carrying-case contains a compactly-built chassis upon which are assembled a five-tube superheterodyne receiver, an electrodynamic loudspeaker and independent "B" battery eliminators for either type of power supply. The instrument is completely shielded and equipped to prevent objectionable interference from the automobile ignition system. All controls are located on the top of the case, permitting easy adjustment when the set is placed as intended upon an automobile seat beside the driver or any passenger.

GENERAL INFORMATION

Equipment

A. Equipment Furnished:

1. *Receiver Package*—Contains:
   - (a) **The Receiver**—Equipped and tested at the factory with RCA Radiotrons—Shipped with all tubes installed in their proper sockets—Includes one dial lamp (6–8 volts) and one each of the following Radiotrons: RCA-78, RCA-6A7, RCA-6B7, RCA-41 and RCA-1-V.
   - (b) **Ignition Interference Suppression Equipment**—As follows:
     - 8 Spark-plug type suppressors (extra units, when required, to be obtained from dealer).
     - 1 Distributor type suppressor.
     - 2 Capacitors.
   - (c) **Power Cord**—For house-lighting circuit.
   - (d) **Shielded Lead-in Wire**—For automobile antenna.
   - (e) **Connector**—For home antenna lead-in wire.
   - (f) **Instruction Booklet.**
2. *Battery Cable Package*—Contains:
   - (a) The cable for automobile battery supply. Length proper for use in coupes and roadsters and in the front compartment of sedans, coaches and touring cars. Equipped with fuse receptacle containing one 20 ampere fuse.

     NOTE—This cable is supplied in two forms, identical except for connections, to accommodate either polarity of storage battery supply: that is, either positive (+) or negative (—) grounded batteries. It is the dealer's responsibility to select the correct cable for your car. An additional cable of suitable length to permit operation of the receiver on the rear seat is procurable from the dealer.

B. Additional Equipment Required:

1. *Automobile Antenna*—One of the following types (listed in the order of preference):
   - (a) **Roof (Concealed) Type.**
   - (b) **Roof (Interior) Type**—For attachment to head-lining of enclosed models or insertion beneath top fabric of open and convertible models. A special antenna of this type complete with pin-hooks and lead-in wire may be purchased from your dealer.
   - (c) **Plate (Sub-mounted) Type**—For attachment to channel members of car chassis. An efficient plate antenna completely equipped for mounting and a specially-designed shielded lead-in wire are also obtainable from the dealer.

Antenna

General Considerations—Although this receiver has excellent sensitivity, best results naturally will be obtained with a good antenna. For any temporary installation, such as when stopping overnight at a hotel, satisfactory reception should be obtained with a short length of insulated wire strung around the room or dangling from a window. However, in any permanent or semi-permanent location, such as the automobile or home, the antenna installation should merit careful consideration.

For Automobile Service—As listed in the preceding section under "Additional Equipment Required," three types of antenna are available for automobile use:

Roof (Concealed) Type—Enclosed models of practically all modern (1932-33-34) automobiles are equipped at the factory with a radio antenna concealed in the roof. Certain convertible and open type cars also contain a suitable antenna in the form of flexible wire strands woven into the folding top fabric; the latter practice, however, is recent and, except for cars in the higher price class, has not been generally adopted. A "concealed" roof antenna naturally is the neatest and most satisfactory arrangement and, therefore, is recommended for use in all automobiles with enclosed bodies. Owners of cars not already equipped with an antenna of this type may have one installed, if desired, by the dealer from whom this radio receiver was purchased. Such work ordinarily involves a nominal additional charge since the services of an experienced automobile upholsterer are required.

Roof (Interior) Type—This antenna is extremely simple to install and often provides a very satisfactory substitute for the preferred concealed unit. It is designed for attachment to the head-lining of a closed car or for insertion beneath the top fabric of open or convertible models and thus renders unnecessary any upholstery work. The effective antenna wire is covered by durable paper obtainable in either gray or tan finish as desired to harmonize with the car interior. For an enclosed car having a wire support screen in the roof grounded to (in contact with) the metallic frame, this type of antenna will not be suitable, as the screen will divert incoming radio waves and seriously impair reception. Before purchase, therefore, consult the dealer who sold this instrument if you are in doubt as to whether such a condition exists in your car.

Plate Type—Although not as efficient as either roof-mounted unit, the sub-mounted plate type antenna affords a concealed installation and may be used in any automobile irrespective of its body style or roof construction, being designed for attachment to the chassis frame beneath the car body. It is adjustable as to length and ground clearance, thus facilitating installation and insuring optimum results. This type of antenna may be depended upon to provide good reception from local or moderately distant powerful stations.

For Home Service—A single-wire outdoor antenna of maximum convenient height and having a length of from 25 to 75 feet including the lead-in is recommended for home service. Because of its high sensitivity, however, this receiver should operate satisfactorily from an indoor antenna of short or medium length if the building in which it is installed is of non-metallic construction. The antenna should be well insulated from all objects and should run neither close nor parallel to electric circuits inside or outside the building. It will be desirable to have a permanent antenna erected at each point where the instrument is to be used more or less regularly.

In some cases, better reception will be obtained by making a ground connection to the shield of the short antenna lead extending from the receiver. The ground lead should be as short as possible and attached preferably to a cold water pipe; if a piped water supply is not available, an excellent alternative ground can be procured by attachment to a metallic stake driven from four to six feet into moist earth. The surface of the pipe or stake should be scraped clean and an approved ground clamp used to insure a tight and permanent connection.

Power Supply

Two distinct and independent circuits, for excitation of the Radiotrons from either an automobile storage battery or an alternating-current power line, are contained in this receiver. The battery circuit embodies a synchronous vibrator mechanism of the full-wave type, whereas the a-c operated circuit is actuated by means of a tube rectifier. These functions are interchangeable by simply turning a switch accessible from the outside of the case (see frontispiece for location of all controls) and by substituting power cords. Since the cords are of entirely different construction and can be attached to the receiver only in the correct manner, no confusion will be experienced.

The battery cable is equipped with metallic lugs for attachment to the battery terminal clamps and when installed may be left in the car at all times. The a-c power cord is terminated by a standard attachment plug for an electrical outlet and may be either carried in the car for ready use or left in the home as deemed most convenient.

INSTALLATION

Automobile Installation

A typical installation of this receiver in an automobile is shown in the frontispiece illustration and is accomplished in the following manner: Lift the seat upon which the instrument will rest, lay the battery cable and antenna shielded lead-in wire in position and then replace the seat. In cases where the automobile battery is mounted beneath that seat, however, it will be necessary to connect the battery cable to the battery (as described in the subsequent paragraph entitled "Connection to Battery") before replacing the seat. Finally, mount the receiver on the seat, attach the connector of the lead-in wire to the short (antenna) lead extending from the rear of the instrument and, with the power switch "off" (in AC position), insert the battery cable plug in the receptacle located adjacent to the antenna lead entrance.

Connection to Antenna—Feed the antenna lead-in wire beneath floor mat to the side of car nearest the wire extending from the antenna. The wire from a factory-installed roof antenna ordinarily is brought down one of the front pillar posts and left in a coil behind the instrument panel. In such cases, therefore, the lead-in wire after leaving the floor mat should be concealed behind the kick-board, then soldered to the wire extending from the antenna at the lower end of the body pillar post, after cutting the necessary length from each wire to eliminate excessive slack. Insulate the joint with tape and then solder or bond the pig-tail extension from the lead-in shield braid to the car frame.

A similar procedure is followed when either alternative form of antenna ("interior" roof or plate type) is employed except that the lead-in wire probably will follow a different route in each case. Such antennas should be mounted as far to the rear of the car as possible to insure minimum ignition interference. The lead-in wire for the interior type unit thus may be carried down the rear quarter of top and then behind the back cushion of seat in open and convertible models or may be anchored to any convenient pillar post in closed models. With the plate antenna, the lead-in wire should be fed through any opening in the floor board.

Connection to Battery—Since, in most cars, the storage battery is located below the floor boards of the driving compartment, the battery cable has been made sufficiently long to reach the battery after passing beneath the driver's seat (see note concerning longer cable available for rear seat operation—Equipment, "Battery Cable Package"). Run the cable under the floor mat and through the floor opening provided above the battery and connect the cable lugs to the battery terminal clamps as illustrated. The lug stamped "BATT. GROUND" must be connected to that side of the battery grounded to the car frame and the remaining lug (on lead with fuse receptacle) attached to the supply side of the battery. Finally, replace the floor cover, notching the side of the opening if necessary to provide clearance for the battery cable.

Suppression of Ignition Interference—

1. Disconnect all wires from the spark plugs. Fasten one spark-plug suppressor to the top of each plug and re-attach the wires to the free ends of the suppressors. These suppressors may be mounted either in line with or at right angles to the plugs in order to avoid interference with metallic parts grounded to the engine or frame.

2. If the distributor is of the plug-in type, disconnect the center wire from the head. Plug the distributor suppressor into the distributor head and insert the wire in the free end of the suppressor.

   NOTE—For cap-type distributors, exchange the distributor suppressor at your dealer's for one of a special type. Cut the wire leading from the distributor to the coil and screw the suppressor into the end attached to the distributor. Screw the other end of the wire (leading to the coil) into the opposite end of the suppressor.

3. Clamp the generator capacitor against the generator frame. The screw holding the cut-out ordinarily may be utilized for securing this unit. Connect the capacitor lead to the terminal on the generator side of the cut-out switch. (In some cases, however, less interference will be encountered with this lead connected to the opposite side of the cutout; the most suitable position therefore should be determined by trial.)

4. The ignition capacitor (unit with two leads) must be connected between the battery terminal of the ammeter and any convenient screw on the instrument panel. In certain cars, interference will be reduced still further by connecting an additional capacitor (obtainable from your dealer) between the battery side of the ignition coil and the car frame.

Home Installation

The circular insert on the frontispiece illustrates a typical installation of this receiver on lighting-circuit operation. Simply place the instrument upon a table or other level surface, attach the antenna lead-in wire (using the small connector furnished) and, with the power switch "off" (in "AUTO" position), connect the power cord to an electrical outlet supplying *alternating current* at the voltage and frequency (cycles) specified on the rating label inside the case.

OPERATION

The instrument should be operated as follows:

1. Turn the Power Switch to the "AUTO" position for automobile service or to the "AC" position for home service. At this point, normal functioning will be evidenced by illumination of the tuning dial, although it will be necessary to wait a few seconds for the Radiotrons to attain their proper operating temperature before reception is possible.

2. With the Volume Control turned fully clockwise, rotate the Station Selector in either direction until a desirable station program is heard.

NOTE—The dial scale is calibrated in channels to aid in station identification. Add one cipher to the scale numerals to obtain frequency in kilocycles.

3. After receiving a signal, turn the Volume Control counter-clockwise until the volume is reduced to a low level. Now, readjust the Station Selector to the position midway between the points where the signal becomes distorted or disappears. *This operation insures the best quality of reproduction.*

4. Finally, advance the Volume Control (clockwise) until the desired level is obtained. Except on weak signals, the automatic volume control will maintain the volume substantially at the latter level, thereby precluding further manual adjustments. (Fading of the signal may be experienced in extreme cases, as when passing under bridges or other metallic structures, since such structures almost completely shield the antenna.)

5. Adjust the Tone Control for the preferred tonal shading. *Full-range* reproduction will be obtained when the control knob is turned fully *clockwise.* Treble response may be reduced as desired and static interference (when present) may be decreased by turning the knob counter-clockwise.

6. The Sensitivity Switch ordinarily should be left in the *counter-clockwise* position which provides maximum distance reception. At times when static interference is objectionable or when local reception is preferred, this switch should be set clockwise for most satisfactory results.

7. When through operating, turn the Power Switch to the opposite position; that is, to the "AC" position to discontinue automobile service and to the "AUTO" position to discontinue home service.

MAINTENANCE

Initial Installation—If the receiver either performs imperfectly or fails to operate when first connected to the power supply (preferably the home-lighting circuit for an initial test) it is probable that one or more of the tubes or dome-terminal (grid) clips have been jarred loose in shipment. With the five control knobs detached, remove the four screws at the outside edges of the bottom panel and lift off the case. Then examine the tube installation, referring to the diagram printed on the rating label, and make certain that all Radiotrons are properly inserted and that the spring clips on the short flexible (grid) leads are pressed down firmly over the respective dome terminals.

Radiotrons—The Radiotrons should be tested periodically and replaced if necessary in order to maintain best performance. The efficiency of each Radiotron may be checked by comparison with a new one of the same type in its place. Spare Radiotrons of each type should be kept on hand.

Fuse—For automobile service, the instrument is protected by a fuse contained in the fuse receptacle attached to the battery cable. If the set fails to operate and the dial lamp does not light, this fuse should be removed for examination. If found to be burned out, the wiring should be inspected for short-circuits or grounds and all tubes tested prior to insertion of a new fuse. *The replacement fuse must be of the same ampere rating.*

Vibrator "B" Battery Eliminator—When operating from the automobile storage battery, a slight buzz should be noticed to emanate from the receiver. This buzz should be taken as indicative of proper operation of the vibrator. Failure to observe this buzz, accompanied by repeated necessary replacement of the fuse, will denote a faulty condition, and, in such cases, the complete receiver should be taken to the dealer for inspection. *Do not attempt to adjust the vibrator yourself.*

Automobile Antenna—A properly installed roof antenna of the concealed or interior type should require no attention. When the plate antenna is employed, the insulator bushings should be cleaned occasionally to prevent grounding.

Automobile Ignition System—The ignition system of the car must be kept in good condition. Fouled plugs or plugs with improperly adjusted gaps will affect the operation of the receiver as well as of the automobile. Burned or improperly adjusted breaker points will also impair the performance. It will be advisable to advance the generator charging rate in order to compensate for the additional drain on the car storage battery imposed by this instrument.

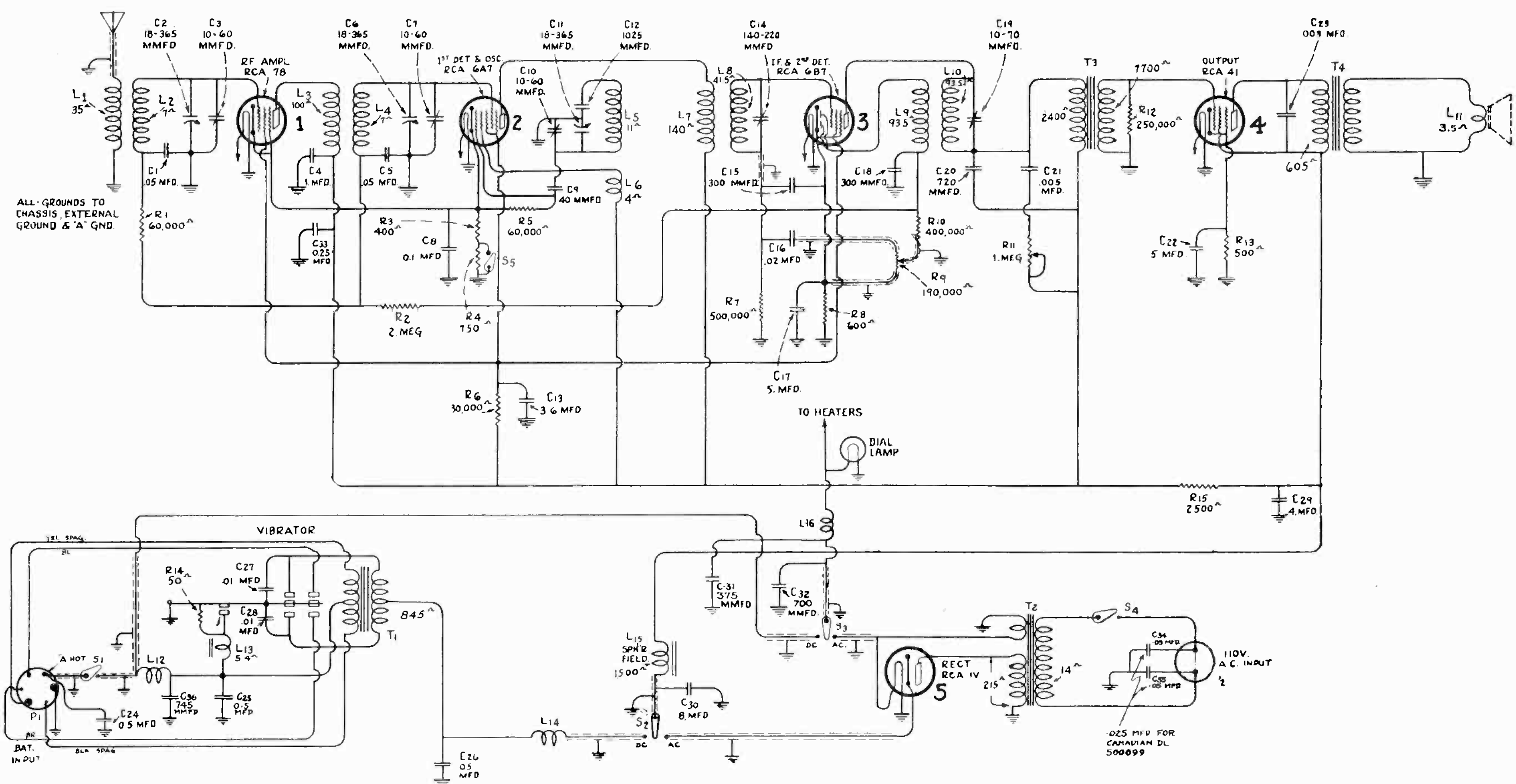


Figure A—Schematic Circuit Diagram

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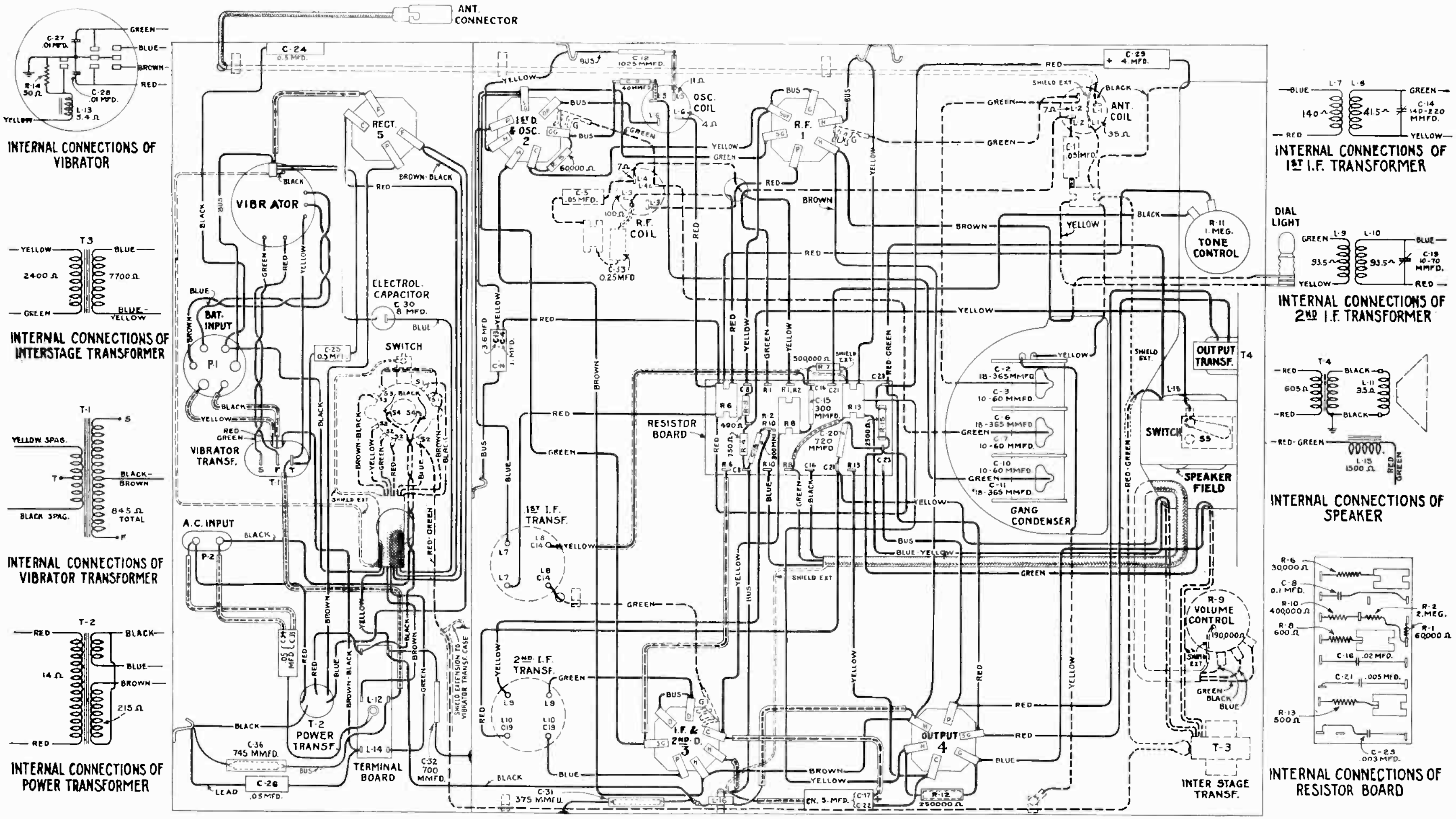


Figure B—Wiring Diagram

SERVICE DATA

Power Requirements ....105–125 volt, 50–60 Cycle A. C. or 6-volt Storage Battery
Power Consumption . . 115 Volts, 60 Cycles A. C.—40 Watts, Battery—5.7 Amperes at 6.3 Volts
Number and Types of Radiotrons..............1 RCA-78, 1 RCA-6A7, 1 RCA-6B7, 1 RCA-41, 1 RCA-1-V—Total 5
Maximum Undistorted Power Output............1.8 Watts
Maximum Output..............................3.6 Watts
Type of Rectifier..............A. C.—Radiotron RCA-1-V Battery—Vibrator Inverter-Rectifier
Tuning Frequency Range............540 K. C.–1500 K. C.

This automobile receiver is of unique design and construction. Among its many features is its adaptability to either battery or 110-volt alternating current operation. This is accomplished by having a separate power transformer and a

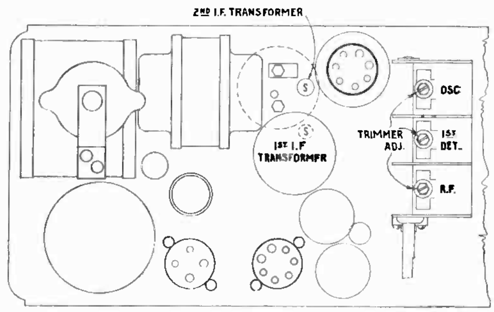


Figure C—Location of Line-up Capacitors

tube rectifier for alternating current, while the conventional vibrator inverter-rectifier with its associated transformer is used for battery operation.

Other important features include its compact portable size, full vision "airplane" type dial, tone control, sensitivity switch, electro-dynamic loudspeaker and the inherent sensitivity, selectivity and tone quality characteristic of the superheterodyne.

Figure A shows the schematic diagram, Figure B the wiring diagram, Figure C the location of the line-up capacitors and Figure D the wiring of the battery cable. A brief description of the circuit follows:

Radio Circuit—The radio circuit consists of four Radiotrons; namely, an RCA-78 R. F. stage, an RCA-6A7 first detector-oscillator, an RCA-6B7 intermediate frequency amplifier, second detector and A. V. C. and an RCA-41 output amplifier.

Power Circuit—The power circuit for battery operation consists of a vibrator inverter-rectifier with its associated transformer and filter circuits. The heaters of the various Radiotrons are powered direct from the car storage battery. The operating switch is so arranged that at one position battery operation is obtained, while at the other position, proper connections are made for A. C. operation.

When the switch is at the A. C. position, the A. C. input current is connected to the primary of the A. C. transformer. Two secondaries are provided, one for furnishing power to the Radiotron heaters and the dial lamp, the other for plate supply to Rectifier RCA-1-V. The output of the rectifier is then filtered by the same filtering system as that used for battery operation. The loudspeaker field is used as a filter reactor.

Inverter-Rectifier Adjustments

This receiver uses a vibrator inverter-rectifier for supplying all plate and grid voltages when operated from a battery source. *This unit is accurately adjusted and sealed at the factory and service adjustment should not be attempted.*

Line-up Capacitor Adjustments

The three R. F. line-up capacitors and two I. F. tuning capacitors are accessible and may require adjustments. The R. F. adjustments are made at 1400 K. C. and the I. F. adjustments at 175 K. C. In order to make these adjustments, it is first necessary to remove the cover of the instrument. The following procedure should be used:

R. F. Adjustment:

(a) Check the position of the dial pointer. It should be aligned with the low-frequency end graduation, as indicated by the small arrow marked "Max. Cap." when the tuning capacitor rotor is fully meshed with the stator.

(b) Procure a modulated oscillator giving a signal at 1400 K. C. (Stock No. 9050), a non-metallic screw driver (Stock No. 7065) and an output meter. Connect the output meter across the cone coil of the loudspeaker.

(c) Couple the output of the oscillator from antenna to ground, set the dial at 140 ,and the oscillator at 1400 K. C.

(d) Place the oscillator and receiver in operation and adjust the oscillator output so that a small deflection is obtained in the output meter when the volume control is at its maximum position.

(e) Then adjust the three line-up capacitors until a maximum deflection in the output meter is obtained. Readjust these capacitors a second time, as there is a slight interlocking of adjustments.

I. F. Adjustments:

(a) Procure a modulated oscillator giving a signal at 175 K. C. (Stock No. 9050), a non-metallic screw driver (Stock No. 7065) and an output meter.

(b) Connect the oscillator between the control grid of the first detector and ground.

(c) Connect the output meter across the voice coil of the loudspeaker. Then connect the antenna lead to ground and adjust the tuning capacitor so that no signal except the I. F. oscillator is heard at maximum volume. With the volume control at maximum, reduce the external oscillator output until a small deflection is obtained. Unless this is done, the action of the A. V. C. will make it impossible to obtain correct adjustments.

(d) Each transformer has but one winding that is tuned by means of an adjustable capacitor, the other windings being untuned. The capacitors should be adjusted for maximum output. At the time I. F. adjustments are made it is good practice to follow this adjustment with the R. F. adjustments, due to the interlocking that always occurs. The reverse of this, however, is not always true.

RADIOTRON SOCKET VOLTAGES

115 Volts A. C. or 6.3 Volt Battery—No Signal—Max. Sensitivity

Radiotron No.		Cathode to Ground	Cathode to Screen Grid Volts	Cathode to Plate Volts	Cathode Current M. A.	Heater Volts
RCA-78 R. F.		4.2	86	216	5.5	5.9
RCA-6A7	First Detector	4.2	86	216	10.0 Total	5.9
	Oscillator		—	216		
RCA-6B7 Second Det.		2.7	87	207	4.5	5.9
RCA-41 Power		15.0	255	235	30.0	5.9
RCA-1-V		—	—	325 RMS	50.0	5.9

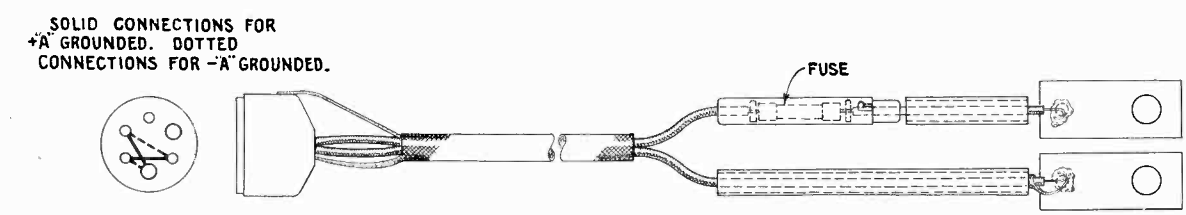


Figure D—Internal Connections of Cable

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

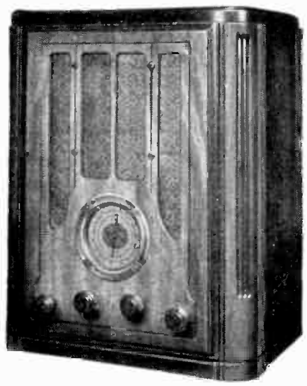
Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
2240	Resistor—30,000 ohms—Carbon type—¼ watt (R6)	$0.22
2734	Capacitor—745 mfd. (C-36)—Package of 5	1.50
2747	Cap—Contact cap—Package of 5	.50
2917	Washer—"C" washer for condenser drum and shaft assembly—Package of 10	.25
3218	Resistor—600 ohms—Carbon type—¼ watt (R8)—Package of 5	1.00
3469	Resistor—2,500 ohms—Carbon type—1 watt (R15)—Package of 5	1.10
6844	Capacitor—Comprising two 5.0 mfd. (C17, C22)	1.10
3572	Socket—7-contact Radiotron socket	.38
3584	Ring—Antenna, R. F. or oscillator coil retaining ring—Package of 5	.40
3597	Capacitor—0.25 mfd. (C33)	.40
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R1, R5)—Package of 5	1.00
3619	Resistor—400,000 ohms—Carbon type—¼ watt (R10)—Package of 5	1.00
3621	Coil—Choke coil—Located on terminal board (L14)	.35
3623	Shield—Antenna, R. F. or oscillator coil shield	.30
3632	Resistor—500 ohms—Carbon type (R13)—Package of 5	1.10
3639	Capacitor—0.02 mfd. (C16)	.25
3696	Capacitor—40 mmfd. (C9)	.22
3699	Capacitor—720 mmfd. (C20)	.40
3744	Resistor—250,000 ohms—Carbon type—¼ watt (R12)—Package of 5	1.00
3751	Capacitor—0.5 mfd. (C25)	.40
3877	Capacitor—0.1 mfd. (C8)	.32
3888	Capacitor—0.05 mfd. (C1, C5)	.25
3920	Capacitor—0.003 mfd. (C23)	.25
3937	Capacitor—300 mmfd. (C15, C18)	.34
3950	Shield—Radiotron shield	.26
3954	Screw—Chassis mounting screw and washer assembly—Package of 10	.32
3955	Coil—Choke coil—Located on terminal board (L12)	.68
3956	Clamp—Capacitor mounting clamp—Package of 5	.32
3957	Indicator—Station selector indicator pointer—Package of 5	.42
3958	Plug—2-contact "AC" connection plug	.50
3959	Plug—6-contact "DC" connection plug	.40
3968	Spring—Tuning condenser drive cord tension spring—Package of 10	.30
3969	Cord—Tuning condenser drive cord—Package of 10	1.22
3970	Drum and shaft assembly—Small—For tuning condenser drive	.24
3971	Escutcheon—Switch escutcheon engraved "AC-DC"	.24
3972	Drum and bushing assembly—Large—For tuning condenser drive	.34
3993	Screw—Set screw for tuning condenser drive drum—Package of 10	.25
4001	Capacitor—1,02 5mmfd. (C12)	.32
4002	Capacitor—375 mmfd. (C31)	.30
4003	Capacitor—700 mmfd. (C32)	.30
4020	Resistor—750 ohms—Carbon type—¼ watt (R4)—Package of 5	1.00
4089	Capacitor—Two 0.05 mfd. (C34, C35)	.40
4508	Connector—Flat type, female section—Used with plug No. 3958	.30
6135	Resistor—270 ohms—Carbon type—¼ watt (R3)—Package of 5	1.00
6165	Lamp—Station selector dial lamp—Package of 5	1.75
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R7)—Package of 5	1.00
6242	Resistor—2 megohms—Carbon type—¼ watt (R2)—Package of 5	1.00
6282	Resistor—60,000 ohms—Carbon type—½ watt (R5)—Package of 5	1.00
6300	Socket—4-contact Radiotron socket	.35
6512	Capacitor—0.005 mfd. (C21)	.28
6738	Capacitor—8.0 mfd. (C30)	1.54
6739	Condenser—3-gang variable tuning condenser assembly (C2, C3. C6, C7, C10, C11)	5.16
6740	Transformer—First intermediate frequency transformer (L7, L8, C14)	2.16
6741	Transformer—Second intermediate frequency transformer (L9, L10, C19)	1.78
6742	Coil—Antenna coil assembly (L1, L2)	.88
6743	Coil—R. F. coil assembly (L3, L4)	.98
6744	Capacitor—0.05 mfd. (C26)	.30
6745	Coil—Oscillator coil assembly (L5, L6)	.62
6746	Volume control (R9)	1.20
6747	Tone control (R11)	1.20
6748	Switch—Noise suppressor switch (S5)	.40
6749	Switch—AC-DC switch (S1, S2, S3, S4)	2.14
6759	Transformer—Interstage transformer (T3)	2.55
6781	Capacitor—Comprising one 3.6 mfd. and one 1.0 mfd. (C4, C13)	1.10
6782	Capacitor—4.0 mfd. (C29)	1.10
7485	Socket—6-contact Radiotron socket	.40
9456	Transformer—Power transformer—105-125 volts, 50-60 cycles (T2)	$4.00
9457	Transformer—Power transformer—9 volts (T1)	4.78
	CABLE ASSEMBLIES	
3466	Connector—Antenna lead-in connector	.16
3646	Fuse—20 amperes—Package of 5	.40
4008	Shield—Metal shield for cable plug—Package of 5	.58
4009	Terminal—Metal terminal (plain) for battery connection—Package of 5	.44
4010	Terminal—Metal terminal engraved "Batt-Ground"—For battery connection—Package of 5	.44
6150	Plug—Battery cable plug	.50
6516	Connector—Fuse connector	.16
6760	Cable—7-conductor shielded—Switch cable	.40
6761	Cable—2-conductor shielded—Approximately 10½ inches long, from resistor board to volume control	.26
6762	Lead—Antenna lead-in—Approximately 15¾ inches long—With connector	.44
6773	Cable—Battery cable—Plus A grounded—Overall length approximately 61 inches—Complete with plug, fuse, fuse connector and terminal	2.36
6774	Cable—Battery cable—Minus A grounded—Overall length approximately 61 inches—Complete with plug, fuse, fuse connector and terminal	2.36
6775	Cable—Battery cable—Plus A grounded—Overall length approximately 105 inches—Complete with plug, fuse, fuse connector and terminal	3.30
6776	Cable—Battery cable—Minus A grounded—Overall length approximately 105 inches—Complete with plug, fuse, fuse connector and terminal	3.30
6777	Cable—Antenna lead-in cable—Shielded—Approximately 98 inches long—With connector	1.26
6779	Cable—2-conductor shielded cable—Approximately 58 inches long—Battery cable, less fuse plug and connectors	1.10
6780	Cable—2-conductor shielded cable—Approximately 102 inches long—Battery cable, less fuse plug and connectors	2.04
6834	Cable—Battery cable—Minus "A" grounded—Overall length approximately 185 inches—Complete with plug, fuse, fuse connector and terminal	3.92
6835	Cable—Battery cable—Plus "A" grounded—Overall length approximately 185 inches—Complete with plug, fuse, fuse connector and terminal	3.92
7008	Lacquer—Touch up lacquer (1 pint of lacquer and 1 pint of thinner)	2.25
	MISCELLANEOUS PARTS	
3960	Handle—Carrying handle	.44
3961	Knob—Tone control, volume control or suppressor switch knob—Package of 5	.60
3962	Knob—Station selector knob—Package of 5	1.00
3963	Knob—"AC-DC" switch knob—Package of 5	.60
3964	Bezel—Metal bezel for station selector dial glass	.54
3965	Glass—Station selector dial glass	.22
3966	Spring—Contact spring—Grounds vibrator shield to case—Package of 10	.92
4011	Capacitor—0.5 mfd. (C24)	.60
4017	Scale—Station selector dial scale—Package of 5	1.38
6151	Suppressor—Spark plug suppressor	.56
6152	Suppressor—Distributor suppressor	.56
6175	Suppressor—Distributor suppressor—Splice in type	.56
6494	Capacitor—0.5 mfd.—Ammeter capacitor	.46
6495	Capacitor—0.5 mfd.—Generator capacitor	.72
6670	Suppressor—Spark plug suppressor—"Elbow" type	.56
6763	Cord—Power cord with connectors	.94
7694	Vibrator—Complete (C27, C28, L13, R14)	7.20
7696	Housing—Metal housing—Top section	5.44
7697	Base—Housing base	.90
9050	Oscillator—Test oscillator—150 to 25,000 K. C.	29.50†
	REPRODUCER ASSEMBLIES	
6750	Screen—Dust screen	.28
6751	Screen—Metal screen	.46
6764	Transformer—Output transformer (T4)	1.42
6772	Ring—Felt ring—Used between speaker and metal housing—Package of 5	1.20
8987	Cone—Reproducer cone (L11)—Package of 5	5.00
9458	Reproducer complete	5.20
9459	Coil—Comprising field coil, magnet and cone support (L15)	3.34

.0736 † Full Discount not allowed.

RCA Victor
Models 118 and 211

Five-Tube, Two-Band A. C. Receivers

SERVICE NOTES



SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

A RADIO CORPORATION OF AMERICA SUBSIDIARY

REPRESENTATIVES IN PRINCIPAL CITIES

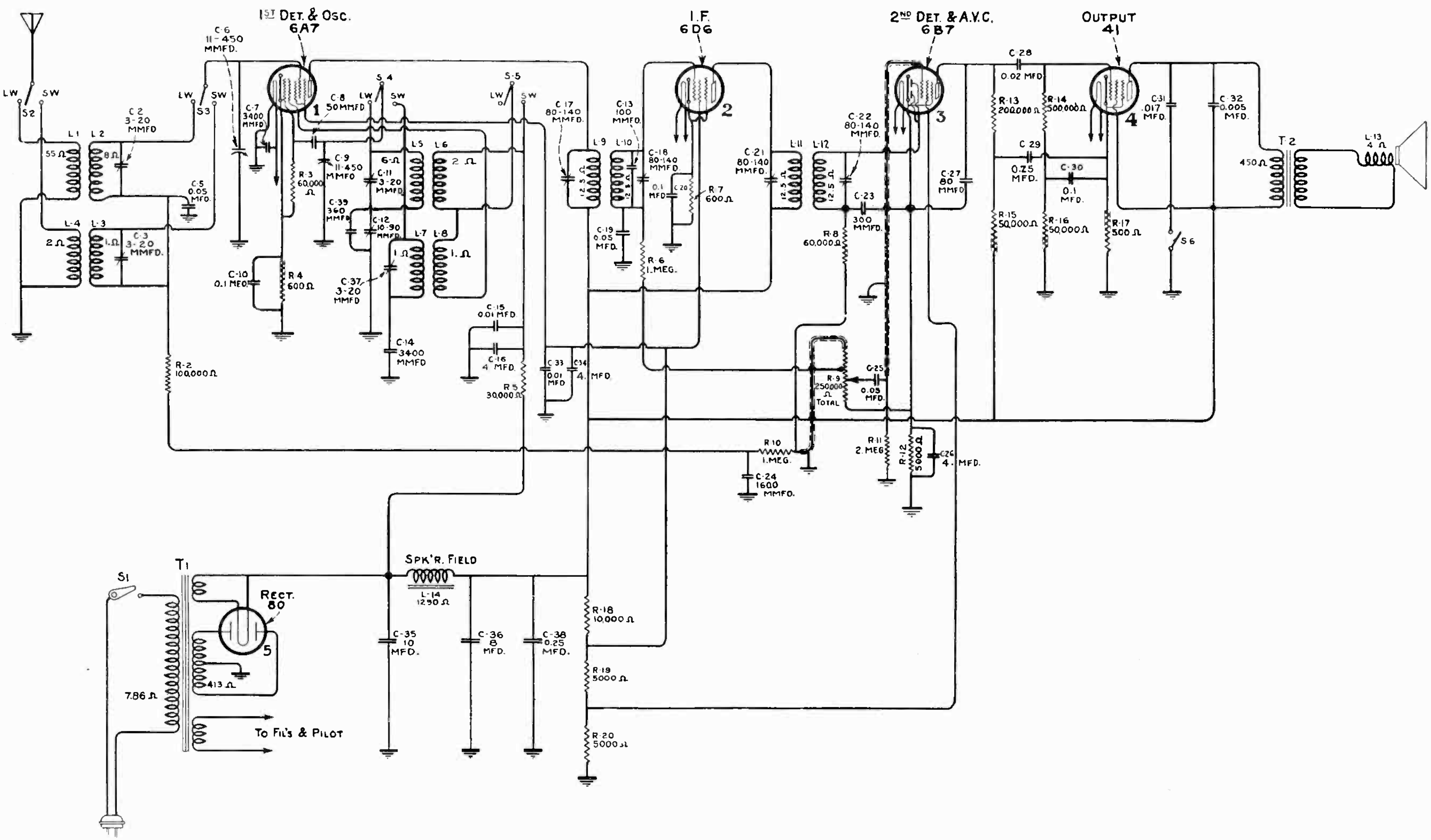


Figure 1—Schematic Circuit Diagram

RCA VICTOR MODELS 118 AND 211

5-Tube, 2-Band A. C. Receivers

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Voltage Rating	105–125 Volts and 100–130/195–250 Volts (double range transformer)
Frequency Rating	25–60 and 50–60 Cycles
Power Consumption (All Frequencies)	85 Watts
Number and Types of Radiotrons	1 RCA-6A7, 1 RCA-6D6, 1 RCA-6B7, 1 RCA-41, 1 RCA-80—Total, 5
Undistorted Output	1.9 Watts
Maximum Output	3.5 Watts
Tuning Frequency Ranges	540 K. C.–1720 K. C.—5400 K. C.–18,000 K. C.
Line-up Frequencies	460 K. C., 600 K. C., 1720 K. C. and 18,000 K. C.

PHYSICAL SPECIFICATIONS

	MODEL 118	MODEL 211
Height	17⅝ Inches	40 Inches
Width	14⅜ Inches	23½ Inches
Depth	9¾ Inches	11 9/16 Inches

This receiver is a five-tube, two-band A. C. operated superheterodyne having tuning ranges that cover both the standard and short-wave broadcasting bands. Features include an "Airplane" type dial, two-point tone control, double reduction vernier drive, dynamic type loudspeaker and excellent performance in all respects. The entire mechanism is housed in a cabinet of pleasing design.

A special feature of this receiver is the accessibility of all parts for inspection and repair. This will be of interest to the service man, as the removal and replacement of any part can be quickly and easily done. All parts are rigidly held in place, thus preventing the rigors of handling and transportation from damaging the receiver.

DESCRIPTION OF ELECTRICAL CIRCUIT

The circuit is of the superheterodyne type and consists of a combined oscillator and first detector, an I. F. stage, a combined second detector and automatic volume control and a Pentode output stage. An RCA-80 is used as a rectifier for providing grid and plate power to all other tubes.

The signal enters the receiver through the antenna system and is applied through a tuned circuit to the grid of the first detector. Combined with the signal is the local oscillator signal, which is at a constant frequency difference (460 K. C. higher) throughout the tuning range. The combined signals after passing through the first detector produce the I. F. signal, which is 460 K. C. The RCA-6A7 is the combined detector and oscillator.

The I. F. amplifier consists of a single RCA-6D6 and two transformers, having a total of four tuned circuits. The high I. F. frequency (460 K. C.) is used to reduce image frequency response and to improve the short-wave performance.

The output of the I. F. amplifier is then applied to the diode sections of the RCA-6B7, which is a combined second detector, automatic volume control and A. F. amplifier. The direct current component of the rectified signal produces a voltage drop across resistor R-9. The full voltage drop constitutes the automatic bias voltage for the first detector while a tap is provided for the I. F. voltage. These automatic bias voltages for the detector and I. F. give the automatic volume control action of the receiver. The volume

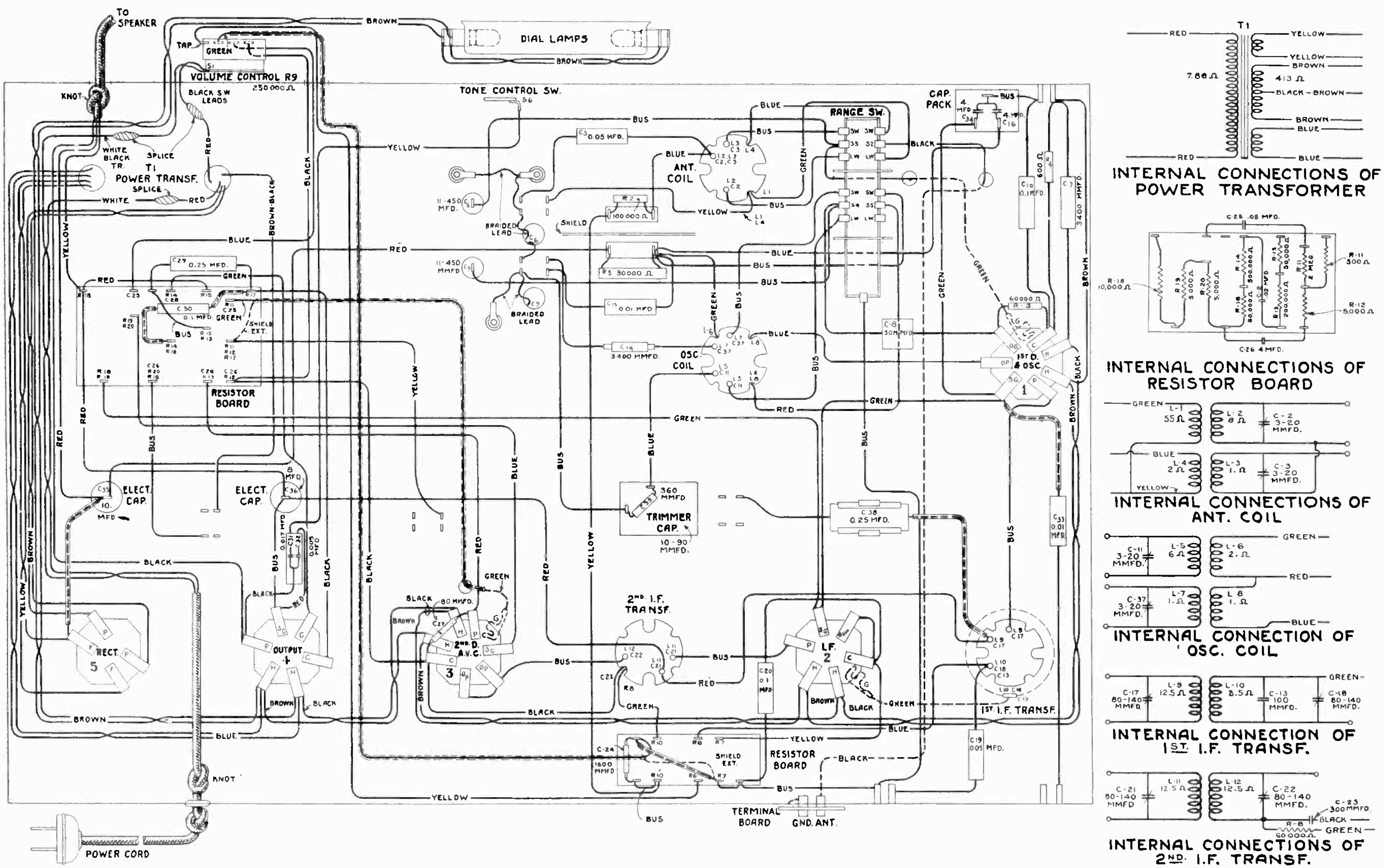


Figure 2—Wiring Diagram—Early Production

control selects the amount of audio voltage that is applied to the grid of the RCA-6B7 and thereby regulates the audio output of the entire receiver.

The output of the RCA-6B7 is resistance coupled to the grid of the RCA-41 tube, which is the power output amplifier. This tube is operated as a Pentode and provides high audio gain and satisfactory output power. The plate circuit of the output stage is matched to the cone coil of the reproducer by means of a step-down transformer.

The tone control consists of a 0.017 mfd. capacitor connected from the plate of the output tube to ground through a single pole switch. Closing the switch reduces the high-frequency output of the receiver.

Plate and grid voltages for all tubes are supplied from the output of the rectifier-filter system. An RCA-80 is used as a rectifier and a suitable network of capacitors and resistors gives the necessary filtering and voltages. The loudspeaker field is used as a filter reactor.

SERVICE DATA

(1) Line-Up Capacitor Adjustments:

To properly align this receiver, it is essential that a modulated R. F. oscillator, such as Stock No. 9050, an output indicator and an alignment tool (Stock No. 4160) be available. Figure 6 shows the location of the various line-up capacitors.

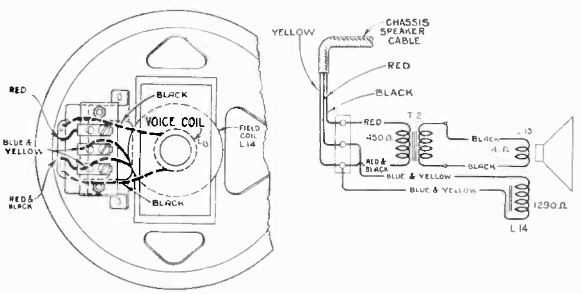


Figure 3—Table Model Loudspeaker Wiring

I. F. Tuning Adjustments:

Two transformers comprising four tuned circuits are used in the intermediate amplifier. These are tuned to 460 K. C. and the adjustment screws are accessible as shown in Figure 6. Proceed as follows:

(a) Short-circuit the antenna and ground terminals and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the ground terminal.

(b) Connect the test oscillator output between the first detector control grid and chassis ground. Connect the output meter across the voice coil of the loudspeaker and adjust the oscillator output so that, with the receiver volume control at maximum, a slight deflection is obtained in the output meter.

(c) Adjust the secondary and primary of the first and then the second I. F. transformers until a maximum deflection is obtained. Keep the oscillator output at a low value so that only a slight deflection is obtained on the output meter at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. adjustments.

R. F. and Oscillator Adjustments:

The R. F. line-up capacitors are located at the bottom of the coil assemblies instead of their usual position on the gang capacitor. They are all accessible

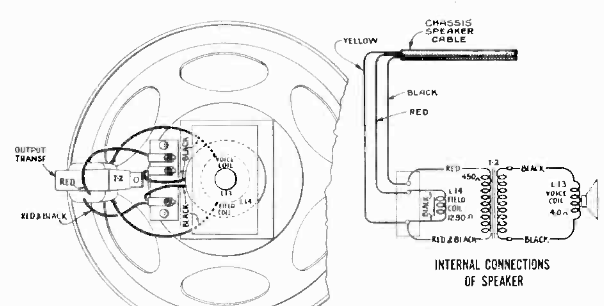


Figure 4—Console Model Loudspeaker Wiring

from the bottom of the chassis except the 600 K. C. series capacitor, which is accessible from the top of the chassis. Proceed as follows:

(a) Connect the output of the oscillator to the antenna and ground terminals of the receiver. Check the position of the indicator pointer when the tuning capacitor plates are fully meshed. It should be coincident with the radial line adjacent to the dial reading of 540. Then set the Test Oscillator at 1720 K. C., the dial indicator at 1720 and the oscillator output so that a slight deflection will be obtained in the output meter when the volume control is at its maximum position.

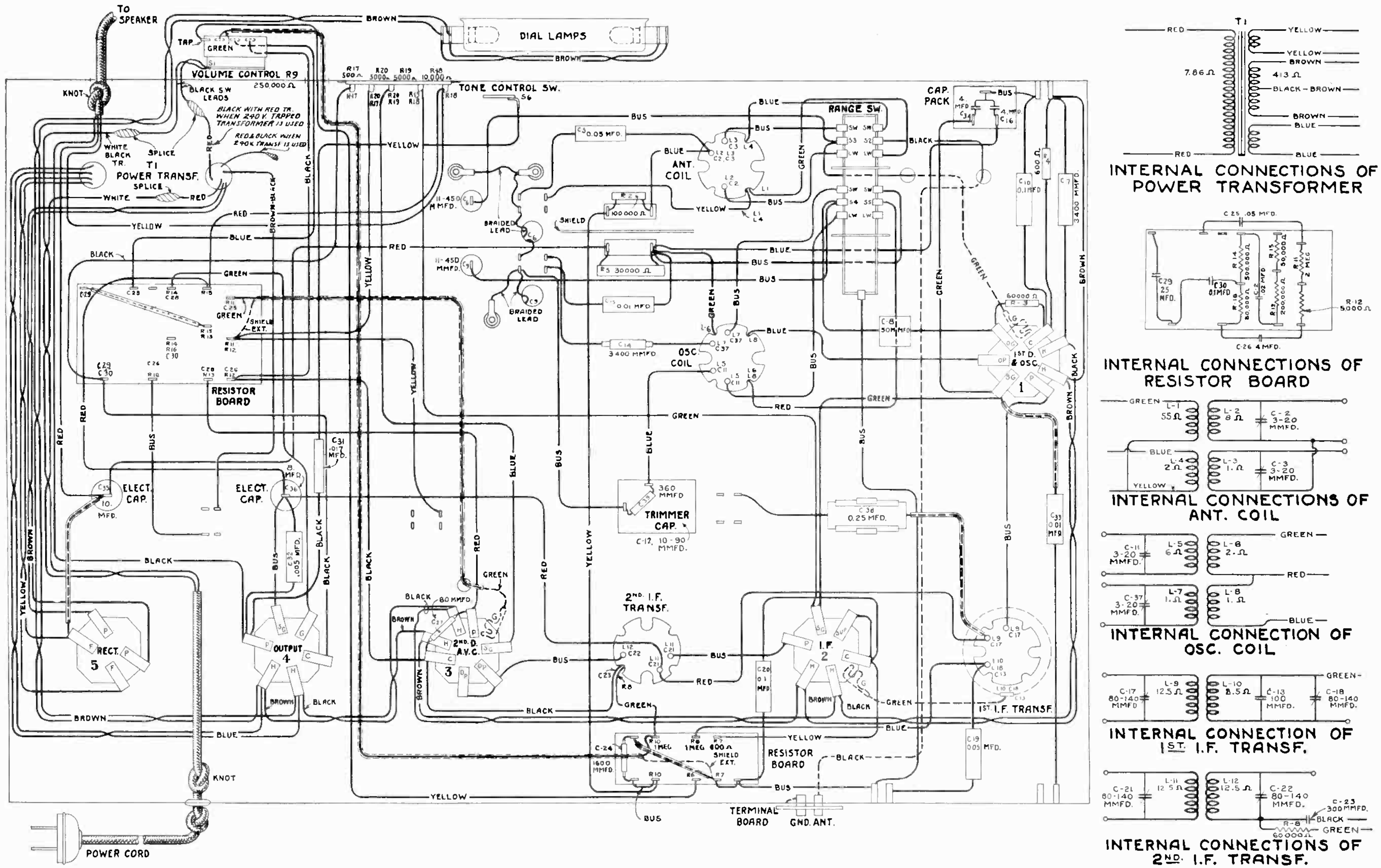


Figure 5—Wiring Diagram—Late Production

(b) With the Range Switch at the "in" position, adjust the two trimmers under the two R. F. coils, designated as BC in Figure 6, until a maximum deflection is obtained in the output meter. Then shift the Test Oscillator frequency to 600 K. C. The trimmer capacitor, accessible from the top of the chassis, should now be adjusted for maximum output while rocking the main tuning capacitor back and forth through the signal. Then repeat the 1720 K. C. adjustment.

(c) Now place the Range Switch at the "out" position, shift the Test Oscillator to 18,000 K. C. and set the dial at 18M. Adjust the two trimmer capacitors designated as SW in Figure 6 for maximum output, beginning with the oscillator trimmer. It will be noted that the oscillator and first detector trimmers will have two positions at which the signal will give maximum output. The position which uses the lower trimmer capacitance, obtained by turning the screw counter-clockwise, is the proper adjustment for the oscillator, while the position that uses a higher capacitance is correct for the detector. The detector trimmer *must* be adjusted for maximum output while rocking the main tuning capacitor back and forth through the signal. Both of these adjustments must be made as indicated irrespective of output.

The important points to remember are the need for using the minimum oscillator output to obtain a deflection in the output meter with the volume control at its maximum position and the manner of obtaining the proper high frequency oscillator and detector adjustments.

(2) Radiotron Socket Voltages:

The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if lower resistance meters are used, such allowances must be made:

RADIOTRON SOCKET VOLTAGES

115-Volt, A. C. Line—Maximum Volume Control—No Signal

Radiotron No.		Cathode to Ground Volts, D. C.	Screen Grid to Ground Volts, D. C.	Plate to Ground Volts, D. C.	Plate Current, M. A.	Heater Volts, A. C.
RCA-6A7	Detector	6.0	105	265	3.5	6.3
	Oscillator		—	220	4.5	
RCA-6D6 I. F.		6.0	105	265	9.0	6.3
RCA-6B7 2nd Det. AVC		3.0	50*	90*	0.7	6.3
RCA-41 Power		16.5	265	245	30.0	6.3
RCA-80 Rectifier		—	—	690 (Plate to Plate)	64.0	5.0

* Voltage calculated from 265V+B.

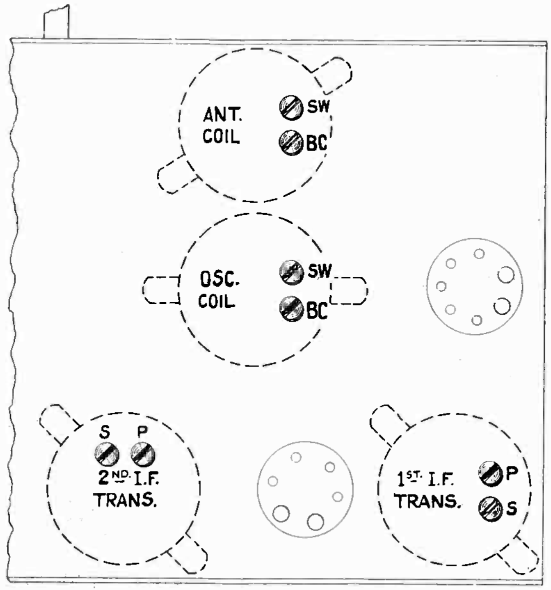


Figure 6—Location of Line-Up Capacitors

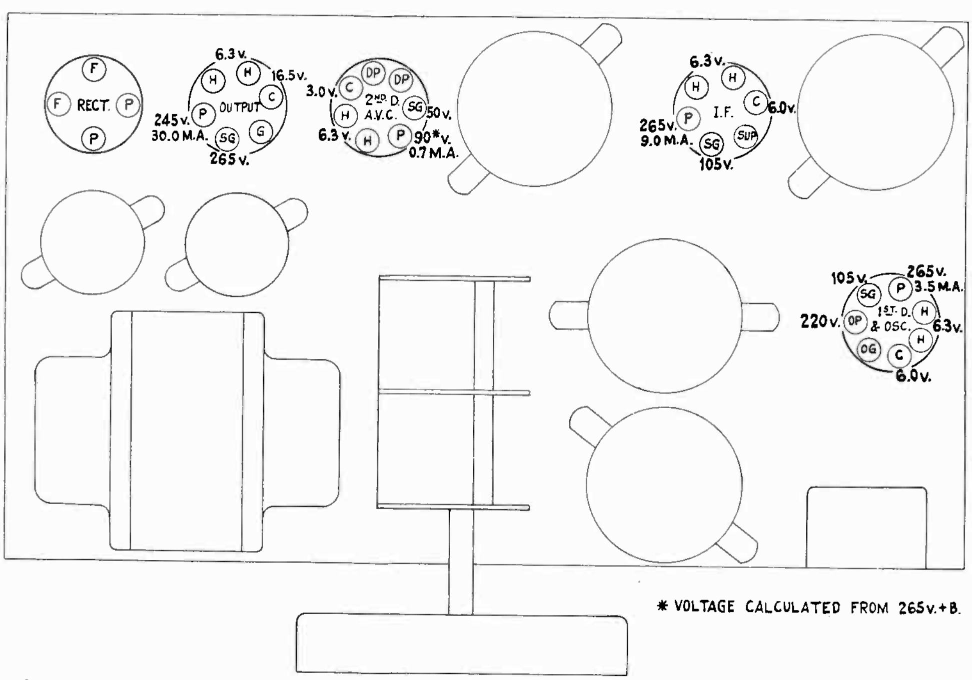


Figure 7—Radiotron Socket Voltages

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

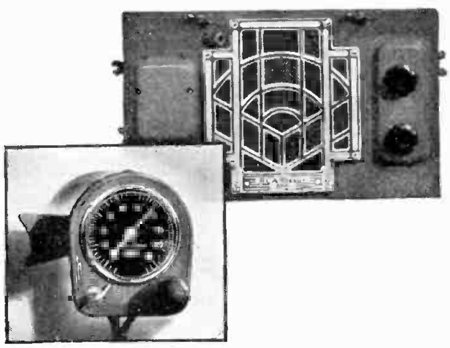
Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
10194	Ball—Steel ball for condenser drive assembly—Package of 20	$0.25
4358	Bracket—Capacitor mounting bracket	.15
4427	Bracket—Volume control mounting bracket	.18
2747	Cap—Contact cap—Package of 5	.50
4428	Capacitor—8 mfd. (C36)	1.05
7790	Capacitor—10 mfd. (C35)	1.05
4442	Capacitor—50 mmfd. (C8)	.22
4509	Capacitor—80 mmfd. (C27)	.15
4413	Capacitor—360 mmfd. (C39)	.22
4441	Capacitor—1600 mmfd. (C24)	.35
4439	Capacitor—3400 mmfd. (C14)	.35
4471	Capacitor—3400 mmfd. (C7)	.44
6512	Capacitor—.005 mfd. (C32)	.28
4443	Capacitor—0.01 mfd. (C15)	.25
4444	Capacitor—0.01 mfd. (C33)	.22
4752	Capacitor—.017 mfd. (C31)	.26
4435	Capacitor—0.02 mfd. (28)	.25
3888	Capacitor—0.05 mfd. (C25)	.25
4417	Capacitor—0.05 mfd. (C5)	.25
3901	Capacitor—0.05 mfd. (C19)	.36
3877	Capacitor—0.1 mfd. (C20, C30)	.32
4415	Capacitor—0.1 mfd. (C10)	.30
3597	Capacitor—0.25 mfd. (C29, C38)	.40
3796	Capacitor—4.0 mfd. (C26)	.60
3861	Capacitor—Adjustable trimmer capacitor (C12)	.78
7589	Capacitor pack—Comprising two 4.0 mfd. capacitors (C16, C34)	1.64
4422	Clutch—Condenser drive clutch assembly complete	.88
4430	Coil—Antenna coil (L1, L2, L3, L4, C2, C3)	1.92
4432	Coil—Oscillator coil (L5, L6, L7, L8, C11, C37)	1.65
4504	Condenser—2-gang variable tuning condenser (C6, C9)	2.78
4434	Drive—Tuning condenser drive assembly complete	2.42
3632	Resistor—500 ohms—Carbon type—¼ watt (R17)—Package of 5	1.10
3218	Resistor—600 ohms—Carbon type—¼ watt (R4, R7)—Package of 5	1.00
4436	Resistor—5,000 ohms—Carbon type—¼ watt (R12)—Package of 10	2.00
3114	Resistor—50,000 ohms—Carbon type—¼ watt (R16)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R3)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R2)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
3033	Resistor—1 megohm—Carbon type—¼ watt (R6, R10)—Package of 5	1.00
6242	Resistor—2 megohms—Carbon type—¼ watt (R11)—Package of 5	1.00
3594	Resistor—50,000 ohms—Carbon type—½ watt (R15)—Package of 5	1.00
6228	Resistor—200,000 ohms—Carbon type—½ watt (R13)—Package of 5	1.00
3891	Resistor—5,000 ohms—Carbon type—1 watt (R19, R20)—Package of 5	1.10
2240	Resistor—30,000 ohms—Carbon type—1 watt (R5)	.22
6318	Resistor—10,000 ohms—Porcelain type (R18)	.80
4721	Resistor—Tapped resistor—One 10,000 ohm, two 5,000 ohm and one 500 ohm section—(R17, R18, R19, R20)	.88
3943	Screen—Translucent screen for dial lamps—Package of 2	.18
4446	Screen—Chassis mounting screw assembly—Comprising 4 screws, 4 lockwashers, 4 washers, 4 spacers and 4 cushions	.28
3993	Screw—No. 6-32-5/32" square head set screw for condenser drive—Package of 10	$0.25
7800	Shield—Antenna, oscillator or I. F. transformer coil shield	.45
4145	Shield—First detector and oscillator Radiotron shield	.30
4103	Shield—I. F. Radiotron shield	.20
4438	Shield—Second detector—AVC Radiotron shield	.25
3529	Socket—Dial lamp socket	.32
3859	Socket—4-contact Radiotron socket	.30
7485	Socket—6-contact Radiotron socket	.40
6676	Socket—6-contact output Radiotron socket	.40
3572	Socket—7-contact Radiotron socket	.38
4426	Switch—Tone control switch (S6)	.35
4437	Switch—Range switch (SW-BC) (S2, S3, S4, S5)	2.35
9511	Transformer—105-125 volts—50-60 cycles	4.78
4431	Transformer—First intermediate frequency transformer (L9, L10, C13, C17, C18)	2.28
9512	Transformer—Power transformer—105-125 volts—25-40 cycles	6.58
9513	Transformer—Power transformer—105-250 volts—40-60 cycles (T1)	4.85
4433	Transformer—Second intermediate frequency transformer (L11, L12, R8, C21, C22, C23)	2.15
4429	Volume control (R9)	1.40
	REPRODUCER ASSEMBLIES (CONSOLE)	
4473	Board—Reproducer terminal board	.26
4445	Cable—3-conductor-reproducer cable	.36
9460	Coil—Field coil—Magnet and cone support	6.00
8935	Cone—Reproducer cone—Package of 5	5.25
9527	Reproducer complete	8.00
4472	Transformer—Output transformer	1.40
	REPRODUCER ASSEMBLIES (TABLE)	
4448	Board—Reproducer terminal board	.25
4445	Cable—3-conductor-reproducer cable	.36
9531	Coil—Field coil magnet and cone support	2.75
9492	Cone—Reproducer cone (L13)—Package of 5	3.70
9514	Reproducer complete	6.00
4447	Shield—Terminal board shield	.18
4505	Transformer—Output transformer (T2)	1.55
	MISCELLANEOUS ASSEMBLIES	
6706	Bezel—Station selector dial escutcheon bezel—Model 118	.42
4450	Dial—Station selector dial—Model 211	.52
4474	Dial—Station selector dial—Model 118	.76
6840	Escutcheon—Station selector escutcheon—Model 211	.56
6707	Glass—Station selector dial glass—Model 118	.20
6614	Glass—Station selector dial glass—Model 211	.30
4449	Knob—Station selector, volume control, tone or range switch knob—Package of 5	.60
4348	Lamp—Pilot lamp	.38
4363	Pointer—Station selector indicator pointer—Model 211	.18
4475	Pointer—Station selector indicator pointer—Model 118	.18
6708	Ring—Spring retaining ring for dial glass—Package of 5—Model 118	.44
6615	Ring—Spring retaining ring for dial glass—Package of 5—Model 211	.34
4613	Screw—8-32-7/16" headless set screw for knob—Package of 10	.25

RCA Victor

Model M-123

"De Luxe" Single Unit Automobile Receiver

SERVICE NOTES



SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

A RADIO CORPORATION OF AMERICA SUBSIDIARY

REPRESENTATIVES IN PRINCIPAL CITIES

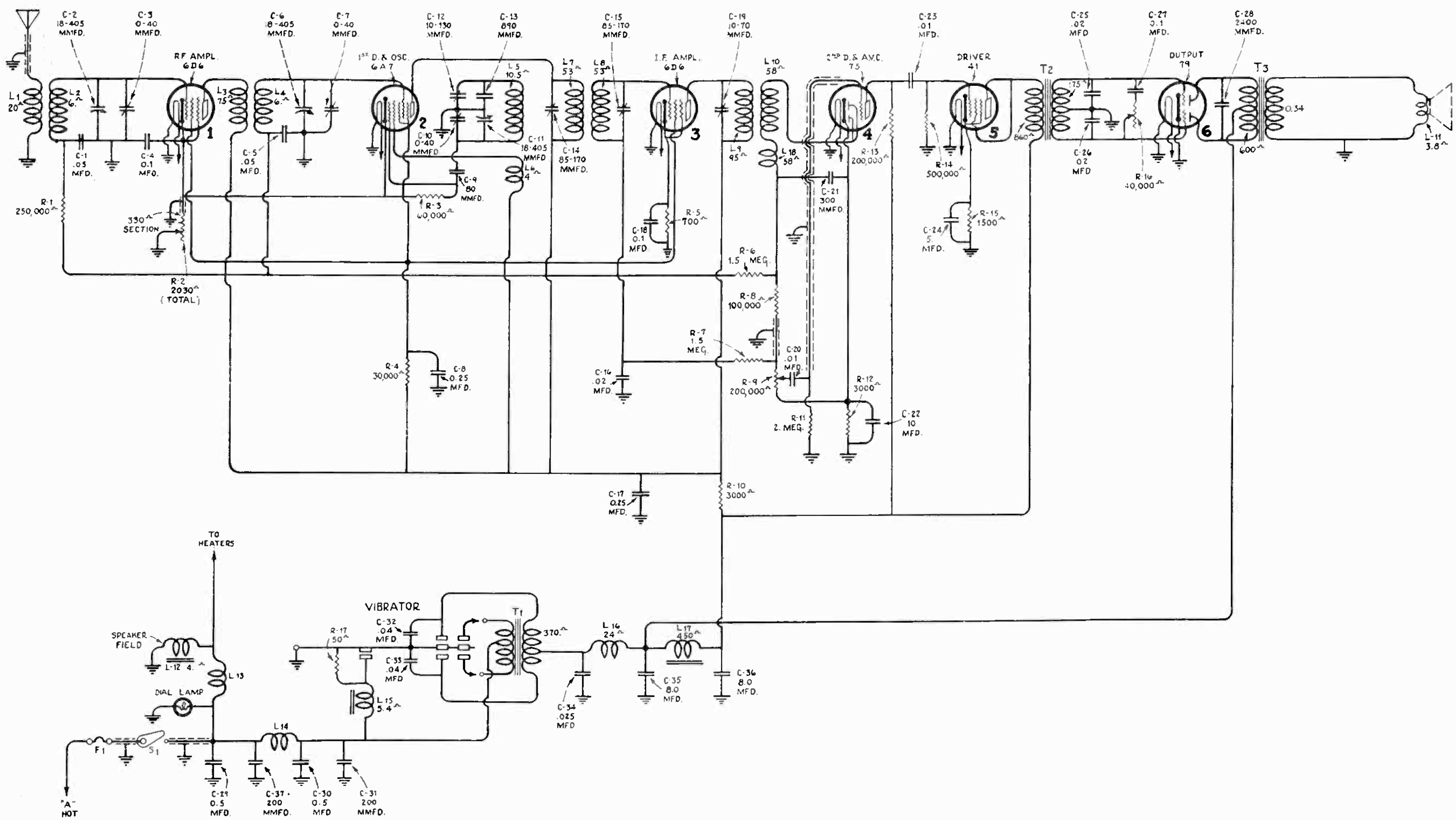


Figure 1—Schematic Circuit Diagram

RCA VICTOR MODEL M-123

Six-Tube "De Luxe" Automobile Receiver

SERVICE NOTES

Electrical Specifications

Type and Number of Radiotrons Used—2 RCA-6D6, 1 RCA-6A7, 1 RCA-75, 1 RCA-41, 1 RCA-79 —Total, 6

Battery Current (6.3 Volt Battery):

Speaker Field (Cold)	1.35 Amperes
Tubes	2.2 Amperes
Dial Lamp	0.15 Ampere
Power Supply (No Signal)	2.8 Amperes
Total (No Signal)	6.5 Amperes
Total (Maximum Output)	8.0 Amperes (Average)

Tuning Frequency Range	540 K. C.–1600 K. C.
Maximum Undistorted Output	4.2 Watts
Maximum Output	6.8 Watts
Line-up Frequencies	175 K. C., 600 K. C., 1400 K. C.

Physical Specifications

Height	7½ Inches
Width	12 Inches
Depth (Case Alone)	7 Inches
Depth (Overall)	8½ Inches

This six-tube automobile receiver incorporates the latest mechanical and electrical refinements for furnishing a rugged, fool-proof, mobile-type receiver having performance equivalent to that of a high quality home receiver. Ease of installation, accessibility for servicing and ruggedness of construction are features of unusual interest.

In performance the receiver is characterized by unusual tone quality, high output (equal to that of the usual console and greater than that of a table model), high sensitivity and adequate selectivity. Full control of all features is made possible by having the station selector, volume control and operating switch accessible on the steering column control and the sensitivity and tone control on the right panel of the receiver proper.

The construction of the unit embodies several new features of particular interest to the service man. The receiver proper is mounted to the front fire wall of the car by means of a single bolt. The case of the receiver is made in two sections so that the chassis may be dropped down for inspection or tube replacement, merely by removing and loosening several thumb nuts and screws. The receiver proper is divided into three units, the power supply including a plug-in type vibrator, a loudspeaker including the audio transformers and the receiver chassis. Each of these several units may be removed for replacement or repair merely by the use of a screwdriver. Adequate terminal boards eliminate the need for a soldering iron when making such removals.

ELECTRICAL DESCRIPTION OF CIRCUIT

The circuit is of the superheterodyne type, having features such as automatic volume control, diode second detector, continuously variable tone control, continously variable sensitivity control and a class "B" output stage. The power supply consists of a plug-in type vibrator inverter-rectifier and a specially designed filter system which eliminates all traces of vibrator R. F. interference from the power supply.

Examining the circuit closely we find the following functions taking place while the receiver is in operation.

The signal enters the receiver through the shielded antenna lead-in and the antenna coupling coil. The signal voltage is applied to the grid of the first R. F. tube by means of the secondary coupling coil, which is tuned by means of the first unit of the three-gang tuning capacitor. The R. F. tube is a Radiotron RCA-6D6, which is a super-control R. F. amplifying Radiotron which gives a minimum amount of cross modulation, hum modulation and modulation distortion. This tube has the general characteristics of the RCA-58.

The output of the R. F. stage is fed to the Radiotron RCA-6A7, which is a combined oscillator and first detector. The detector grid circuit is tuned to the signal, whereas the oscillator grid circuit is tuned to a frequency 175 K. C. higher than the signal. The use of a suitable bridge circuit provides a method whereby the tuning capacitor maintains this same frequency difference throughout its tuning range. The output of the detector is the difference or beat frequency provided by combining the signal and oscillator frequency and is the I. F. frequency of the receiver. A single I. F. stage using Radiotron RCA-6D6 and utilizing three tuned circuits is provided for selecting and amplifying the I. F. signal. The output of this stage is applied to the second detector. It will be noted that the secondary of the second I. F. transformer is divided into two sections, wound in opposite directions. The purpose of this is to avoid vibrator interference pickup due to circulating currents in the chassis case.

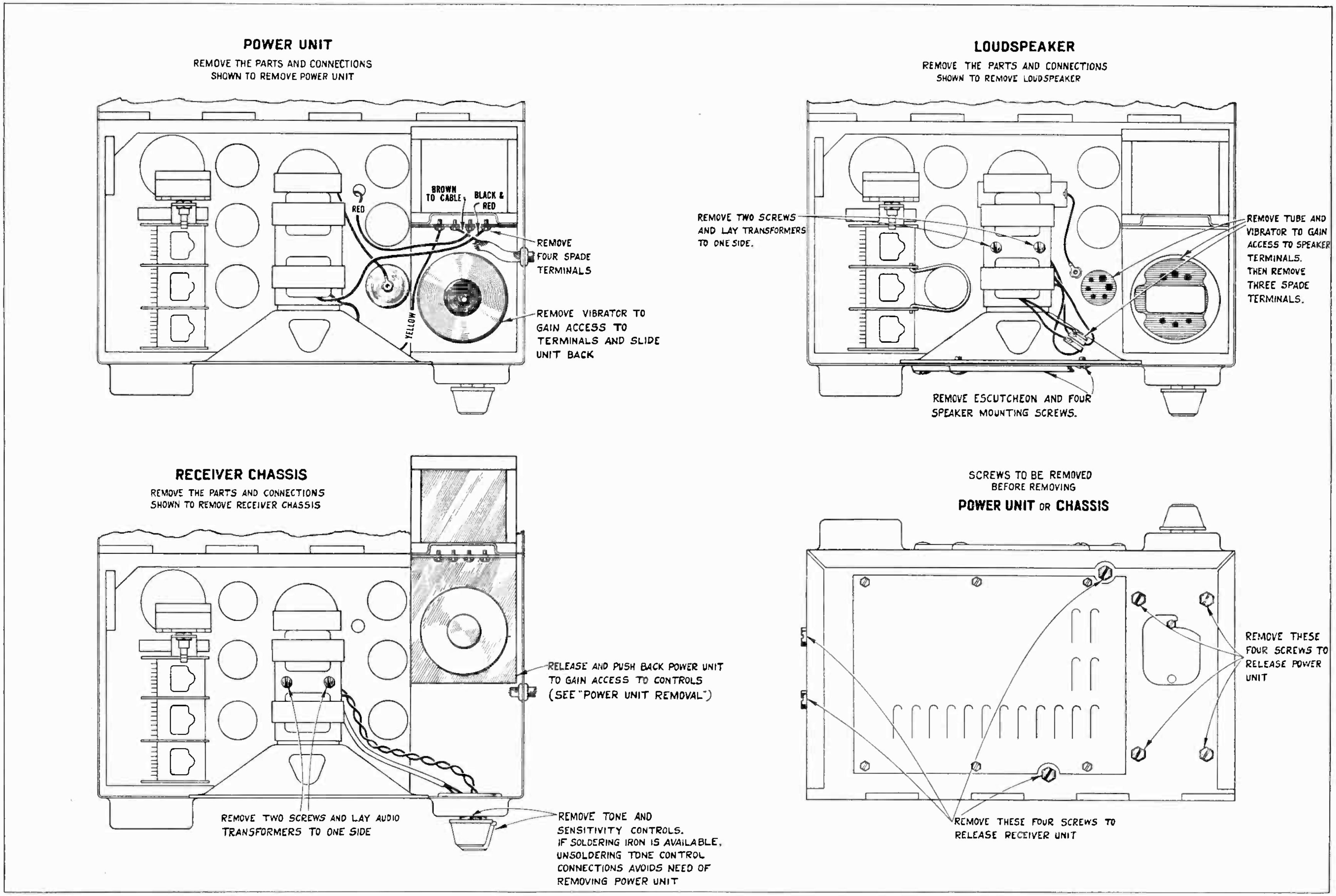


Figure 2—Details of removing units individually from chassis

The next tube is an RCA-75, which is a combined second detector, automatic volume control and audio amplifier. The signal is applied to the diode sections of this tube, which act as a two-element rectifier. The direct current component of the rectified signal produces a voltage drop across resistors R-8 and R-9. This voltage drop constitutes the automatic bias voltage for the R. F., 1st detector and I. F. amplifier which gives the automatic volume control action of the receiver. The volume control selects the amount of audio voltage that is applied to the grid of the audio amplifying part of the tube and thereby regulates the audio output of the entire receiver.

The output of the audio section of the RCA-75 is resistance coupled to the grid circuit of the RCA-41, which is the audio driver stage. While this tube is usually connected as a pentode, in this receiver it operates as a triode (Class A).

The last tube is an RCA-79, which is a Class "B" twin amplifier. This tube has two individual sets of elements and takes the place of two tubes. required in the usual Class "B" stage.

The tone control, comprising a variable resistor and capacitor, is connected across the grids of the RCA-79. Maximum attenuation of the high frequencies is obtained when the variable resistor is at its minimum resistance position. The plate circuit is coupled through a step-down transformer to the cone coil of the reproducer unit.

A sensitivity control, which varies the fixed bias on the R. F. and 1st detector stage, is mounted on the right side of the case. By means of this control, the sensitivity of the receiver may be adjusted so that any degree of noise suppression is obtained.

Field excitation power is obtained by connecting the loudspeaker field directly across the car battery. Filament power is obtained in a similar manner, all Radiotrons having 6.3 volt heaters. Plate and grid voltage for all tubes is obtained through the vibrator inverter-rectifier unit and its associated transformer and filter circuits.

SERVICE DATA

(1) Removing Units from Chassis:

The three major units, the power unit, the loudspeaker and the receiver chassis, are easily removed independently without disturbing the other units not removed. To do this, the use of a screwdriver is the only tool required. Figure 2 shows the details of the screws and terminals to be removed in each individual case.

(2) Loose or Tight Tuning Action:

An adjustment screw is provided at the worm drive unit, so that proper tension may be provided for the particular worm being used. The instruction book accompanying the instrument describes the proper manner of turning the drive assembly when using either right or left hand drives. However, whenever this change is made, the adjusting screw located on the front of the drive unit should be loosened or tightened until a satisfactory amount of tension and elimination of backlash is obtained.

(3) Line-up Capacitor Adjustments:

Adjustable capacitors are provided in the R. F. oscillator and intermediate frequency amplifier to provide a means of properly aligning the receiver. A modulated R. F. oscillator such as Full Range Test Oscillator, Type TMV-97-B (Stock No. 9050), a non-metallic screwdriver such as alignment wrench Stock No. 4160 and an output meter are required for properly aligning this receiver. Refer to Figure 3 for the location of the line-up capacitors.

I. F. Tuning Adjustments:

Two transformers comprising three tuned circuits (the secondary of the second transformer is untuned) are used in the intermediate amplifier. These are tuned to 175 K. C. and the adjustment screws are accessible from beneath the chassis as shown in Figure 3. Proceed as follows:

(a) Procure a modulated oscillator giving a signal at 175 K. C., a non-metallic screwdriver such as Stock No. 4160 and an output meter.

(b) Short-circuit the antenna and ground leads and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the chassis.

(c) Connect the oscillator output between the first detector control grid and chassis ground. Connect the output meter across the voice coil of the loudspeaker and adjust the oscillator output so that with the receiver volume control at maximum, a slight deflection is obtained in the output meter.

(d) Adjust the primary of the second, and the secondary and primary of the first I. F. transformers, until a maximum deflection is obtained. Keep the oscillator output at a low value so that only a slight deflection is obtained on the output meter at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. adjustments.

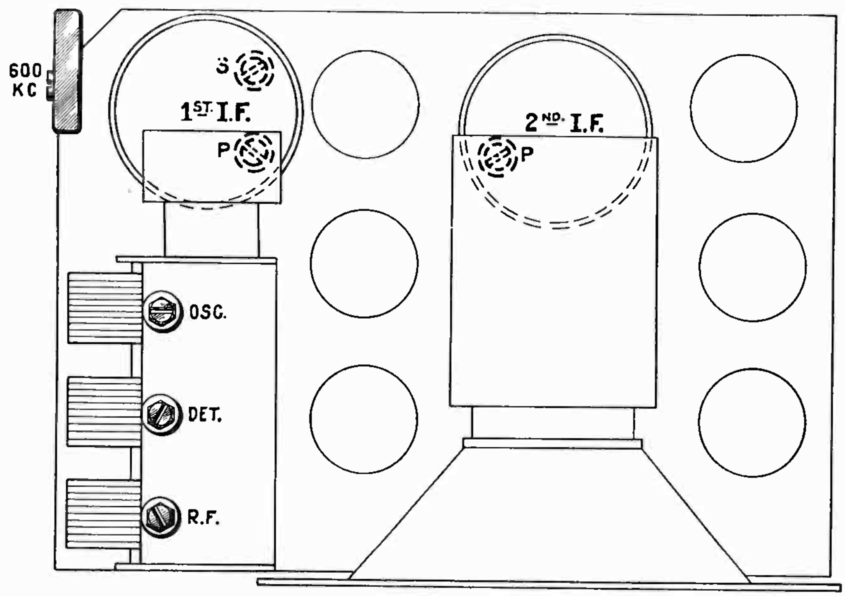
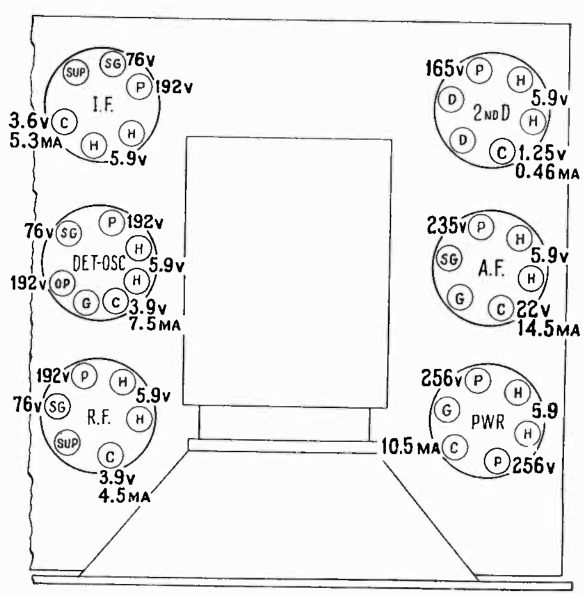


Figure 3—Location of Line-up Capacitors



All voltages except heater are to ground.

Figure 4—Voltages at Individual Socket Contacts

R. F. and Oscillator Adjustments:

The three-gang capacitor screws are located on the main tuning capacitor, accessible at the top of the chassis. Proceed as follows:

(a) Procure a modulated oscillator giving a signal at 1400 K. C. and 600 K. C., a non-metallic screwdriver such as Stock No. 4160 and an output meter.

(b) Connect the output of the oscillator to the antenna and ground lead of the receiver. Place the receiver in operation and attach the control box as in normal operation. Turn the tuning control until the tuning capacitors are fully meshed. Then set the indicator on the dial at the 530 K. C. reading. Turn the tuning control until the dial reads 1400. Then set the oscillator at 1400 K. C. and connect the output meter across the cone coil. Adjust the three-gang capacitor trimmer screws until maximum output is obtained. Be careful not to disturb the relation of the control box to the receiver after setting the dial.

(c) After making the 1400 K. C. adjustment, shift the oscillator to 600 K. C. and tune in the signal. Adjust the 600 K. C. trimmer, accessible from the side of the chassis for maximum output while rocking the gang-capacitor back and forth. Then again check the adjustment described in (b).

When making both the I. F. and R. F. adjustments, the important point to remember is that the receiver volume control must be at its maximum position and the minimum input signal necessary from the oscillator must be used.

(4) R. F. Interference from Vibrator:

In event R. F. interference originating with the vibrator inverter-rectifier unit is encountered, check the following points:

(a) Vibrator not properly seated. The vibrator must be pushed tight against its socket at all times.

(b) The clip from the top of the R. F. tube shield to the gang-capacitor must be in place.

(c) The various by-pass capacitors, such as C-29, C-30, C-31, C-34, C-37, and chokes L-16 and L-14, L-13, must be properly connected, and in operating condition. It is well to remember that some of the interference produced by the vibrator is of a frequency as high as one meter and any replacement of capacitors must always be made with ones of similar mechanical as well as electrical construction.

(5) Voltage Readings:

The following voltages are those at the tube socket while the receiver is in operating condition. No allowance has been made for currents drawn by the meter and if low resistance meters are used, such allowances must be made.

(6) Vibrator Inverter-Rectifier:

The Vibrator Inverter-Rectifier unit used in this receiver is of advanced design and construction. It is adjusted by means of special equipment at the factory and then sealed to prevent tampering. The unit is provided with a special plug-in base so that in event of suspected failure it may be easily interchanged with one of known condition.

With the seals unbroken, the Vibrator carries the standard ninety-day guarantee, which also applies to all parts of the receiver. Vibrator defects should be remedied by replacement, not by attempted adjustment.

(7) Stiff Tuning Mechanism:

In event the station selector turns hard or stiff, it is probably due to excessive pressure between the worm and drive gear. Proper tension between these units exists when the gear is pushed 1/32" beyond the point of contact with the worm, before being tightened.

(8) Antenna Lead Clamp:

A clamp has been provided for holding the antenna lead securely to the side of case. This clamp is held by one of the chassis mounting screws and prevents the antenna lead from interfering with the operation of the brake pedal or starter button. When making an installation it is important to see that this lead is securely clamped.

RADIOTRON SOCKET VOLTAGES

6.3 Volt Battery—No Signal—Maximum Sensitivity

Radiotron No.		Cathode to Ground Volts, D. C.	Screen Grid to Ground Volts, D. C.	Plate to Ground Volts, D. C.	Cathode Current, M. A.	Heater Volts, D. C.
RCA-6D6—R. F.		3.9	76	192	4.5	5.9
RCA-6A7	1st Det.	3.9	76	192	7.5	5.9
	Osc.		—	192		
RCA-6D6—I. F.		3.6	76	192	5.3	5.9
RCA-75—2nd Det.		1.25	—	165	.46	5.9
RCA-41—A. F.		22.0	—	235	14.5	5.9
RCA-79—Pwr.		0	—	256	10.5	5.9

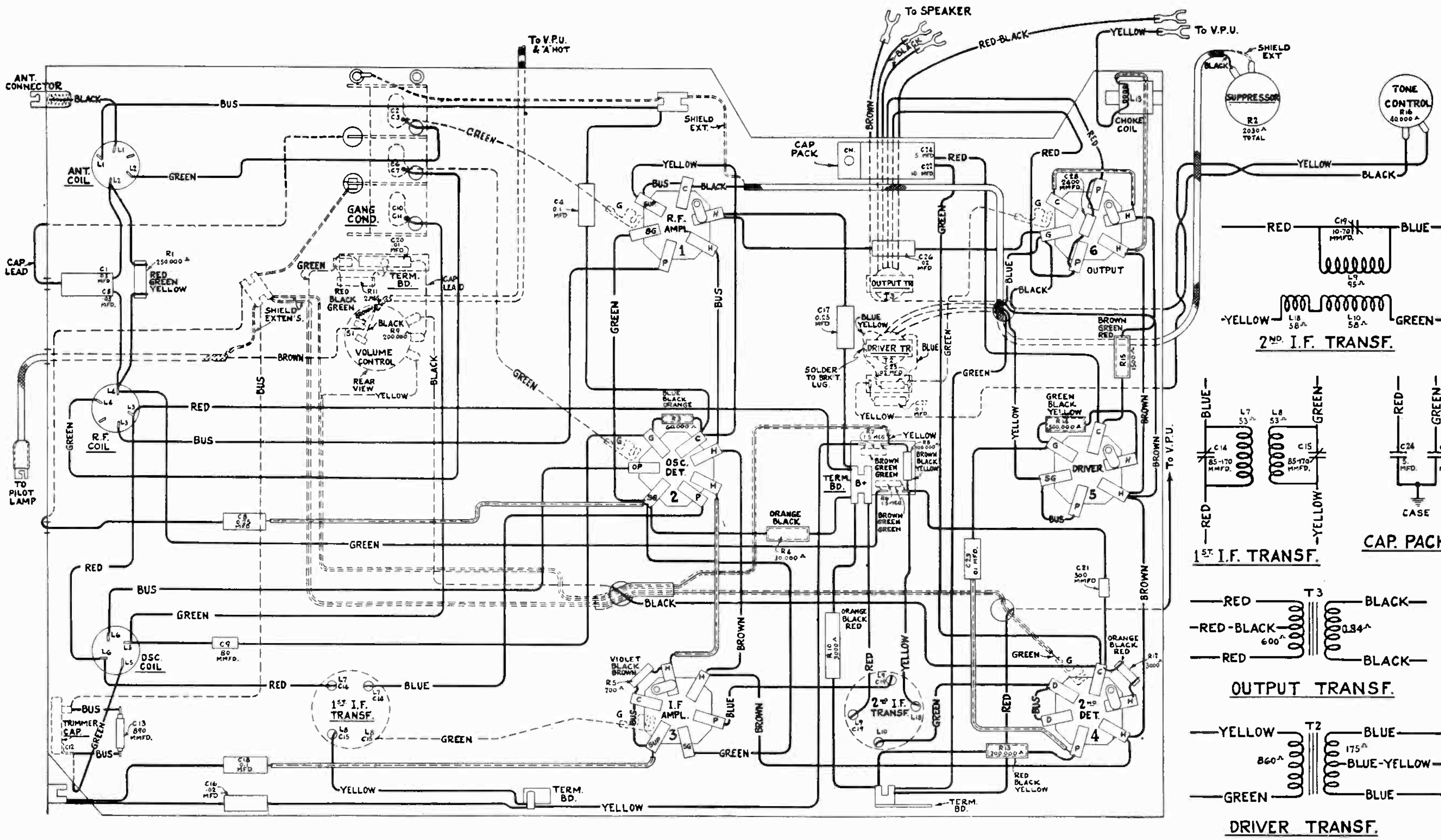


Figure 5—Receiver Assembly Wiring Diagram

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4237	Cable—Single-conductor shielded cable with female section of connector—From volume control switch to pilot lamp cable	$0.35
4238	Cable—Two-conductor power cable from S1 to power lead connector	.95
4244	Cap—Contact cap—Package of 5	.20
3861	Capacitor—Adjustable capacitor (C12)	.78
4246	Capacitor—80 mmfd. (C9)	.24
4248	Capacitor—300 mmfd. (C21)	.22
4245	Capacitor—890 mmfd. (C13)	.26
4247	Capacitor—2,400 mmfd. (C28)	.34
3702	Capacitor—0.25 mfd. (C8)	.42
3639	Capacitor—.02 mfd. (C16, C25, C26)	.25
3701	Capacitor—.01 mfd. (C20, C23)	.30
3641	Capacitor—0.1 mfd. (C27)	.35
3877	Capacitor—0.1 mfd. capacitor (C4, C18)	.32
3597	Capacitor—0.25 mfd. (C17)	.40
4243	Capacitor pack—Comprising two 0.05 mfd. capacitors (C1, C5)	.35
6963	Capacitor pack—Comprising one 10. and one 5. mfd. capacitors (C22, C24)	1.10
6965	Coil—Antenna coil (L1, L2)	.70
6967	Coil—Oscillator coil (L5, L6)	.52
6966	Coil—R. F. coil (L3, L4)	.80
6961	Condenser—3-gang variable tuning condenser (C2, C3, C6, C7, C10, C11)	3.85
6973	Drive assembly—Variable tuning condenser drive assembly	.40
4249	Drive bracket and worm assembly—For variable tuning condenser drive	1.20
6968	Reactor (L13)	.35
4240	Resistor—700 ohms—Carbon type—¼ watt (R5)—Package of 5	1.00
4242	Resistor — 3,000 ohms — Carbon type — ¼ watt (R12)—Package of 5	1.00
3602	Resistor — 60,000 ohms — Carbon type — ¼ watt (R3)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R8)—Package of 5	1.00
3116	Resistor—200,000 ohms—Carbon type—¼ watt (R13)—Package of 5	1.00
3744	Resistor—250,000 ohms—Carbon type—¼ watt (R1)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
4241	Resistor—1.5 megohms—Carbon type—¼ watt (R6, R7)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R11)—Package of 5	1.00
3047	Resistor—1,500 ohms—Carbon type—½ watt (R15)—Package of 5	1.00
2240	Resistor — 30,000 ohms — Carbon type — 1 watt (R4)	.22
4239	Resistor — 3,000 ohms — Carbon type — 3 watts (R10)	$0.25
6972	Rheostat—Noise suppressor rheostat (R2)	.90
3584	Ring—Retaining ring for antenna, radio frequency or oscillator coils—Package of 5	.40
3993	Screw—No. 6-32-⅜-inch square head set screw—For mounting condenser drive assembly to shaft—Package of 10	.25
3623	Shield—Antenna, radio frequency or oscillator coil shield	.30
4233	Shield—Oscillator or second detector Radiotron shield	.22
4235	Shield — Intermediate frequency Radiotron shield	.24
4236	Shield—Radio frequency Radiotron shield	.22
4232	Socket—6-contact Radiotron socket	.35
3572	Socket—7-contact Radiotron socket	.38
6971	Tone control (R16)	.90
6969	Transformer—Audio driver transformer (T2)	1.50
6970	Transformer—Audio output transformer (T3)	1.52
6960	Transformer — First intermediate frequency transformer (L7, L8, C14, C15)	1.80
6962	Transformer—Second intermediate frequency transformer (L9, L10, L18, C19)	1.85
6964	Volume control (R9, S1)	1.20
	CONTROL BOX ASSEMBLIES	
6974	Box—Control box complete	3.80
6976	Back—Control box back	.75
6975	Cover—Control box front cover	.86
4259	Cover—Station selector dial cover—Transparent celluloid—Package of 5	.92
4261	Dial—Station selector dial	.15
4258	Key—Volume control key	.20
4340	Lamp—Dial lamp—Package of 5	.60
4260	Pointer—Station selector indicator	.18
4257	Ring—Station selector dial cover ring	.75
4262	Screen—Dial light screen—Package of 5	.26
4252	Screw—No. 10-32-11/32-inch fillister head set screw for holding condenser drive and pinion gear and volume coupling control shaft—Package of 10	.32
3652	Screw—No. 10-32-¼-inch cupped point set screw for holding station selector or volume control flexible drive shaft to control box—Package of 10	.32
4255	Screw—No. 4-40-¼-inch oval head machine screw for holding control box cover—Package of 10	.16
4254	Shaft—Volume control coupling shaft	.36
4250	Shaft and gear—Station selector pointer shaft and gear	.56
4251	Shaft and gear—Station selector drive shaft and pinion gear	.20

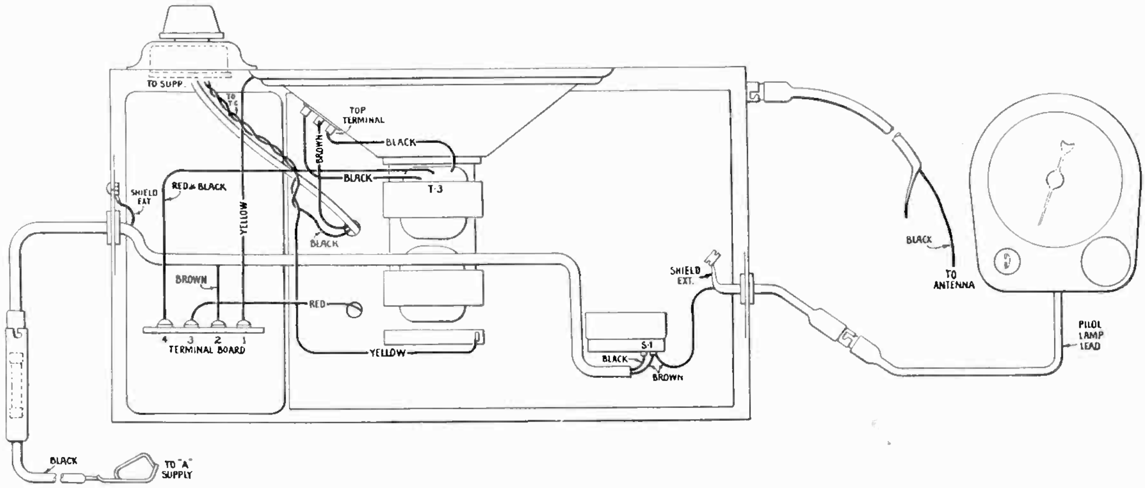


Figure 6—Assembly Wiring Diagram

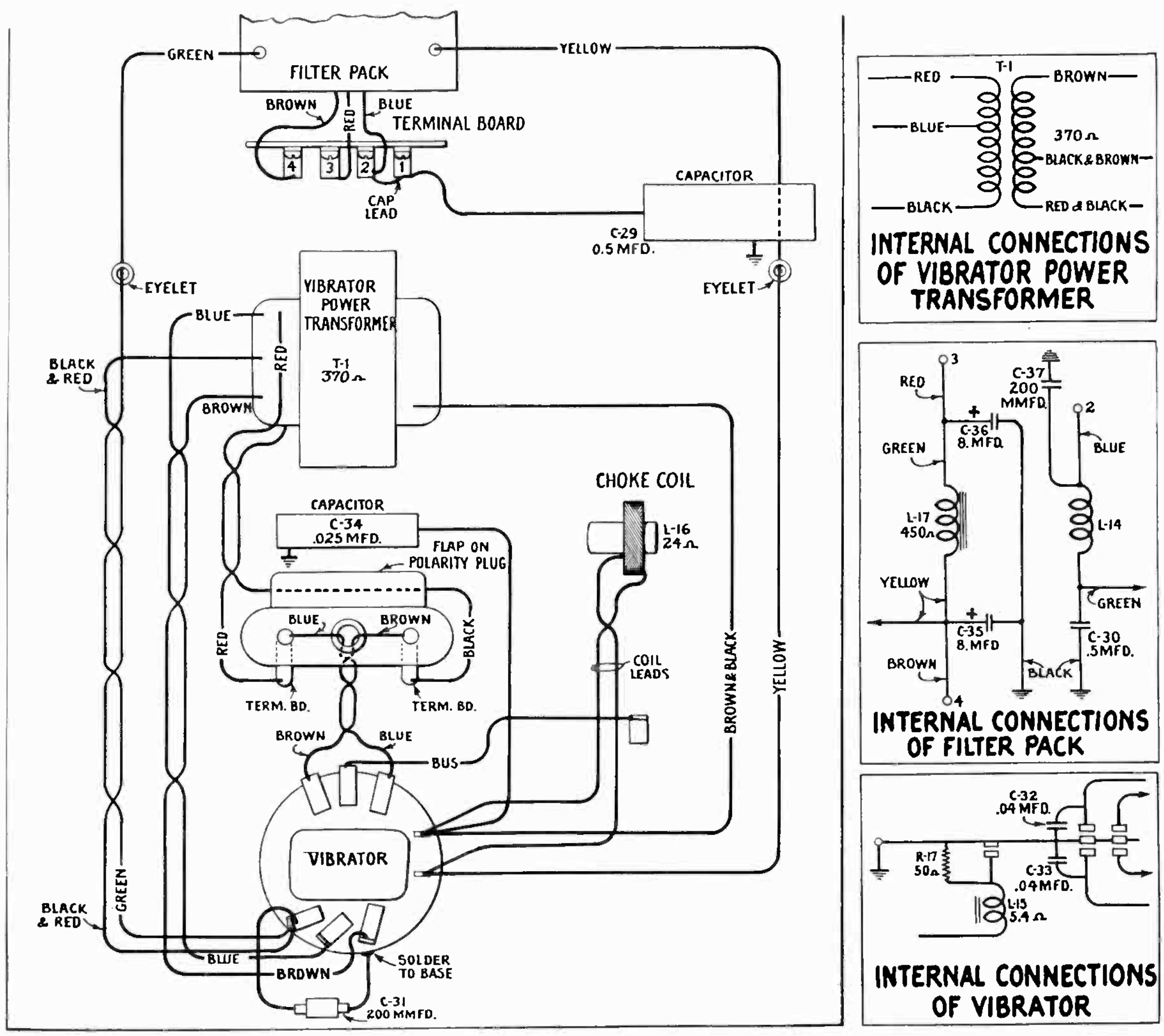


Figure 7—Vibrator Inverter-Rectifier Unit Wiring

REPLACEMENT PARTS—(Continued)

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
4253	Spring—Volume control key holding spring—Package of 10	$0.32
3690	Strap and bracket assembly—For mounting control box to steering column—Comprising one bracket, two screws, one lock-washer and one strap	.40
	FLEXIBLE SHAFT AND CABLE ASSEMBLIES	
7762	Cable—Dial lamp cable with socket and section of connector	.76
4264	Clamp—Metal clamp—Package of 10	.35
4295	Screw—No. 10-32-¼-inch cupped point set screw—Fastens flexible shaft housing to shaft bushing—Package of 10	.20
7760	Shaft—Station selector flexible drive shaft—Approximately 29 inches long	1.60
7764	Shaft—Station selector flexible drive shaft—Approximately 24 inches long	1.55
7761	Shaft—Volume control flexible shaft—Approximately 31½ inches long	1.60
7763	Shaft—Volume control flexible drive shaft—Approximately 27 inches long	1.55
4265	Sleeve—Coupling sleeve for volume control shaft—Package of 5	.15
4263	Socket—Dial lamp socket	.20
	REPRODUCER ASSEMBLIES	
9493	Coil—Field coil magnet and cone support (L12)	2.70
9492	Cone—Reproducer cone (L11)—Package of 5	3.70
9491	Reproducer complete	4.16
	VIBRATOR ASSEMBLIES	
4280	Board—Terminal board—Located on filter pack	.35
4013	Capacitor—200 mmfd. (C31)	.30
4274	Capacitor—.025 mfd. (C34)	.80
4273	Capacitor—0.5 mfd. (C29)	.90
4275	Coil—Choke coil (L16)	.30
7758	Filter pack—Comprising one reactor, one choke coil, two 8. mfd. capacitors, one 0.5 and one 200 mmfd. capacitors (C30, C35, C36, C37, L14, L17)	6.00
4276	Plug—2-prong plug	.25
4308	Screw—Binder head No. 6-32-¼-inch screw—Fastens shield to cover—Package of 10	.18
4278	Socket—Vibrator mounting socket	.26
7759	Transformer—Vibrator transformer (T1)	3.95
7757	Vibrator assembly complete (R17, C32, C33, L15)	8.50
	HOUSING ASSEMBLIES	
4272	Bracket—Volume control shaft bracket—For left-hand mounting located on front of receiver housing	.28
4270	Cover—Tuning condenser drive bracket and worm assembly cover	$0.25
7755	Housing—Front section of housing complete—Less hinge pin	.80
7756	Housing—Rear section of housing complete—Less hinge pin	.54
4267	Nut—Wing nut—Package of 10	.46
4266	Pin—Hinge pin—Package of 5	.42
4268	Screw—Wing screw—Package of 10	.68
4269	Screw—No. 6 self-tapping screw for fastening front and bottom sections of housing—Package of 10	.50
4271	Screw—Self-tapping No. 6 screw for fastening tuning condenser drive bracket and worm cover to housing—Package of 10	.50
4295	Screw—No. 10-32-¼-inch headless set screw—Located in worm gear cover and bracket used to fasten drive shafts—Package of 10	.20
	MISCELLANEOUS ASSEMBLIES	
4287	Body—Antenna connector body—Package of 10	.40
4289	Body—Fuse connector body—Package of 10	.35
4283	Cable — Antenna lead-in cable — Approximately 35 inches long	.80
4288	Cap—Antenna or fuse connector cap—Package of 10	.36
4293	Capacitor—Ammeter capacitor—0.5 mfd.	.60
4292	Capacitor—Generator capacitor—0.5 mfd.	.90
4291	Clip—"A" supply clip—Package of 10	.70
7767	Escutcheon—Grille escutcheon and name plate	1.06
4286	Ferrule—Antenna or fuse connector ferrule and bushing—Package of 10	.38
3646	Fuse—20 ampere—Package of 5	.40
7765	Grille—Baffle board and grille cloth	.38
4290	Insulator—Fuse connector insulator—Package of 10	.35
4132	Knob—Noise suppressor or tone control knob—Package of 5	.55
4282	Knob—Station selector knob—Package of 5	.65
4691	Lacquer—Touch-up lacquer (1 pint of lacquer and 1 pint of thinner)	2.15
7766	Lead—Power lead with female section of fuse connector—From power cable to battery	.30
4284	Spring—Antenna or fuse connector spring—Package of 10	.30
6152	Suppressor—Distributor suppressor	.56
6151	Suppressor—Spark-plug suppressor	.56
4277	Screw—No. 8-32-⅜-inch binder head screw used to mount escutcheon—Package of 10	.22
4294	Screw—No. 10-32-5/16-inch hexagon head screw—Used to mount chassis to housing—Package of 10	.45
4285	Washer—Antenna or fuse connector insulating washer—Package of 10	.22

Instructions for

RCA Victor 124

Six-Tube Double-Range Superheterodyne

INSTALLATION

Preliminary—After unpacking the instrument, refer to the tube location diagram printed on the license label attached to the cabinet, and ***make certain:***

(a) That all tubes are in the proper sockets and pressed down firmly.

(b) That all shields are rigidly in place over the tubes shown by double circles on the diagram.

(c) That the short flexible (grid) leads shown on the diagram are attached to the dome contacts of the proper tubes as indicated, and that the spring contact clips are pressed down firmly.

> NOTE—The grid lead for the RCA-2B7 Radiotron must be enclosed by the cylindrical tube shield. A slot is provided at the bottom of this shield for entrance of the lead.

Location—The instrument should be placed convenient to the antenna and ground connections and near an electrical outlet.

Antenna and Ground—A well-insulated outdoor antenna having a length of from 50 to 100 feet, including the lead-in wire, is recommended. It should be erected as high as conveniently possible and sufficiently remote from power lines and street railways to prevent excessive local interference. If the instrument is installed in a building of non-metallic construction, an indoor antenna ordinarily will afford satisfactory reception and may be considered the most practical. Buildings in which the roof or framework is of metal, however, form an effective shield which greatly impedes the passage of radio waves; to insure best results in such installations, therefore, an outdoor antenna is essential.

A *good* ground connection also is essential for best performance. The ground lead should be as short as possible and preferably attached to a cold-water pipe. An approved ground clamp should be used to insure a tight and permanent connection.

A terminal board is provided at the rear of the receiver chassis for connection to the antenna and ground. Attach the antenna wire or lead-in to the left-hand terminal (marked "ANT.") and the ground wire to the right-hand terminal (marked "GND."). Tighten both terminals with a screwdriver to insure permanent electrical connections.

Power Supply—Connect the power cord to an electrical outlet supplying alternating current at the proper voltage and frequency (cycles), as specified on the license label.

OPERATION

Controls—The instrument has four operating controls, located on the front panel of the cabinet as follows:

(1) *Volume Control* (Left-hand Knob)—Volume increases with clockwise rotation.

(2) *Power Switch and Tone Control* (Middle Knob)—In extreme counter-clockwise position, power is "off"—slight clockwise rotation turns the power "on." Extreme clockwise position gives *full range* reproduction—counter-clockwise rotation decreases treble response and static interference (when latter is present).

(3) *Station Selector* (Right-hand Knob—Symmetrical with Volume Control)—Equipped with an illuminated dial, calibrated to facilitate location and identification of stations (add one cipher to scale numerals to obtain frequency in kilocycles).

(4) *Frequency Range Switch* (Below and to Right of Station Selector)—With this knob in its *counter-clockwise* position, stations in the standard broadcast band (540–1500 kilocycles) will be received, frequencies in this range being indicated by the large numerals adjacent to the scale graduations. With the knob in its *clockwise* position, stations transmitting between 1400 and 2800 kilocycles may be received. Frequencies in the latter range are indicated approximately by the small numerals at the top of the dial and include the following services:

(a) **Police Calls**—At dial settings near "170" for stations transmitting at 1712 kilocycles, and slightly above "240" for stations operating in the 2450 kilocycle band.

(b) **Amateur Radio "Phone"**—At dial settings between "180" and "200" (assigned band 1800–2000 kilocycles).

(c) **Aviation Communications "Phone"**—At dial settings above "240" (2400–2800 kilocycles).

Procedure—To operate the receiver, proceed as follows:

1. Set the Frequency Range Switch for the desired frequency band—see preceding paragraph (4).

2. Apply power by turning the Tone Control knob clockwise from the "off" position; continue rotation of this control to the opposite extremity for *full-range* reproduction. Set the Volume Control near the middle of its range.

3. Allow approximately one-half minute for the tubes to heat, then turn the Station Selector slowly over the range of the dial until a desirable station program is heard. If no station is heard, advance the Volume Control further in a clockwise direction and again rotate the Station Selector.

> NOTE—The majority of stations in the 1400–2800 kilocycle band do not offer continuous programs. Police calls are usually intermittent, at regular or irregular intervals. Local or strong stations in the 540–1500 kilocycle broadcast band may be audible (sometimes at more than one point on the dial) when the Frequency Range Switch is set for 1400–2800 kilocycles.

4. After receiving a signal, turn the Volume Control counter-clockwise until the volume is reduced to a low level. Now readjust the Station Selector accurately to the position mid-way between the points where the quality becomes poor or the signal disappears. ***This setting minimizes the proportion of background noise and provides the fine quality of reproduction possible with this instrument.***

5. Adjust the Volume Control to the desired volume level.

> NOTE—The *automatic volume control* built into this instrument maintains the volume level substantially constant irrespective of normal fluctuations of signal strength (fading). Also, other stations with good signal strength will be received at approximately the same volume without readjustment of the Volume Control.

6. Turn the Tone Control counter-clockwise if reduced treble response is preferred, or if interference (static) is excessive.

7. When through operating, switch the power "off" by turning the Tone Control knob to its extreme counter-clockwise position.

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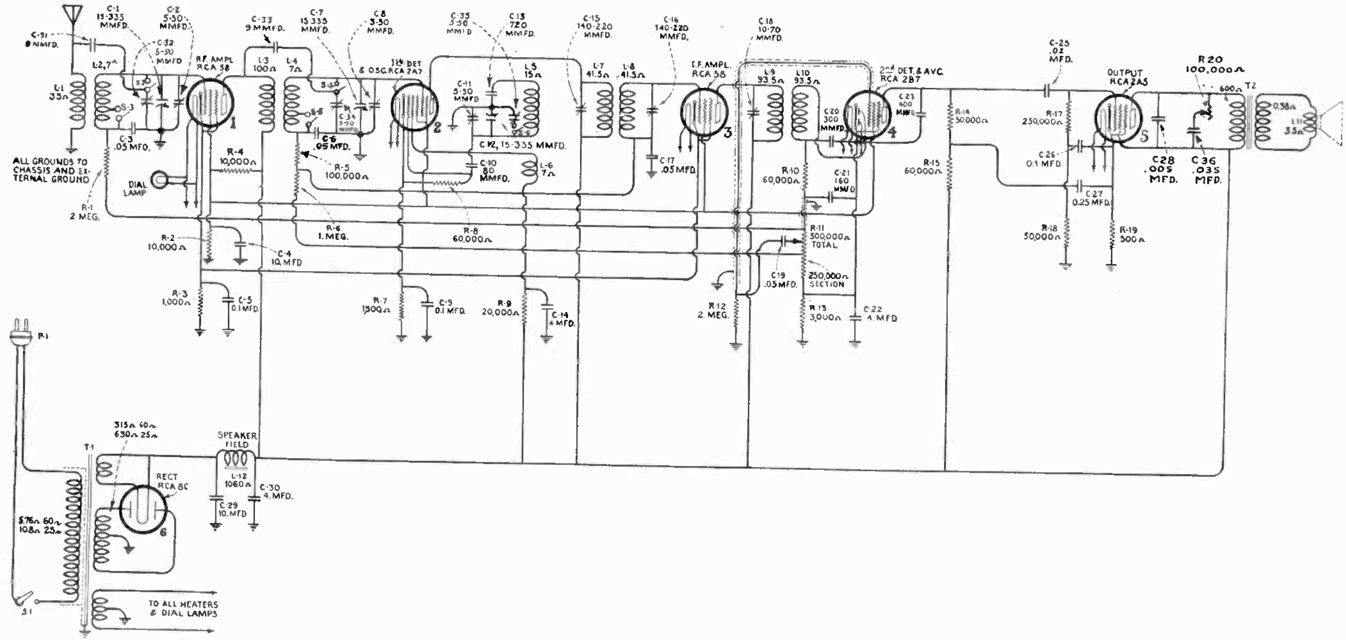

Figure A—Schematic Circuit Diagram

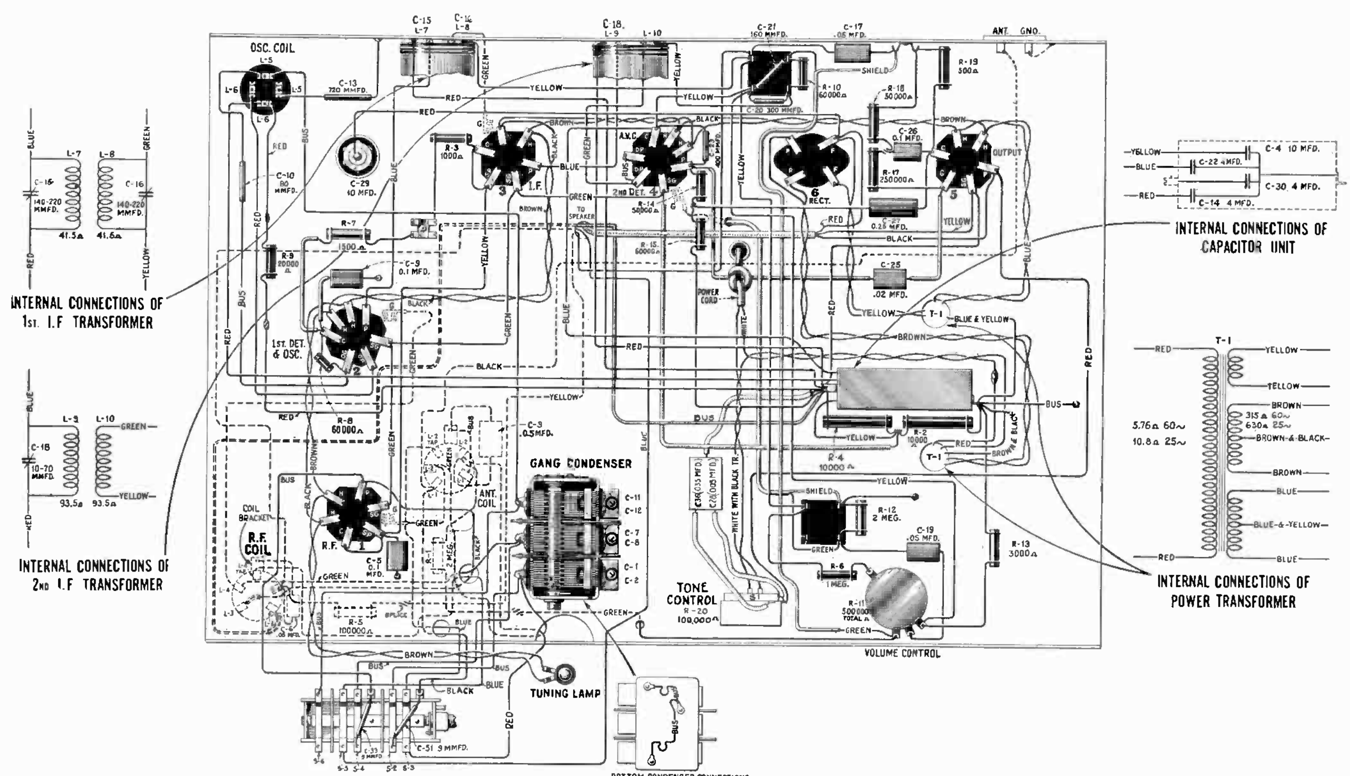

Figure B—Wiring Diagram

SERVICE DATA

ELECTRICAL SPECIFICATIONS

Voltage Rating............................105–125 Volts
Frequency Rating.................25–60 and 50–60 Cycles
Power Consumption...60 Cycle 75 Watts, 25 Cycle 80 Watts
Number and Types of Radiotrons...............2 RCA-58, 1 RCA-2A7, 1 RCA-2B7, 1 RCA-2A5, 1 RCA-80—Total 6
Undistorted Output............................1.75 Watts
Frequency Range.................540 K. C. to 1500 K. C. and 1400 to 2800 K. C.

This receiver is a six-tube Superheterodyne incorporating features such as Dynamic Loudspeaker, automatic volume control, single heater type Pentode output tube, continuously variable type tone control and the inherent sensitivity, selectivity and tone quality of the Superheterodyne.

A special feature is a Range Switch that allows reception of signals either of the broadcast band or higher frequencies. Figure A shows the schematic circuit, Figure B the wiring diagram and Figure C the loudspeaker wiring. With the switch in the broadcast band position, the frequency range is from 540 to 1500 K. C. At the higher frequency position, the receiver covers the 1400 to 2800 K. C. band.

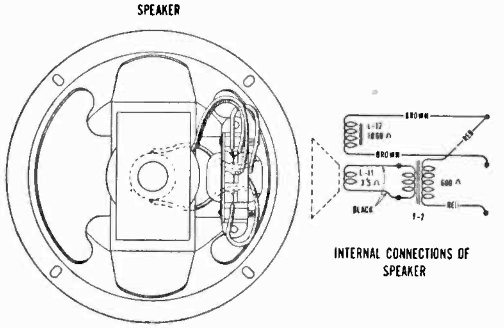

Figure C—Loudspeaker Wiring

The circuit consists of an R. F. stage using Radiotron RCA-58, a combined oscillator and first detector in the RCA-2A7 tube, an intermediate stage using Radiotron RCA-58, an RCA-2B7 functioning a combined second detector and automatic volume control, an output stage using the new heater Pentode RCA-2A5 and the RCA-80 functioning as a rectifier.

Service work in conjunction with this receiver will be similar to that of other Superheterodyne receivers incorporating a similar type automatic volume control.

LINE-UP ADJUSTMENTS

I. F. Tuning Adjustments—Two transformers comprising three tuned circuits (the secondary of the second transformer is untuned) are used in the intermediate amplifier. These are tuned to 175 K. C. and the adjustment screws are accessible as shown in Figure D. Proceed as follows:

(a) Procure a modulated oscillator giving a signal at 175 K. C., a non-metallic screw driver such as Stock No. 7065 and an output meter.

(b) Short-circuit the antenna and ground terminals and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the chassis.

(c) Connect the oscillator output between the first detector control grid and chassis ground. Connect the output meter across the voice coil of the loudspeaker and adjust the oscillator output so that with the receiver volume control at maximum, a slight deflection is obtained in the output meter.

(d) Adjust the primary of the second, and the secondary and primary of the first I. F. transformers until a maximum deflection is obtained. Keep the oscillator output at a low value so that only a slight deflection is obtained on the output meter at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. adjustments.

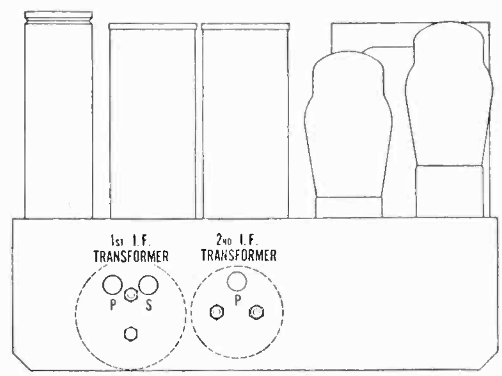

Figure D—Location of I. F. Line-up Adjustment Screws

R. F. and Oscillator Adjustments—The three gang capacitor screws are accessible at the bottom of the chassis. The high frequency capacitor screws are located on the Range Switch. Proceed as follows:

(a) Procure a modulated oscillator giving a signal at 1400 and 2440 K. C., a non-metallic screw driver such as Stock No. 7065 and an output meter.

(b) Connect the output of the oscillator to the antenna and ground terminals of the receiver. Check the dial at the extreme maximum position of the tuning capacitor. The indicator should be opposite the last division of the low frequency end of scale with the indicator at its center position. Then set the dial at 140. the oscillator at 1400 K. C. and connect the output meter across the cone coil. Adjust the oscillator output so that a slight deflection is obtained when the receiver volume control is at maximum.

(c) With the Range Switch at the counter-clockwise position, adjust the three tuning condenser line-up capacitors until maximum deflection is obtained in the output meter. Then shift the oscillator to 2440 K. C., the Range Switch to the clockwise position and the dial to 120. The three line-up capacitors located on the Range Switch should then be adjusted for maximum output.

When making both the I. F. and R. F. adjustments, the important points to remember are that the receiver volume control must be at its maximum position and that the input signal from the external oscillator must be no greater than necessary.

TUBE SOCKET VOLTAGES

115 Volts, A. C. Line—No Signal

Radiotron No.	Cathode to Control Grid, Volts	Cathode to Screen Grid, Volts	Cathode to Plate, Volts	Plate Current M. A.	Heater Volts
1. RCA-58 R. F.	4.0	95	255	5.0	2.31
2. RCA-2A7 1st Det. Osc.	5.0*	95*	255*	3.0*	2.31
3. RCA-58 I. F.	4.0	95	255	5.0	2.31
4. RCA-2B7 2nd Det. A. V. C.	7.5	92	60	2.0	2.31
5. RCA-2A5 Power	20.0	250	235	33.0	2.81
6. RCA-80 Rectifier	700–350 Volts—75 M. A. Total Current				4.82

*The voltages and current refer to the detector part of the tube. The total cathode current is 10 M. A.

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
2269	Capacitor—720 mmfd. (C13)	$0.75
2747	Cap—Contact cap—Package of 5	.50
3047	Resistor — 1500 ohms — Carbon type — ½ watt (R7)—Package of 5	1.00
3076	Resistor — 1 megohm — Carbon type — ½ watt (R6)—Package of 5	1.00
3252	Resistor—100,000 ohms—Carbon type—½ watt (R5)—Package of 5	1.00
3358	Resistor — 3,000 ohms — Carbon type — ½ watt (R13)—Package of 5	1.00
3459	Capacitor—80 mmfd. (C10)	.44
3514	Resistor—250,000 ohms—Carbon type—½ watt (R17)—Package of 5	1.00
3572	Socket—Radiotron 7-contact socket	.38
3584	Ring—R. F. or oscillator coil retaining ring—Package of 5	.40
3594	Resistor—50,000 ohms—Carbon type—½ watt (R14, R18)—Package of 5	1.00
3597	Capacitor—0.25 mfd. (C27)	.40
3598	Capacitor—0.1 mfd.—R. F. and I. F. by-pass (C5)	.36
3616	Capacitor—300 mmfd. (C20)	.34
3623	Shield—Antenna or R. F. coil shield	.30
3626	Shield—Oscillator coil shield	.22
3630	Resistor — 10,000 ohms — Carbon type — 3 watt (R2, R4)	.25
3632	Resistor — 500 ohms — Carbon type — 1 watt (R19)—Package of 5	1.10
3633	Capacitor—400 mmfd. (C23)	.38
3634	Capacitor—160 mmfd. (C21)	.34
3639	Capacitor—0.02 mfd. (C25)	.25
3640	Capacitor—0.05 mfd. (C3, C6, C17, C19)	.25
3641	Capacitor—0.1 mfd. (C9, C26)	.35
3721	Resistor — 1,000 ohms — Carbon type — ½ watt (R3)—Package of 5	1.00
3783	Capacitor—9 mmfd. (C31, C33)—Package of 2	.50
4103	Shield—Radiotron shield—I. F. or R. F.	.20
4133	Knob—Station selector, volume control, tone control or range switch knob—Package of 5	.80
4135	Socket—Dial lamp socket and bracket	$0.25
4140	Shield—Radiotron shield—1st detector	.30
4141	Shield—Radiotron shield—2nd detector	.36
6188	Resistor — 2 megohm — Carbon type — ½ watt (R1, R12)—Package of 5	1.00
6282	Resistor—60,000 ohms—Carbon type—½ watt (R8, R10, R15)—Package of 5	1.00
6300	Socket—Radiotron 4-contact socket	.35
6303	Resistor—20,000 ohms—Carbon type—½ watt (R9)—Package of 5	1.00
6471	Coil—Oscillator coil (L5, L6)	.74
6483	Transformer—1st intermediate frequency transformer (L7, L8, C15, C16)	1.84
6484	Transformer—2nd intermediate frequency transformer (L9, L10, C18)	1.70
6485	Volume control—With mounting nut (R11)	1.20
6487	Capacitor assembly—Comprising three 4.0 mfd. and one 10.0 mfd. capacitors (C4, C14, C22, C30)	2.90
6527	Coil—Antenna coil (L1, L2)	1.08
6528	Coil—R. F. coil (L3, L4)	.94
6534	Switch—Range switch (S2, S3, S4, S5, S6, C32, C34, C35)	1.25
6598	Condenser—3-gang variable tuning condenser (C1, C2, C7, C8, C11, C12)	3.00
6619	Tone control with mounting nut (R20)	1.44
6620	Capacitor—Comprising one .005 and one .035 mfd. (C28, C36)	.50
6851	Scale—Dial scale and drive assembly	1.22
6853	Escutcheon—Station selector escutcheon	.34
7485	Socket—Radiotron 6-contact socket	.40
7590	Capacitor—10.0 mfd. (C29)	1.40
9005	Transformer—Power transformer—105–125 volts, 50–60 cycles (T1)	4.80
9006	Transformer—Power transformer—200–250 volts, 50–60 cycles	5.05
9024	Transformer—Power transformer—105–125 volts, 25–50 cycles	5.85
	REPRODUCER ASSEMBLIES	
6476	Transformer—Output transformer (T2)	1.44
6852	Cable—3-conductor reproducer cable	.26
9032	Coil assembly—Comprising coil, magnet and cone support (L12)	2.35
9428	Cone—Reproducer cone (L11)—Package of 5	5.00
9440	Reproducer complete	4.75

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RCA Victor Company, Inc.

CAMDEN, NEW JERSEY, U. S. A.

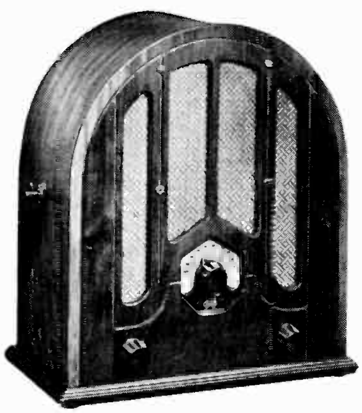
23758 Printed in U. S. A.

RCA Victor

Battery Radio Model 126-B

Six-Tube, Single Band Super-Heterodyne

SERVICE NOTES



SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

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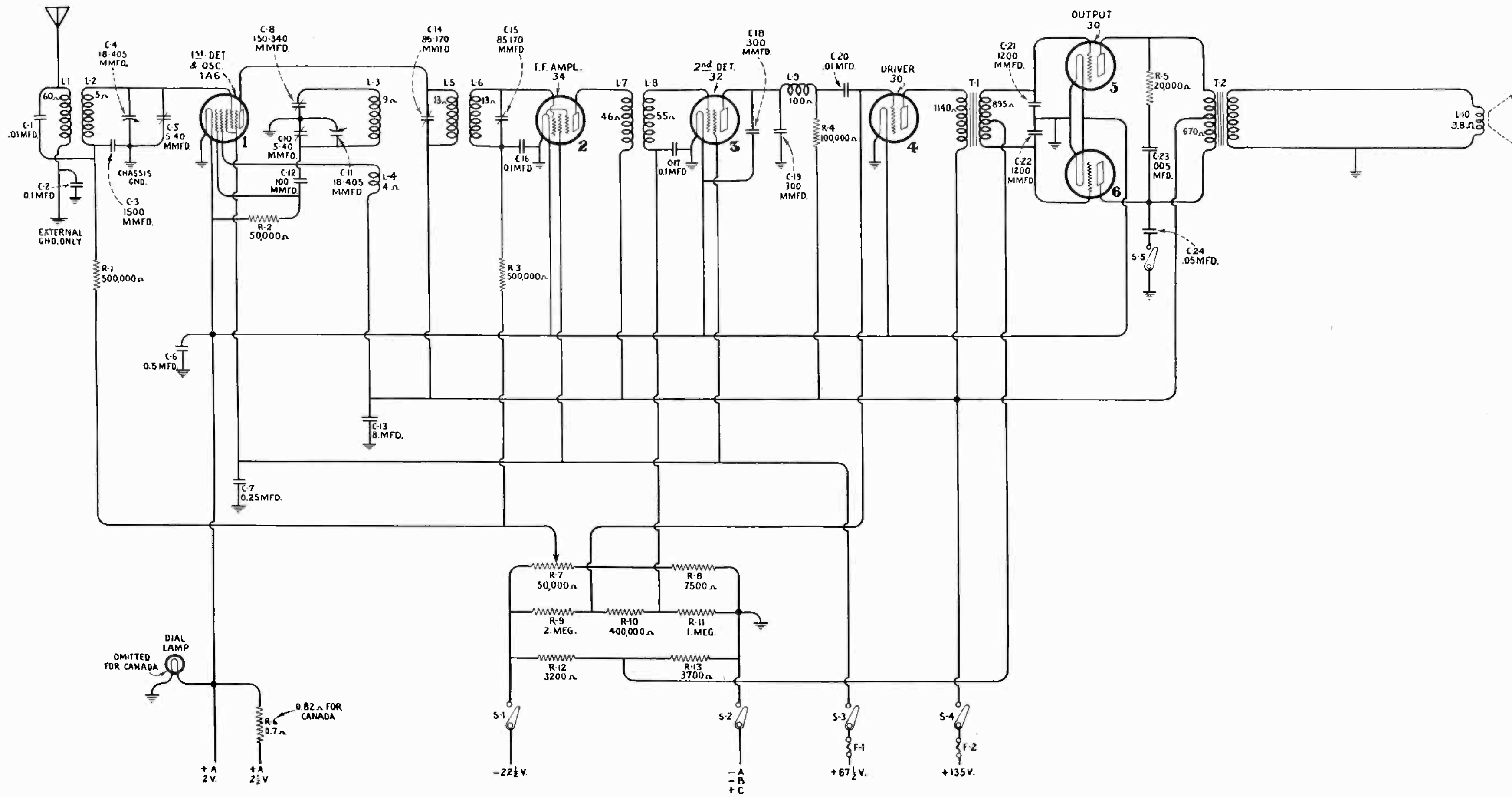


Figure 1—Schematic Circuit Diagram

RCA VICTOR MODEL 126-B

Six-Tube Battery Receiver

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Type and Number of Radiotrons	1 RCA-1A6, 1 RCA-34, 1 RCA-32, 3 RCA-30—Total, 6
Total "A" Battery Current	0.45 Ampere
Total "B" Battery Current	15 M. A.
Batteries Required: "A"	Eveready Air Cell A-600 or 2-volt storage cell
"B"	Three 45-volt "B" batteries
"C"	One 22½-volt "C" battery
Tuning Frequency Range	540 K. C.–1600 K. C.
Maximum Undistorted Output	0.7 Watt
Line-up Frequencies	I. F., 460 K. C. Osc.-Det., 1400 K. C. and 600 K. C.

PHYSICAL SPECIFICATIONS

Height	13½ inches
Width	12 inches
Depth	7 inches

This six-tube battery operated superheterodyne receiver incorporates the latest refinements of receiver construction that permit excellent and economical operation. Outstanding features include a permanent magnet dynamic type loudspeaker, two-point tone control, Class "B" output stage and high I. F. frequency for eliminating image frequency response.

The chassis is characterized by compact construction and accessibility of parts. Suitable electrical protection of the tubes is provided by placing a fuse in each "B" battery lead.

DESCRIPTION OF ELECTRICAL CIRCUIT

The circuit is of the superheterodyne type and consists of a combined oscillator-detector stage, an I. F. amplifying stage, a second detector, an A. F. driver and a Class "B" output stage. A low-current dial lamp is a new feature for battery-operated receivers. A four-pole switch opens all battery leads at the off-position. Figure 1 shows the schematic wiring diagram, while Figure 2 shows the chassis wiring.

The signal enters the receiver through the antenna transformer and is applied through a tuned circuit to the grid of the first detector. Combined with the signal is the local oscillator signal, which is at a constant frequency difference (460 K. C. higher) at all positions of the dial. The combined signals after passing through the first detector produce the I. F. signal. The RCA-1A6 is the combined detector and oscillator.

The I. F. amplifier consists of two transformers having four circuits, two of which are tuned by means of trimmer capacitors. The tube used is an RCA-34, which is a super-control screen grid amplifying tube of the 2-volt variety. The high I. F. frequency (460 K. C.) is used to reduce image frequency response which would occur if a lower I. F. frequency were used in a receiver not including an R. F. stage.

The output of the I. F. amplifier is applied to the second detector, an RCA-32, which extracts the A. F. component of the I. F. signal and applies it to the grid of the driver stage, which is an RCA-30. Resistance coupling is used between these two stages.

The RCA-30 driver stage is coupled to two RCA-30's, which are operated as a Class "B" output amplifier. These tubes are operated with a 12-volt grid bias, which reduces their plate current to 1 M. A. with no signal, although it greatly increases as a signal is applied. A stepdown input transformer is used for driving the stage and a stepdown output transformer provides a means of matching the output and the voice coil of the loudspeaker. An 0.05 capacitor connected from one plate to ground by means of the tone control switch reduces the high-frequency response when the switch is closed.

Plate and grid voltages are supplied through a high resistance bleeder system of which the volume control is a part. The volume control varies the bias voltage applied to the first detector and I. F. Tubes.

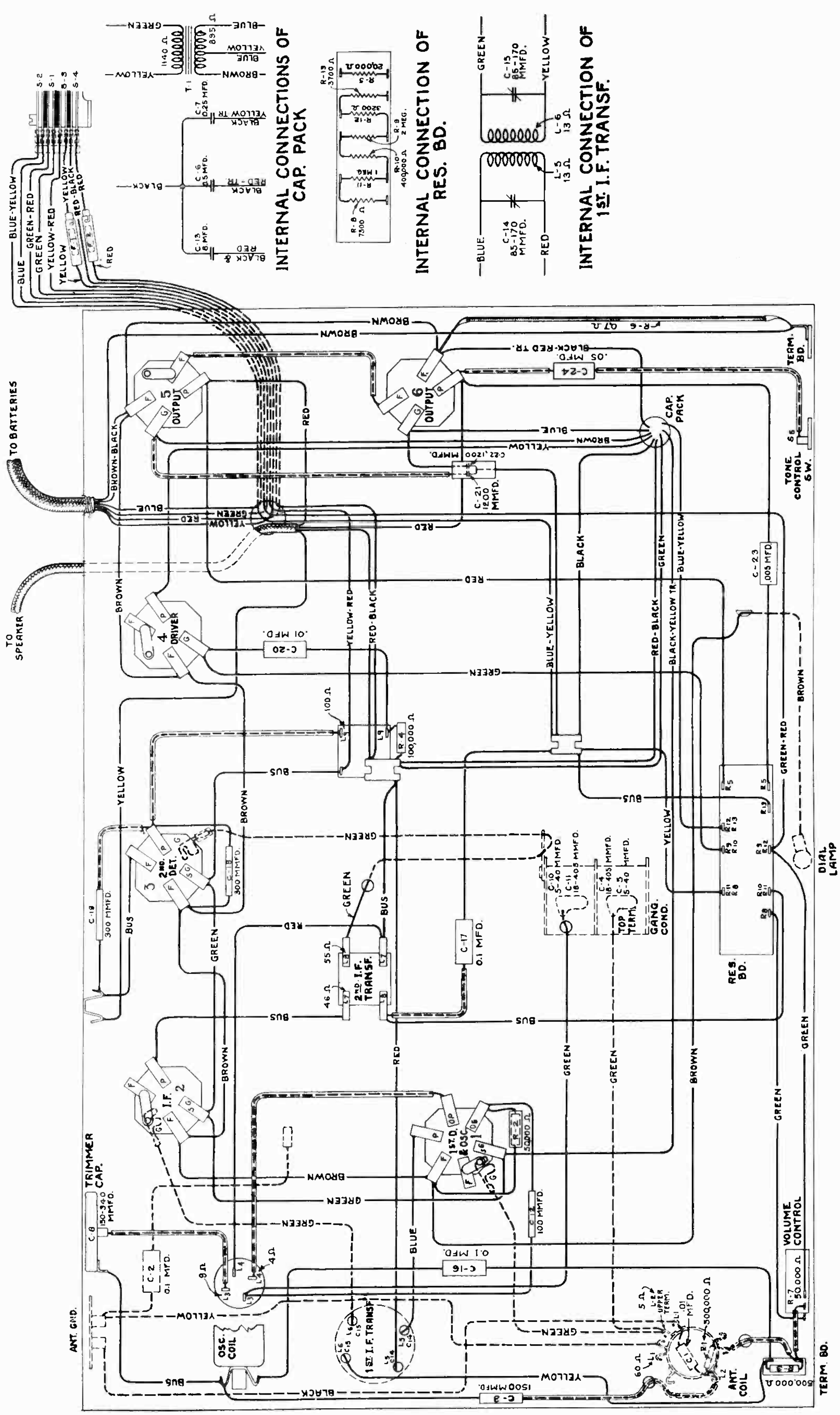


Figure 2—Chassis Wiring Diagram

Sig. 10

SERVICE DATA

(1) Important

Always disconnect the batteries before attempting to remove the chassis from the cabinet. Always turn the operating switch "off" before changing tubes, batteries or fuses.

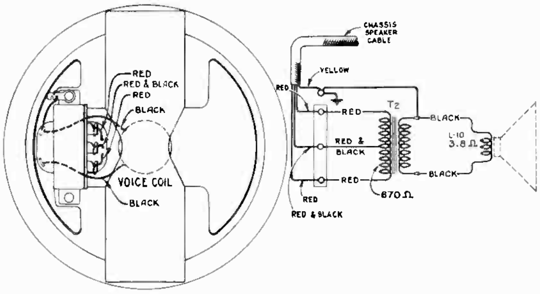


Figure 3—Loudspeaker Wiring

(2) Line-up Capacitor Adjustments

Line-up capacitors are provided in the first detector, oscillator and intermediate amplifier to provide a means of properly aligning the receiver. A modulated R. F. oscillator, such as Full Range Test Oscillator, type TMV-97-B (Stock No. 9050), a non-metallic screw driver, such as alignment wrench (Stock No. 4160), and an output indicator are required for properly aligning this receiver. Refer to Figure 4 for the location of the line-up capacitors.

I. F. Adjustments

Two transformers comprising four circuits, two of which have trimmer capacitors, are used in the I. F. amplifier. Proceed as follows:

(a) Short-circuit the antenna and ground terminals and connect the output of the oscillator between the control grid cap of the first detector (RCA-1A6) and ground. Connect an output indicator across the voice coil leads of the loudspeaker. Place the oscillator in operation at 460 K. C. and adjust its output and the receiver volume control until a deflection is obtained in the output indicator.

(b) Adjust the secondary and then the primary of the first I. F. transformer (see Figure 4) until a maximum deflection is obtained in the output indicator.

This completes the I. F. adjustments. It is good practice to always follow the I. F. adjustments with the detector and oscillator adjustment, as there is an interlocking of adjustments that always occurs.

Detector-Oscillator Adjustments

The two-gang capacitor trimmer screws are accessible at the top of chassis. The series (600 K. C.) trimmer is accessible from the rear. Proceed as follows:

(a) Connect the oscillator between the antenna and ground terminals of the receiver. Connect the output meter across the voice coil leads of the loudspeaker.

(b) Place the oscillator in operation at 1400 K. C., set the dial at 140 and adjust the oscillator output and receiver volume control until a deflection is obtained in the output indicator.

(c) Adjust each trimmer on the gang capacitor until a maximum deflection is obtained.

(d) Set the oscillator at 600 K. C. and tune in the signal on the receiver. Then adjust the series trimmer, located on the rear of the chassis, until maximum output is obtained. While making this adjustment, rock the tuning capacitor back and forth through the signal. Then again check the adjustments in (b).

(3) Voltage Readings

The following voltages are those at the tube sockets while the receiver is in operating condition. No allowance has been made for current drawn by the meter and if low resistance meters are used, such allowances must be made.

RADIOTRON SOCKET VOLTAGES

135-Volt "B" Supply—No Signal—Maximum Volume Control

Radiotron No.		Control Grid to Ground Volts, D. C.	Screen Grid to Ground Volts, D. C.	Plate to Ground Volts, D. C.	Plate, M. A.	Filament Volts, D. C.
RCA-1A6	1st Det.	*3.0	67.5	135	1.7	2.0
	Osc.	—	—	135	1.8	
RCA-34—I. F.		*3.0	67.5	135	3.0	2.0
RCA-32—2nd Det.		*6.5	67.5	*95	0.4	2.0
RCA-30—Driver		*9.0	—	130	3.5	2.0
RCA-30—Output		12.0	—	135	1.0	2.0
RCA-30—Output		12.0	—	135	1.0	2.0

*These voltages cannot be measured with ordinary voltmeter, as they are obtained by means of high resistance bleeders across a 22½-volt "C" battery.

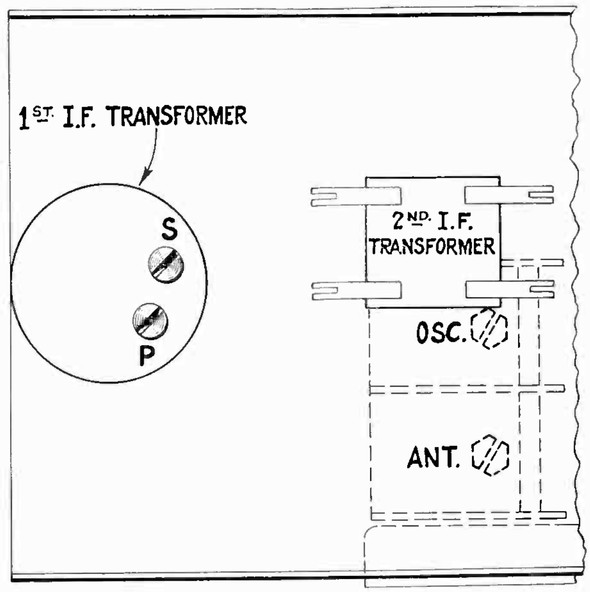


Figure 4—Location of Line-up Capacitors

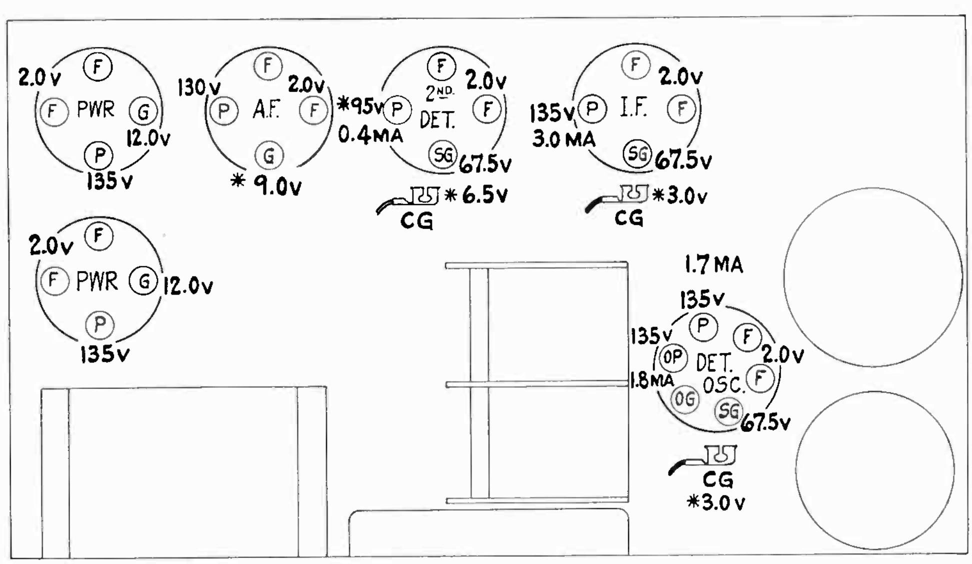


Figure 5—Socket Voltage Readings

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers.

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
2747	Cap—Contact cap—Package of 5	$0.50
4000	Capacitor—Adjustable trimmer capacitor (C8)	.78
4353	Capacitor—100 mmfd. (C12)	.30
4354	Capacitor—1500 mmfd. (C3)	.36
4352	Capacitor—300 mmfd. (C18, C19)	.25
6512	Capacitor—0.005 mfd. (C23)	.28
3888	Capacitor—0.05 mfd. (C24)	.25
3701	Capacitor—0.01 mfd. (C1, C20)	.30
3877	Capacitor—0.1 mfd. (C2, C16, C17)	.32
4355	Capacitor pack — Comprising two 1200 mmfd. capacitors (C21, C22)	.26
4349	Capacitor and transformer pack—Comprising one 8.0 mfd., one 0.5, one 0.25 mfd. capacitor and driver transformer (C7, C6, C13, T1)	3.95
6992	Coil—Antenna coil (L1, L2, R1, C1)	.98
4343	Coil—Choke coil (L9)	.60
6664	Coil—Oscillator coil (L3, L4)	.94
6660	Condenser—2-gang variable tuning condenser (C4, C5, C10, C11)	2.78
4356	Resistor—0.7 ohm—Flexible type (R6)—Package of 10	1.50
4345	Resistor — 3200 ohms — Carbon type — ¼ watt (R12)—Package of 10	2.00
4346	Resistor — 3700 ohms — Carbon type — ¼ watt (R13)—Package of 10	2.00
4344	Resistor — 7500 ohms — Carbon type — ¼ watt (R8)—Package of 10	2.00
6303	Resistor—20,000 ohms—Carbon type—½ watt (R5)—Package of 5	1.00
3114	Resistor—50,000 ohms—Carbon type—¼ watt (R2)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R4)—Package of 5	1.00
3619	Resistor—400,000 ohms—Carbon type—¼ watt (R10)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R1, R3)—Package of 5	1.00
3033	Resistor—1 megohm—Carbon type—¼ watt (R11)—Package of 5	1.00
6242	Resistor—2 megohm—Carbon type—¼ watt (R9)—Package of 5	1 00
3584	Ring—Oscillator coil retaining ring—Package of 5	.40
3682	Shield—First detector and oscillator—Radiotron shield	.22
4351	Shield—I. F. Radiotron socket shield	.25
6665	Shield—Oscillator coil shield	.34
3056	Shield—Second detector—Radiotron shield—Package of 2	.40
3858	Socket—Dial lamp socket	.26
6300	Socket—4-contact second detector—Radiotron socket	.35

Stock No.	Description	List Price
6980	Socket—4-contact output (No. 5) Radiotron socket	$0.20
3859	Socket—4-contact output (No. 6) Radiotron socket	.30
4232	Socket—6-contact—1st detector and oscillator—Radiotron socket	.35
6669	Switch—Tone control switch (S5)	.50
4347	Terminal strip—Engraved "ANT-GND"	.25
6993	Transformer—First intermediate frequency transformer (L5, L6, C14, C15)	2.10
6994	Transformer—Second intermediate frequency transformer (L7, L8)	1.05
6995	Volume control (R7)	1.10
	REPRODUCER ASSEMBLIES	
4350	Cable—4-conductor—Reproducer cable	.54
9428	Cone—Reproducer cone (L10)—Package of 5	5.00
9503	Housing—Cone housing and core assembly	2.70
3949	Magnet	1.40
9502	Reproducer assembly complete	8.40
6996	Transformer—Output transformer (T2)	1.68
	MISCELLANEOUS ASSEMBLIES	
4289	Body—Fuse connector body—Package of 10	.35
4357	Cable—Battery cable—6-conductor	1.52
4288	Cap—Fuse connector cap—Package of 10	.36
6516	Connector—Fuse connector complete	.16
4468	Dial—Station selector dial	.22
6176	Escutcheon—Operating switch escutcheon—Package of 5	.50
4286	Ferrule—Fuse connector ferrule and bushing—Package of 10	.38
3748	Fuse—0.5 ampere (F1, F2)—Package of 5	.40
4290	Insulator—Fuse connector insulator—Package of 10	.35
3088	Knob—Operating switch knob—Package of 5	.50
4085	Knob—Station selector knob and pointer—Package of 5	.60
4132	Knob—Volume control or tone control switch knob—Package of 5	.55
4348	Lamp—Dial lamp	.38
9050	Oscillator—Test oscillator—90 to 25,000 K.C.	29.50†
3886	Reflector—Dial light reflector	.30
3238	Screw—Set screw for operating switch knob—Package of 10	.25
4393	Screw—No. 8-32-5/16-inch headless set screw for knobs—Package of 10	.25
4160	Screw driver—Combination insulated screw driver and socket wrench for I. F. and R. F. adjustments	1.00
4284	Spring—Fuse connector spring—Package of 10	.30
4540	Switch—Operating switch (S1, S2, S3, S4)	2.28
4285	Washer—Fuse connector insulating washer—Package of 10	.22

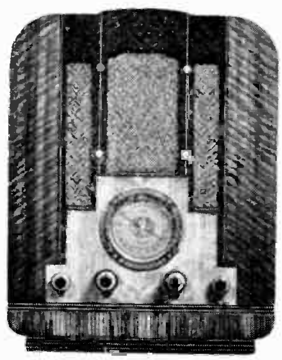
† Full Discount Not Allowed

RCA Victor

Direct Current Radio Model 127

Six-Tube, 220-Volt D. C., Two-Band Receiver

SERVICE NOTES



SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

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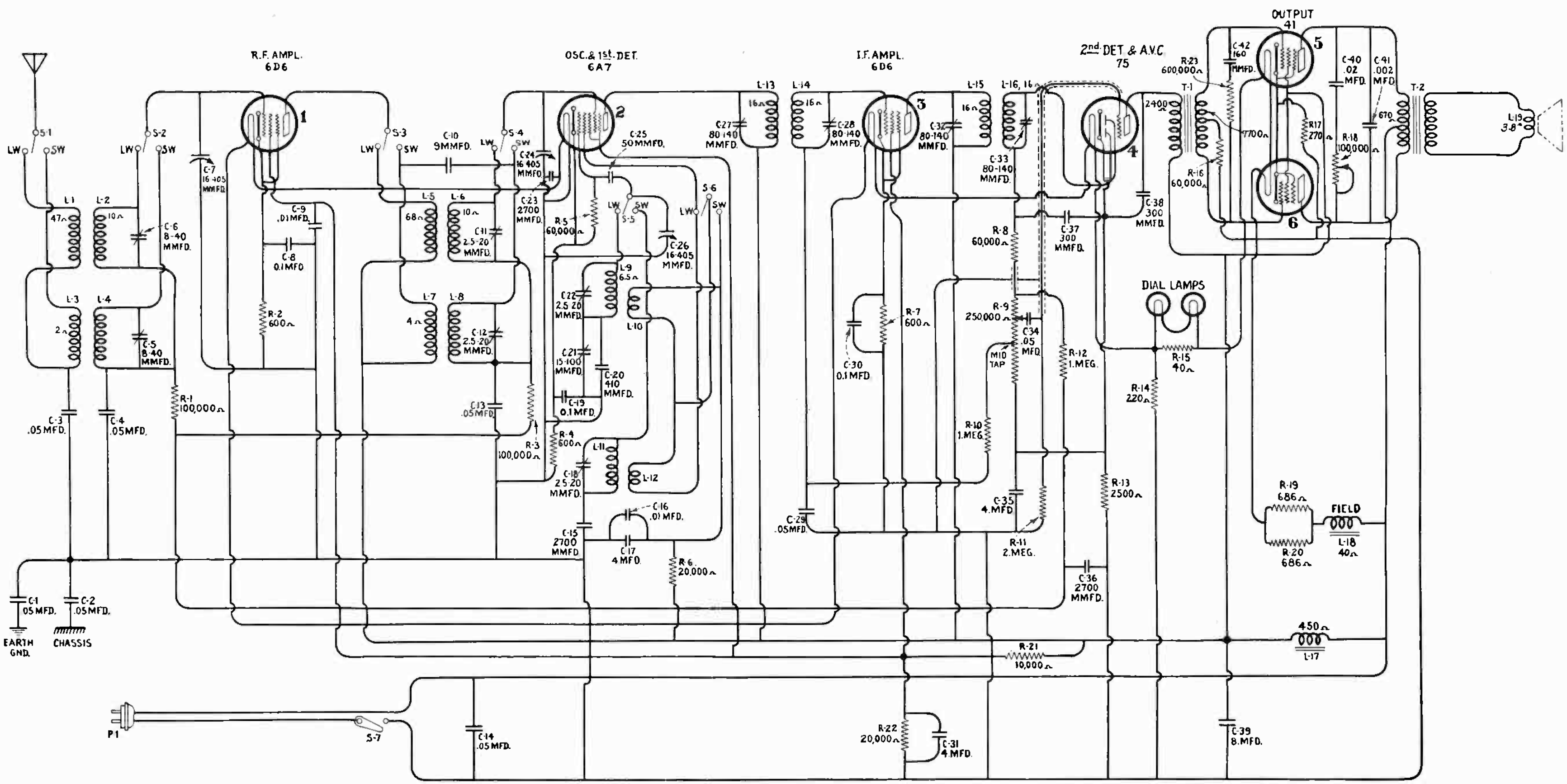


Figure 1—Schematic Circuit

RCA VICTOR MODEL 127

Six-Tube, 220 Volt D. C., Two-Band Receiver

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Voltage Rating	200–250 Volts D. C.
Power Consumption	145 Watts Maximum
Number and Types of Radiotrons	2 RCA-6D6, 1 RCA-6A7, 1 RCA-75, 2 RCA-41—Total, 6
Tuning Ranges	540 K. C.–1500 K. C. and 5400 K. C.–15,350 K. C.
Maximum Undistorted Power Output	2.5 Watts
Line-up Frequencies	370 K. C., 600 K. C., 1400 K. C., 15,000 K. C.

PHYSICAL SPECIFICATIONS

Height	17½ Inches
Width	13½ Inches
Depth	6½ Inches

This receiver is a six-tube, two-band, 220-volt direct current superheterodyne designed to receive both the standard and short-wave broadcasting bands. A range switch provides an easy means of changing to either band desired. Special features include a double reduction vernier drive giving either a 10–1 or 50–1 ratio of speed reduction, a continuously variable tone control, electro-dynamic type loudspeaker, automatic volume control and a high gain push-pull power amplifier.

Excellent sensitivity, selectivity and tone quality are characteristic of this instrument. An "airplane" type dial, calibrated in frequency and showing the location of the short-wave bands, is a special feature of this instrument. Small, compact size and unusual accessibility of parts are important service features. Figure 1 shows the schematic circuit, Figure 2 the chassis wiring, and Figure 3 the speaker wiring.

ELECTRICAL DESCRIPTION OF CIRCUIT

The signal enters the receiver through the antenna coupling transformer, the secondary of which is tuned and is applied to the grid of the RCA-6D6 R. F. amplifier. The output of this stage is then coupled through a tuned stage to the grid of the RCA-6A7, which is a combined first detector and oscillator. The oscillator maintains a constant frequency difference (370 K. C. higher) from the R. F. signal, with which it is combined in the first detector grid circuit. The output of the first detector is a 370 K. C. signal, which is of course the intermediate frequency.

Two sets of coils are provided for the R. F., oscillator and first detector coils for the two tuning ranges provided. A push-pull switch permits selection of the desired band.

The intermediate frequency amplifier consists of a single RCA-6D6 and two transformers, comprising four circuits, all of which are tuned.

The output of the I. F. amplifier is then applied to the RCA-75, which is the combined second detector, automatic volume control and A. F. amplifier. The signal is applied to the diode sections of the tube, which act as a two-element rectifier. The direct current component of the rectified signal produces a voltage drop across resistors R-8 and R-9. This voltage drop constitutes the automatic bias voltage for the R. F., first detector and I. F. amplifier, which gives the automatic volume control action of the receiver. The volume control selects the amount of audio voltage that is applied to the RCA-75 and

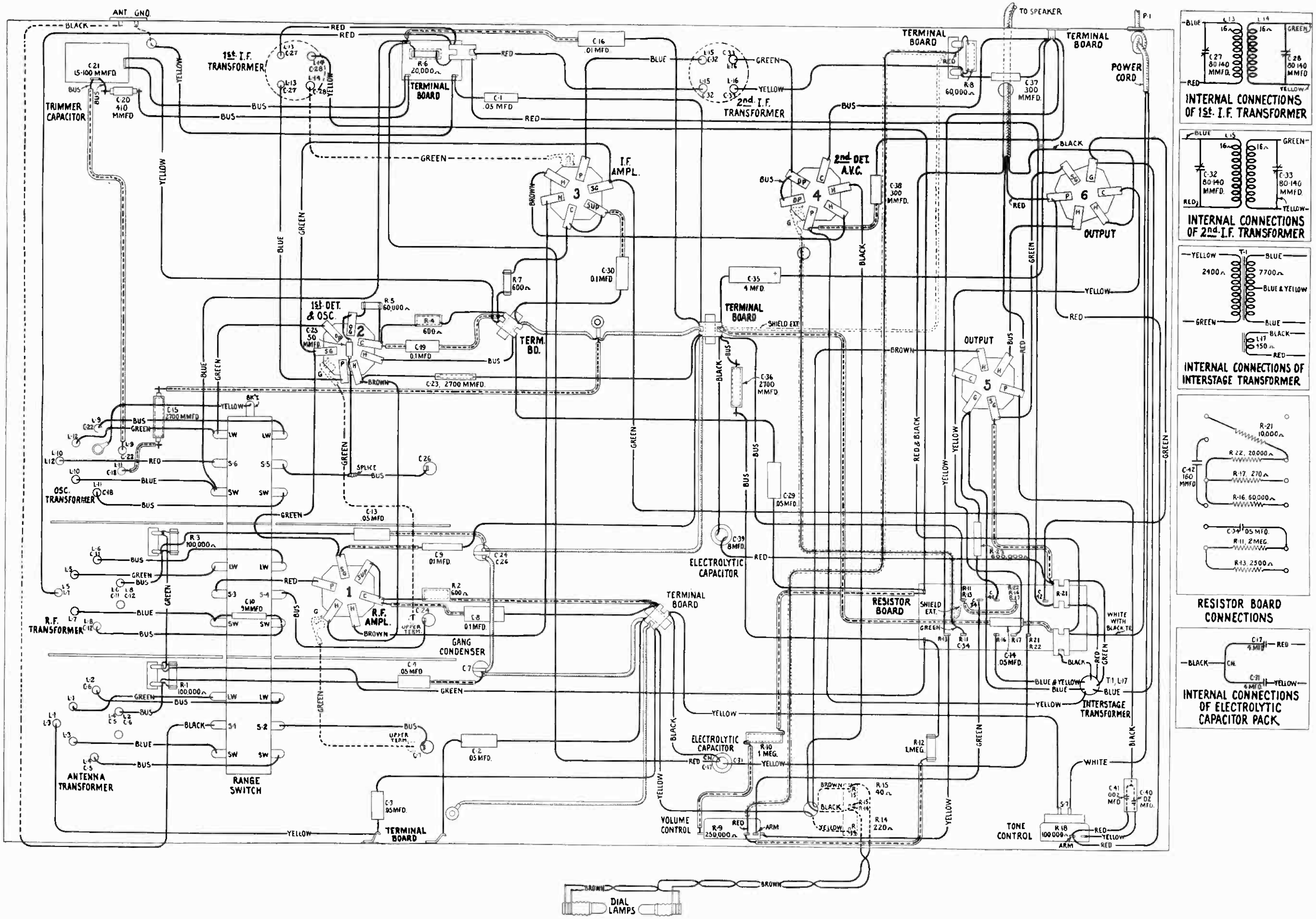


Figure 2—Wiring Diagram

thereby regulates the audio output of the entire receiver.

The output of the RCA-75 is transformer coupled to the grid of the RCA-41 tubes, which constitute the output amplifier of the receiver. These are operated as a push-pull Pentode stage and give the receiver a high gain audio amplifier (necessary for short-wave reception) and a large undistorted power output. The plate circuit of the output stage is matched to the cone coil of the reproducer by means of a step-down output transformer.

The tone control consists of a variable resistor and capacitor connected in series and placed across the plates of the output stage. Reducing the amount of resistance attenuates the high frequency response of the receiver.

The power supply is taken direct from the line. All tube heaters, the speaker field and the dial lamps are connected in series with a resistor and placed across the line. Plate and grid voltages use the same source, although suitable filters and resistors are used to properly filter the line and provide correct voltages.

SERVICE DATA

CAUTION—This receiver operates on 220-volt direct current without a transformer between the line and the various parts of the receiver, such as A. C. receivers use. It is therefore extremely important to use the utmost caution when operating the receiver outside of the cabinet. Also a knob must always be placed on the shaft of the main tuning capacitor, as under certain conditions the full line voltage is obtained between this point and ground.

(1) Line-up Capacitor Adjustments

To properly align this receiver, it is essential that a modulated R. F. oscillator, such as Stock No. 9050, an output indicator and an alignment tool (Stock No. 4160) be available. Figure 4 shows the location of the various line-up capacitors.

I. F. Tuning Adjustments

Two transformers comprising four tuned circuits are used in the intermediate amplifier. These are tuned to 370 K. C. and the adjustment screws are accessible as shown in Figure 4. Proceed as follows:

(a) Short-circuit the antenna and ground leads and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the ground terminal.

(b) Connect the test oscillator output between the first detector control grid and chassis ground, preferably through a series condenser. Connect the output meter across the voice coil of the loudspeaker and adjust the oscillator output so that, with the receiver volume control at maximum, a slight deflection is obtained in the output meter.

(c) Adjust the secondary and primary of the first and then the second I. F. transformers until a maximum deflection is obtained. Keep the oscillator output at a low value so that only a slight deflection is obtained on the output meter at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. adjustments.

R. F. and Oscillator Adjustments

The R. F. line-up capacitors are located at the bottom of the coil assemblies instead of their usual

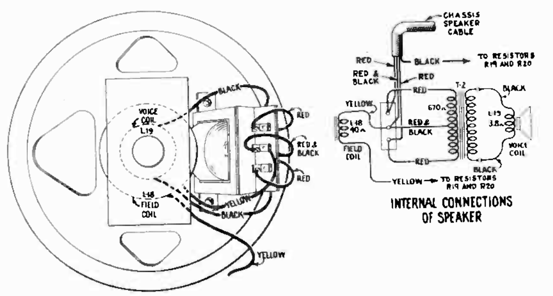


Figure 3—Loudspeaker Wiring

position on the gang capacitor. They are all accessible from the bottom of the chassis except the 600 K. C. series capacitor, which is accessible from the rear of the chassis. Proceed as follows:

(a) Connect the output of the oscillator to the antenna and ground terminals of the receiver. Check the position of the indicator pointer when the tuning capacitor plates are fully meshed. It should be coincident with the radial line adjacent to the dial reading of 54. Then set the Test Oscillator at 1400 K. C., the dial indicator at 140 and the oscillator output so that a slight deflection will be obtained in the output meter when the volume control is at its maximum position.

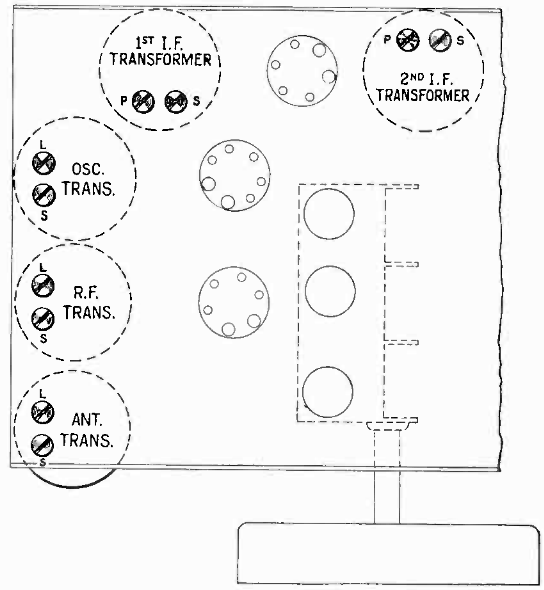
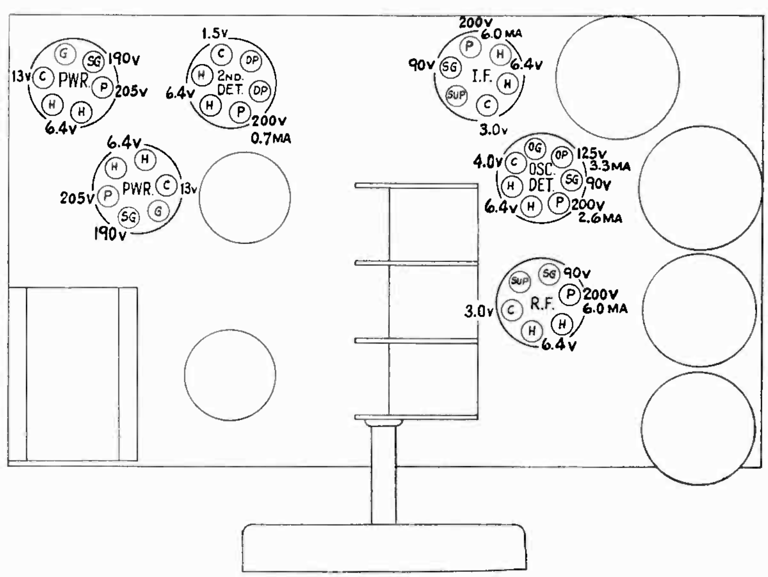


Figure 4—Location of Line-Up Capacitors—Viewing bottom of chassis



ALL VOLTAGES ARE TO – B

Figure 5—Radiotron Socket Voltages

(b) With the Range Switch at the "in" position, adjust the three trimmers under the three R. F. coils, designated as L in Figure 4, until a maximum deflection is obtained in the output meter. Then shift the Test Oscillator frequency to 600 K. C. The trimmer capacitor, accessible from the rear of the chassis, should now be adjusted for maximum output while rocking the main tuning capacitor back and forth through the signal. Then repeat the 1400 K. C. adjustment.

(c) Now place the Range Switch at the "out" position, shift the Test Oscillator to 15,000 K. C. and set the dial at 150. Adjust the three trimmer capacitors designated as S in Figure 4 for maximum output, beginning with the oscillator trimmer. It will be noted that the oscillator and first detector trimmers will have two positions at which the signal will give maximum output. The position which uses the lower trimmer capacitance, obtained by turning the screw counter-clockwise, is the proper adjustment for the oscillator, while the position that uses a higher capacitance is correct for the detector. *Both of these adjustments must be made as indicated irrespective of output.* The R. F. is merely peaked. In conjunction with the detector adjustment, it is necessary to rock the main tuning capacitor back and forth while making the adjustment. This completes the line-up adjustments.

The important points to remember are the need for using the minimum oscillator output to obtain a deflection in the output meter with the volume control at its maximum position and the manner of obtaining the proper high frequency oscillator and detector adjustments.

(2) Radiotron Socket Voltages

The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if lower resistance meters are used, such allowances must be made.

RADIOTRON SOCKET VOLTAGES

220-Volt, D. C. Line—No Signal

Radiotron No.		Cathode to B— Volts, D. C.	Screen Grid to B— Volts, D. C.	Plate to B— Volts, D. C.	Plate Current, M. A.	Heater Volts, A. C.
RCA-6D6 R. F.		3.0	90	200	6.0	6.4
RCA-6A7	1st Detector	4.0	90	200	2.6	6.4
	Oscillator	—	—	125	3.3	
RCA-6D6 I. F.		3.0	90	200	6.0	6.4
RCA-75 2nd Detector		1.5	—	200	0.7	6.4
RCA-41 Power		13.0	190	205	25.0	6.4
RCA-41 Power		13.0	190	205	25.0	6.4

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
10194	Ball—Steel ball for condenser drive assembly—Package of 20	$0.25
2747	Cap—Contact cap—Package of 5	.50
3938	Capacitor—9 mmfd. (C10)	.25
3849	Capacitor—50 mmfd. (C25)	.30
6314	Capacitor—160 mmfd. (C23)—Package of 5	2.00
4352	Capacitor—300 mmfd. (C37, C38)	.25
4297	Capacitor—410 mmfd. (C20)	.30
4031	Capacitor—2700 mmfd. (C15, C23, C36)	.50
3701	Capacitor—0.01 mfd. (C9, C16)	.30
4211	Capacitor—0.05 mfd. (C1, C2, C3, C14, C34)	.30
3901	Capacitor—0.05 mfd. (C4, C13)	.36
3888	Capacitor—0.05 mfd. (C29)	.25
3877	Capacitor—0.1 mfd. (C8, C19, C30)	.32
3796	Capacitor—4.0 mmfd. (C35)	.60
6986	Capacitor—8.0 mmfd. (C39)	1.60
3861	Capacitor — Adjustable trimmer capacitor (C21)	.78
6985	Capacitor—Comprising two 4.0 mmfd. capacitors (C17, C31)	1.50
4373	Capacitor pack—Comprising one 0.002 mfd. and one 0.02 mfd. capacitors (C40, C41)	.30
6983	Coil—Antenna coil (L1, L2, L3, L4, C5, C6)	2.68
6700	Coil—Oscillator coil (L9, L10, L11, L12, C18, C22)	2.30
6699	Coil—R. F. coil (L5, L6, L7, L8, C11, C12)	2.44
6694	Condenser—3-gang variable tuning condenser (C7, C24, C26)	3.75
3941	Dial—Station selector dial scale—Package of 5	1.75
6702	Drive—Variable tuning condenser drive assembly complete	1.86
4340	Lamp—Dial lamp—Package of 5	.60
3906	Mounting assembly—Variable condenser mounting assembly—Comprising 3 bushings, 3 lock-washers, 3 nuts and 3 washers—Package of 1 set	.28
3940	Pointer—Station selector indicator—Package of 5	.50
3218	Resistor—600 ohms—Carbon type—¼ watt (R2, R4, R7)—Package of 5	1.00
4338	Resistor — 2500 ohms — Carbon type — ¼ watt (R13)—Package of 10	2.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R5, R8, R16)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1, R3)—Package of 5	1.00
3439	Resistor—600,000 ohms—Carbon type—¼ watt (R23)—Package of 5	1.00
3033	Resistor—1 megohm—Carbon type—¼ watt (R10, R12)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R11)—Package of 5	1.00
4337	Resistor—270 ohms—Carbon type—1 watt (R17)—Package of 10	2.20
6114	Resistor—20,000 ohms—Carbon type—1 watt (R6, R22)—Package of 5	1.10
4339	Resistor — 260 ohms — Porcelain type — Tapped at 220 ohms (R14, R15)	.52

Stock No.	Description	List Price
3991	Resistor — 10,000 ohms — Porcelain type (R21)	$0.60
3943	Screen—Translucent celluloid screen—For dial lamps—Package of 2	.18
3878	Screw—No. 8–32–$\frac{3}{16}$ headless cup point set screw for fastening station selector pointer—Package of 20	.25
3768	Screw—Square head No. 6–32–¼ set screw for condenser drive—Package of 10	.35
6704	Shaft—Tuning condenser drive shaft assembly	.64
4145	Shield—First detector and oscillator Radiotron shield	.30
4103	Shield—I. F. amplifier Radiotron shield	.20
3950	Shield—R. F. amplifier Radiotron shield	.26
4216	Shield—Radiotron shield top	.10
4215	Shield—Second detector Radiotron shield	.15
3529	Socket—Dial lamp socket	.32
6676	Socket—6-contact Radiotron socket	.40
7485	Socket—6-contact second detector and AVC Radiotron socket	.40
3572	Socket—7-contact Radiotron socket	.38
6696	Switch—Range switch (S1, S2, S3, S4, S5, S6)	2.24
6697	Transformer—First intermediate frequency transformer (L13, L14, C27, C28)	1.80
6698	Transformer—Second intermediate frequency transformer (L15, L16, C32, C33)	1.78
6987	Transformer pack—Audio transformer pack—Comprising one reactor and one inter-stage transformer (T1, L17)	4.50
6705	Tone control (R18, S7)	1.20
6695	Volume control (R9)	1.20
	REPRODUCER ASSEMBLIES	
7811	Cable—Reproducer cable	.45
9498	Coil—Field coil, magnet and cone support (L18)	3.50
9499	Cone—Reproducer cone (L19)—Package of 5	6.10
9497	Reproducer complete	6.75
6988	Transformer—Output transformer (T2)	1.60
	MISCELLANEOUS ASSEMBLIES	
6706	Bezel—Metal bezel for station selector dial	.42
6707	Glass—Station selector dial glass	.20
6989	Knob—Range switch or tone control knob—Package of 5	.65
6991	Knob—Station selector knob—Package of 5	1.15
6990	Knob—Volume control knob—Package of 5	1.15
9050	Oscillator — Test oscillator — 90–25,000 K. C.	29.50†
4341	Resistor—Porcelain type—686 ohms (R19, R20)	2.12
6708	Ring—Retaining ring for dial glass—Package of 5	.44
4342	Screw—Receiver mounting screw assembly—Comprising four bushings, four screws and four washers	.30
4160	Screwdriver—Combination insulated screw-driver and socket wrench for I. F. and R. F. adjustments	1.00

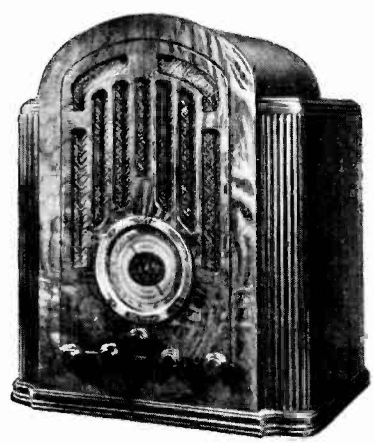
† Full discount not allowed.

Printed in U. S. A.

RCA Victor
Models 128 and 224

Six-Tube, Three-Band A. C. Receivers

SERVICE NOTES



SERVICE DIVISION

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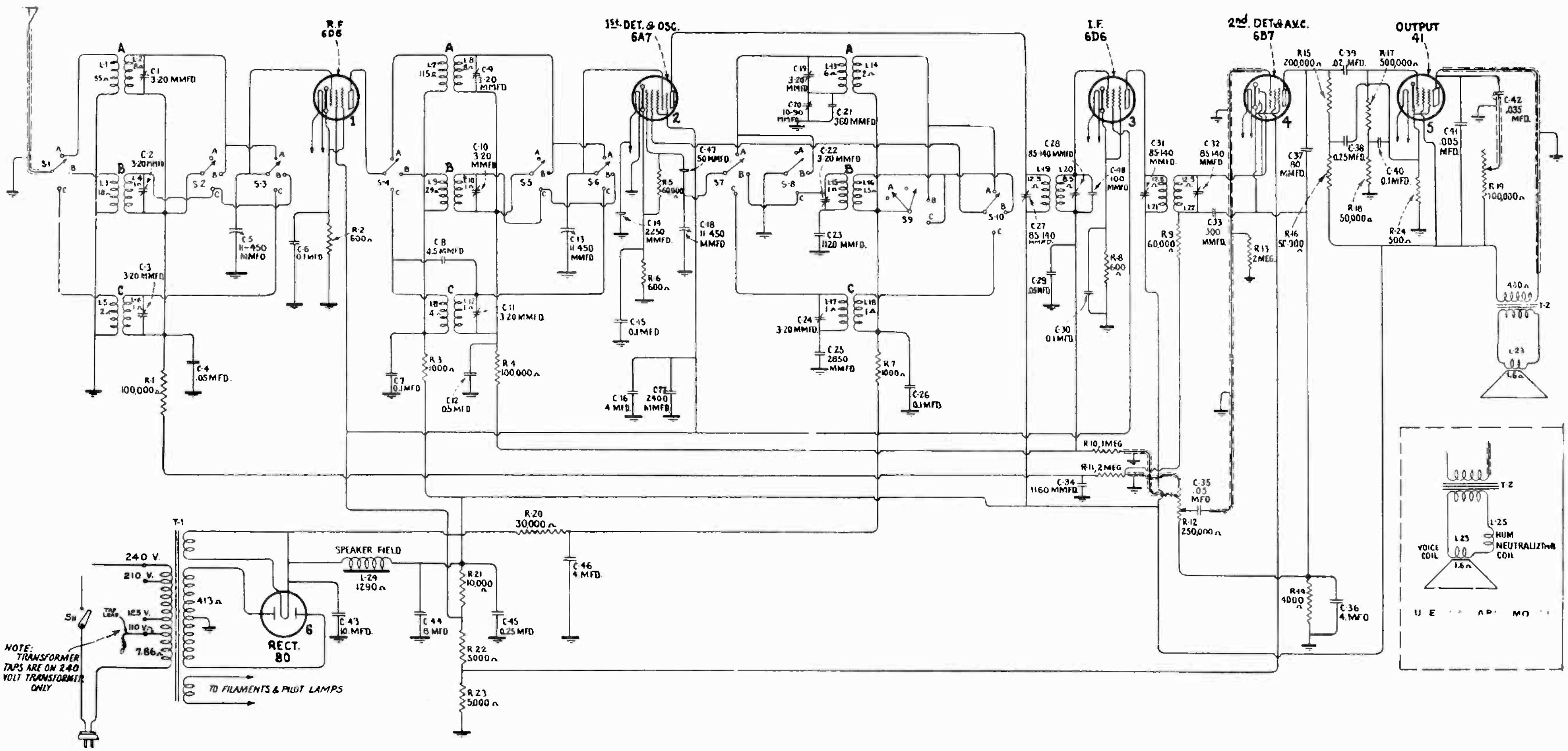


Figure 1—Schematic Circuit Diagram—Early Production

RCA Victor Models 128 and 224

Six-Tube, Three-Band A. C. Receivers

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Voltage Rating	105–125 Volts and 100–130/195–250 Volts (Double Range Transformer)
Frequency Rating	25–60 Cycles and 50–60 Cycles
Power Consumption	85 Watts (All Frequencies)
Type and Number of Radiotrons	2 RCA-6D6, 1 RCA-6A7, 1 RCA-6B7, 1 RCA-41, 1 RCA-80, Total 6
Tuning Frequency Range	Band A—540 K. C.–1720 K. C. Band B—1720 K. C.–5400 K. C. Band C—5400 K. C.–18,000 K. C.
Line-Up Frequencies	460 K. C., 600 K. C., 1720 K. C., 5160 K. C., 18,000 K. C.
Maximum Undistorted Output	1.9 Watts
Maximum Output	3.5 Watts

PHYSICAL SPECIFICATIONS

	Model 128	Model 224
Height	20 5/32 Inches	41 Inches
Width	16¾ Inches	24½ Inches
Depth	11 15/16 Inches	12⅛ Inches

This six-tube, three-band A. C. super-heterodyne receiver is of the "all wave" type and has a continuous tuning range of from 540 K. C. to 18,000 K. C. This tuning range includes all of the important short wave broadcasting, police and aircraft call bands, together with the standard broadcast band. Excellent sensitivity, selectivity and tone quality, together with a number of important operating features, make this an outstanding receiver of its type.

Operating features include a full vision "airplane" type dial, double-ratio vernier drive, high frequency tone control, three position band switch with visual band indicator on dial and an automatic volume control. High tonal fidelity is realized by adequate power output, 1.9 watts undistorted, and a well designed reproducer unit.

DESCRIPTION OF ELECTRICAL CIRCUIT

The general circuit arrangement consists of an R. F. stage, a combined oscillator and first detector, an I. F. stage, a combined second detector and automatic volume control and a single Pentode output stage. An RCA-80 rectifier, together with a suitable filtering system, provides plate and grid voltages for all tubes and field excitation for the loudspeaker. Figures 1 and 2 show the schematic circuit diagrams, Figures 3 and 4, the loudspeaker wiring and Figures 9 and 10, the chassis wiring.

The signal enters the receiver through a shielded antenna lead and is applied to the grid of the R. F. tube through the antenna coupling transformer. The secondary of this transformer is tuned to the signal frequency by means of one unit of the gang-capacitor. The output of this stage is transformer coupled to the grid circuit of the first detector, which is also tuned to the signal frequency by a unit of the gang-capacitor.

Combined with the signal in the first detector is the local oscillator, which is always at a 460 K. C. frequency difference (higher) from the signal frequency. A separate coil system and the third unit of the gang-capacitor are used in this circuit.

In conjunction with these three tuned circuits, it is well to point out that three different groups of tuned circuits are used, one for each tuning band. A three-position selector switch is provided for selecting the band in which the desired signal is located. In addition to selecting the desired coil system, additional groups of contacts are provided for short-circuiting the preceding lower frequency R. F. and detector coils and the two preceding oscillator coils. This is to prevent "dead" spots due to the absorption effects caused by the coils, the natural period of which, with tuning capacitor disconnected, fall in the next higher frequency band.

The output of the first detector, which is the I. F. signal (460 K. C.), is fed directly through two tuned circuits to the grid of the I. F. amplifier stage. The I. F. stage, which utilizes Radiotron RCA-6D6, uses two transformers, which consist of four tuned circuits, all of which are tuned to 460 K. C.

The output of the I. F. amplifier is then applied to the diode electrodes of the RCA-6B7, which is a combined second detector, automatic volume control and A. F. amplifier. The direct current component of the rectified signal produces a voltage drop across resistor

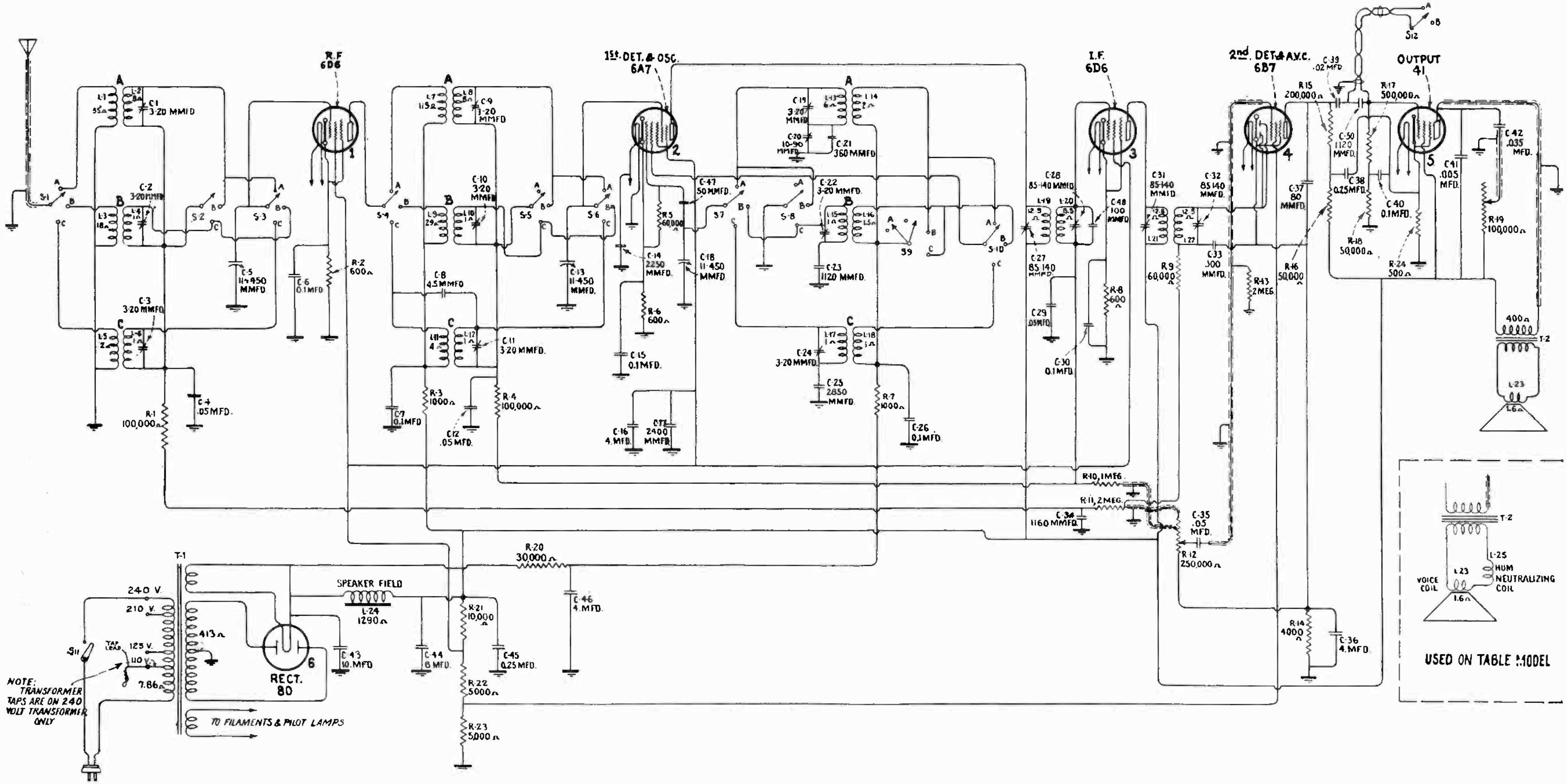


Figure 2—Schematic Circuit Diagram—Late Production Models having fidelity change with band position

R-12. The full voltage drop constitutes the automatic bias voltage for the R. F. while a tap is provided for the first detector and I. F. voltage. These automatic bias voltages for the R. F. first detector and I. F. give the automatic volume control action of the receiver. The volume control selects the amount of audio voltage that is applied to the grid of the RCA-6B7 and thereby regulates the audio output of the entire receiver.

The output of the RCA-6B7 is resistance coupled to the grid of the RCA-41 tube, which is the power output amplifier. This tube is operated as a Pentode and provides high audio gain and satisfactory output power. The plate circuit of the output stage is matched to the cone coil of the reproducer by means of a step-down transformer.

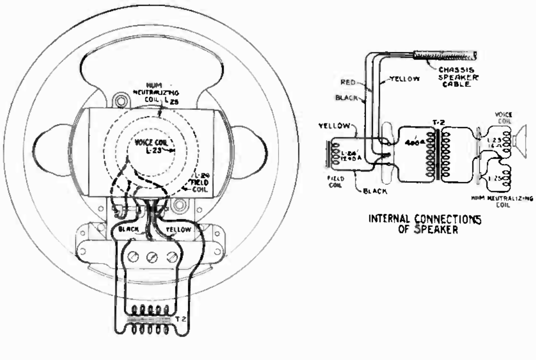


Figure 3—Table Loudspeaker Wiring

The tone control consists of a variable resistor and fixed capacitor connected in series across the primary of the output transformer. At the minimum resistance position of the variable resistor, maximum attenuation of the high audio frequencies is obtained.

Plate and grid voltages for all tubes are supplied from the output of the rectifier-filter system. An RCA-80 is used as a rectifier and a suitable network of capacitors and resistors gives the necessary filtering and voltages. The loudspeaker field is used as a filter reactor.

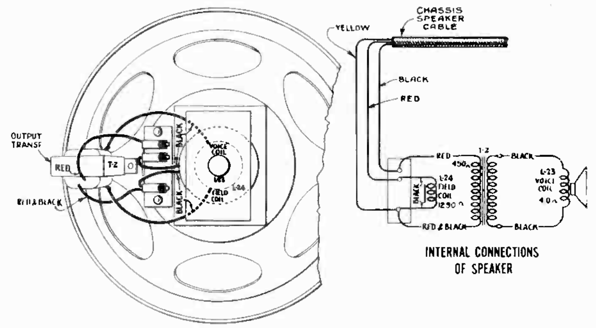


Figure 4—Console Loudspeaker Wiring

Figures 1 and 9 show the schematic diagrams of the early production models while Figures 2 and 10 show the later production. The later production instruments have an additional section on the band selector switch to change the receiver fidelity in Bands B and C.

(1) LINE-UP PROCEDURE

The line-up procedure of this receiver is somewhat involved and it is important that these instructions be carefully followed when making adjustments. Properly aligned, this receiver has outstanding performance; improperly aligned, it may be impossible to receive signals on all bands.

Equipment

To properly align this receiver, proper test equipment must be used. This consists of a modulated R. F. oscillator having proper frequency range, an output indicator, an alignment tool and a tuning wand.

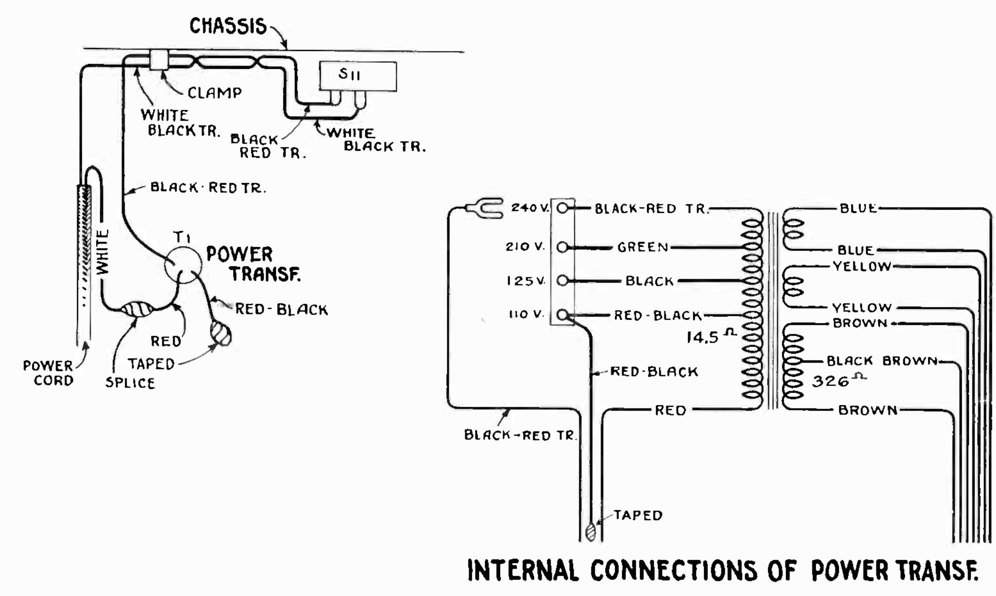


Figure 5—Universal Transformer Connections

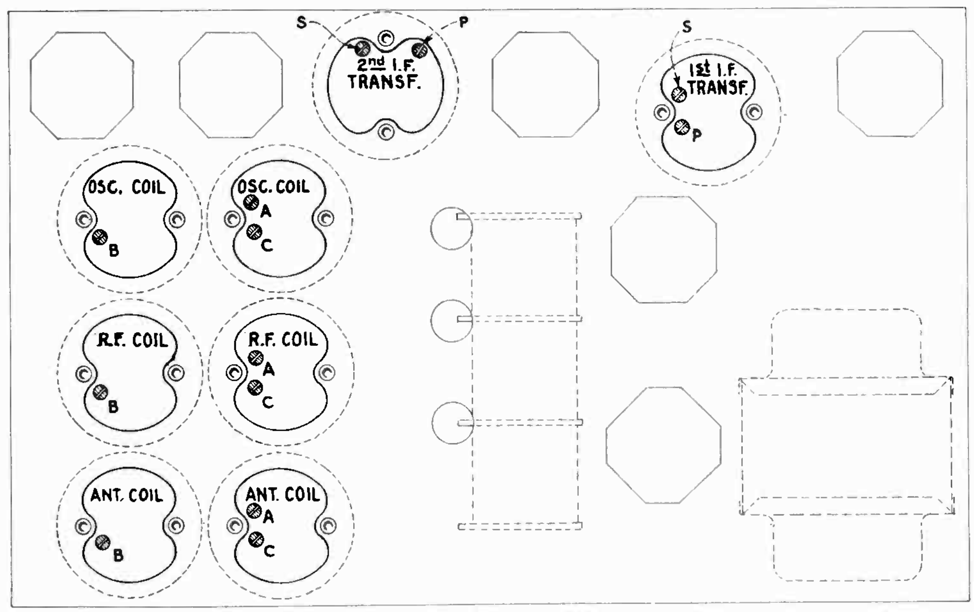
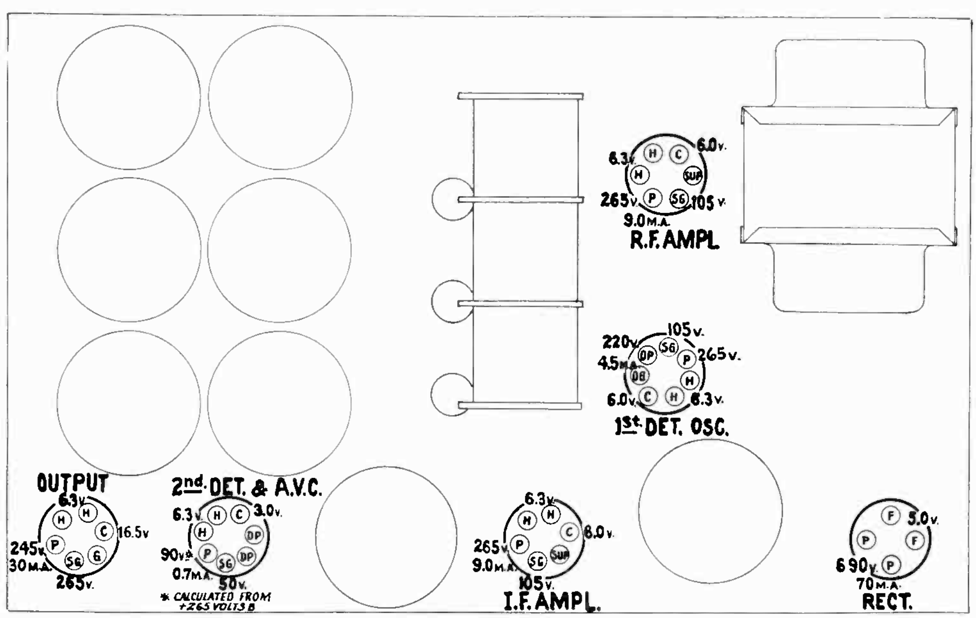


Figure 6—Location of Line-up Capacitors



ALL VOLTAGES ARE TO GROUND

Figure 7—Tube Socket Voltages

Checking with Tuning Wand

Before making any R. F., oscillator or first detector adjustments, the accuracy of the present adjustments may be checked by means of the tuning wand (Stock No. 6679). The tuning wand consists of a bakelite rod having a brass cylinder at one end and a special finely divided iron insert at the other end. Inserting the cylinder into the center of a coil lowers its inductance, while inserting the iron end increases its inductance. From this, it is seen that unless the trimmer adjustment for a particular coil is perfect at alignment frequencies, inserting one end of the wand may increase the output of a particular signal. A perfect adjustment is evidenced by a lowering of output when either end of the wand is inserted into a coil.

The shields over the R. F. coil assembly have a hole at their top for entrance of the tuning wand. The location of the various coils inside of the shield is shown in Figure 8. An example of the proper manner of using the tuning wand would be to assume the external oscillator were set at 1720 and the signal tuned in, and the output indicator should be connected across the voice coil of the loudspeaker. Then the tuning wand would be inserted, first one end and then the other end, into the top of the three transformers at the left of the R. F. assembly, facing the front of the chassis. A perfect adjustment of the trimmer would be evidenced by a reduction in output when each end of the wand is inserted in each of the three transformers. If one end—for example, the iron end—when inserted in one coil caused an increase in output, then that circuit is low. An increase in the trimmer capacitance would be the proper remedy.

(2) I. F. TUNING CAPACITOR ADJUSTMENTS

Although this receiver has one I. F. stage, two transformers having four adjustable capacitors may require adjustment. The transformers are all peaked, being tuned to 460 K. C.

A detailed procedure for making this adjustment follows:

(a) Connect the output of an external oscillator tuned to 460 K. C. between the first detector grid and ground. Connect the output indicator across the voice coil of the loudspeaker.

(b) Place the oscillator in operation at 460 K. C. Place the receiver in operation and adjust the station selector until a point is reached (Band A) where no signals are heard and turn the volume control to its maximum position. Reduce the oscillator input until a slight indication is obtained in the output indicator.

(c) Refer to Figure 6. Adjust each trimmer of the I. F. transformers until a maximum output is obtained. Go over the adjustments a second time.

This completes the I. F. adjustments. However, it is good practice to follow the I. F. adjustments with the R. F. and oscillator adjustments due to interlocking which always occurs.

(3) R. F., OSCILLATOR AND FIRST DETECTOR ADJUSTMENTS

Four R. F., oscillator and first detector adjustments are required in band "A." Three are required in bands "B" and "C."

To properly align the various bands, each band must be aligned individually. The preliminary set-up requires the external oscillator to be connected between the antenna and ground terminals of the receiver and the output indicator must be connected across the voice coil of the loudspeaker. The volume control must be at its maximum position and the input from the oscillator must be at the minimum value possible to get an output indication under these conditions. In the high frequency bands, it may be necessary to disconnect the oscillator from the receiver and place it at a distance in order to get a sufficiently low input to the receiver.

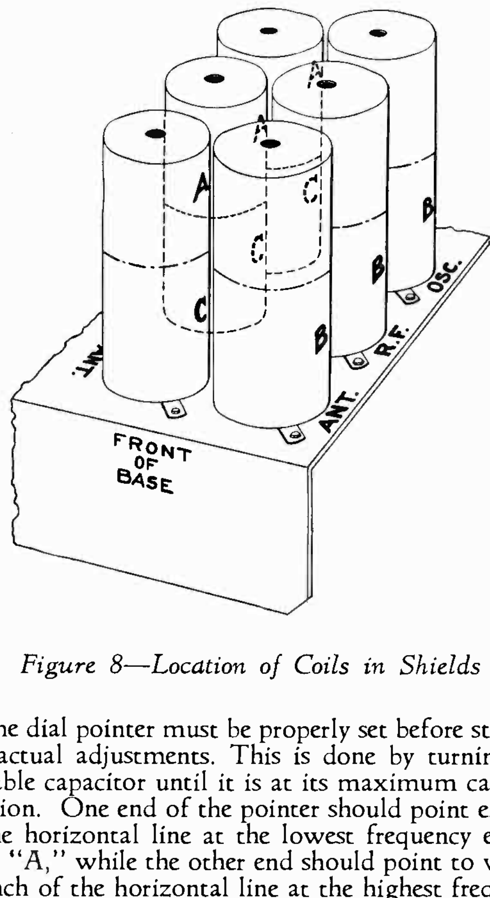


Figure 8—Location of Coils in Shields

The dial pointer must be properly set before starting any actual adjustments. This is done by turning the variable capacitor until it is at its maximum capacity position. One end of the pointer should point exactly at the horizontal line at the lowest frequency end of band "A," while the other end should point to within 1/64-inch of the horizontal line at the highest frequency end of band "A."

Figure 6 shows the location of the trimmers for each band. Care must be exercised to merely adjust the trimmers in the band under test.

Band "A"

(a) Set the Band Switch at "A."

(b) Tune the external oscillator to 1,720 K. C., set the pointer at 1,720 K. C. and adjust the oscillator, detector and R. F. trimmers for maximum output.

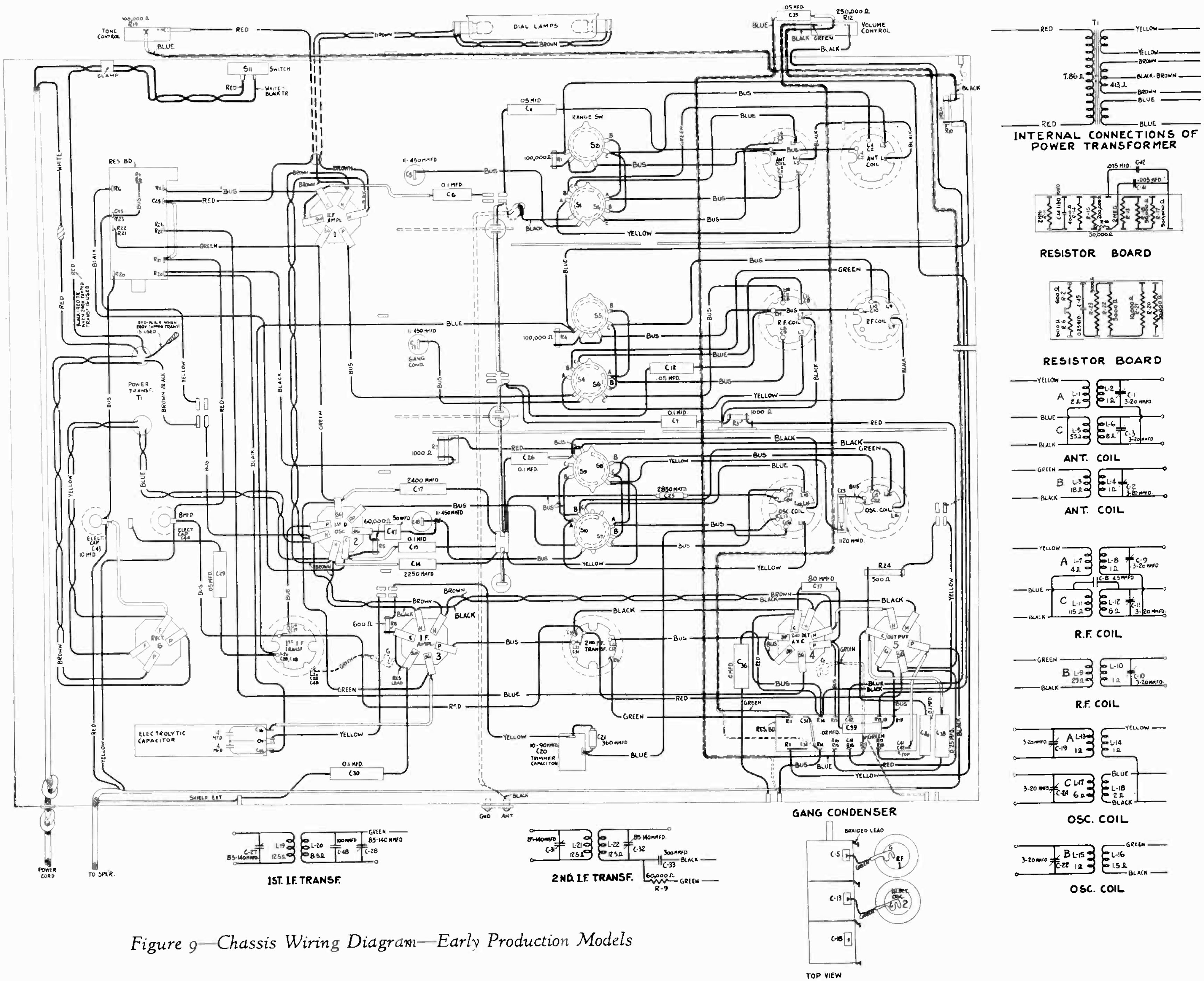


Figure 9—Chassis Wiring Diagram—Early Production Models

(c) Shift the external oscillator frequency to 600 K. C. Tune in the 600 K. C. signal, irrespective of scale calibration, and adjust the series trimmers, located on rear apron of chassis, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 1,720 K. C. as described in (b).

Band "B"

(a) Set the Band Switch at "B."

(b) Tune the external oscillator to 5,160 K. C., and set the pointer at 5,160 K. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(c) Check for the image signal which should be received at approximately 4,240 K. C. on the dial. It will be necessary to increase the external oscillator output for this check.

(d) The antenna and detector trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

Band "C"

(a) Set the Band Switch at "C."

(b) Tune the external oscillator to 18,000 K. C., set the pointer at 18 M.C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(c) Check for the image signal, which should be received at approximately 17,080 on the dial. It may be necessary to increase the external oscillator output for this check.

(d) Reduce the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal disappears. The first detector circuit is then aligned with the oscillator circuit and the RCA-6A7 tube is blocked. Then increase the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal is peaked for maximum output.

(e) The antenna trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

(4) POWER TRANSFORMER CONNECTIONS

The 220-volt power transformer furnished with some instruments includes taps for operating on 110-volt lines. Figure 5 shows the schematic circuit of the transformer and the proper voltage to be applied to the various taps. The taps are located on the power transformer assembly and are accessible without removing the chassis from the cabinet.

(5) VOLTAGE READINGS

The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if low-resistance meters are used, such allowances must be made:

RADIOTRON SOCKET VOLTAGES

115-Volt A. C. Line—No Signal—Volume Control Maximum

Radiotron Number		Cathode to Ground, Volts, D. C.	Screen Grid to Ground, Volts, D. C.	Plate to Ground, Volts, D. C.	Plate Current, M. A.	Heater Volts, A. C.
RCA-6D6—R. F.		6.0	105	265	9.0	6.3
RCA-6A7	Det.	6.0	105	265	3.5	6.3
	Osc.	—	—	220	4.5	
RCA-6D6—I. F.		6.0	105	265	9.0	6.3
RCA-6B7—2nd Detector		3.0	50	90*	0.7	6.3
RCA-41—Pwr		16.5	265	245	30.0	6.3
RCA-80—Rectifier		—	—	690 (RMS)	70.0	5.0

*Voltage calculated from 265 V. + B.

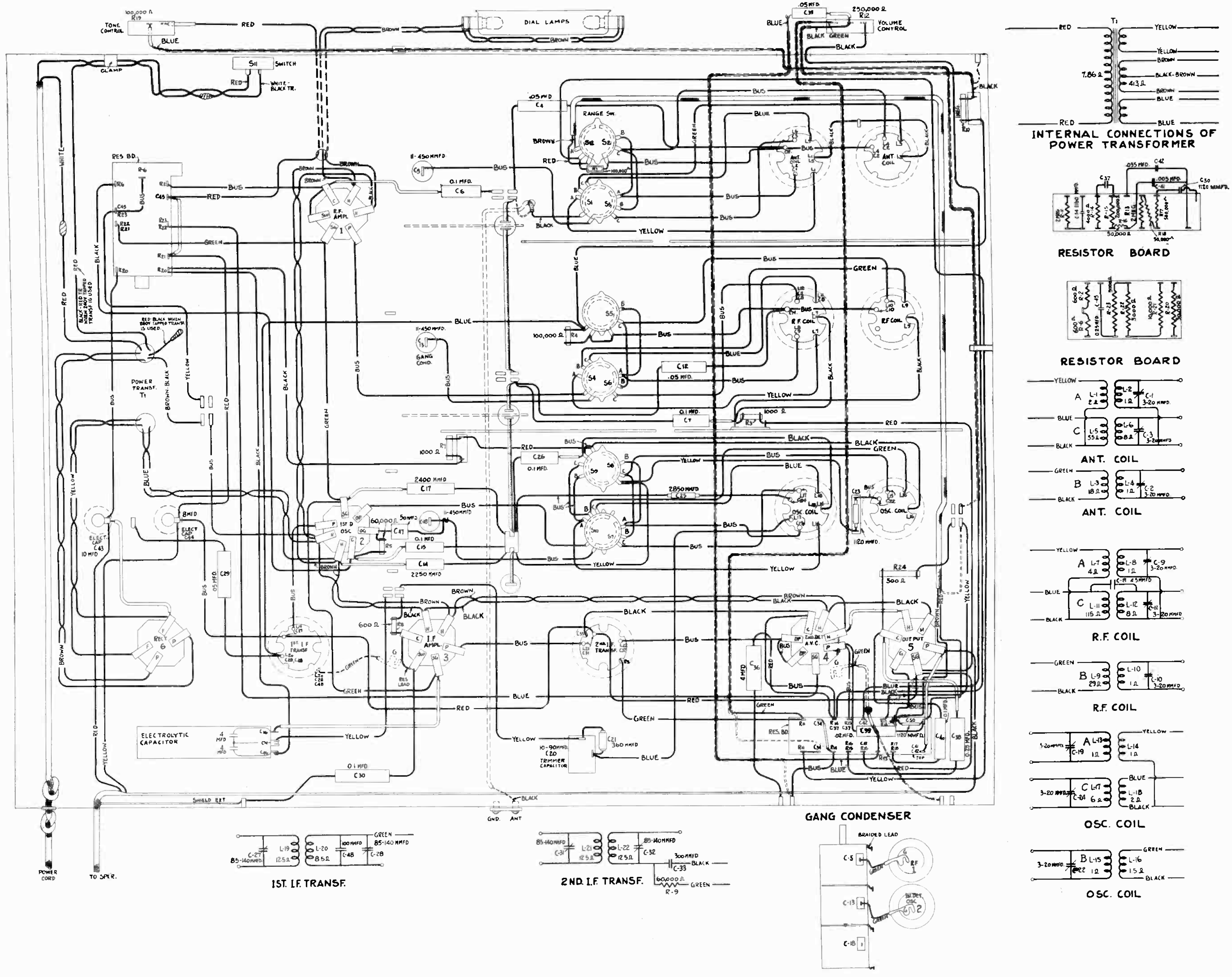


Figure 10—Wiring Diagram—Late Production Model having fidelity change with band position

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4427	Bracket—Volume control or tone control mounting bracket	$0.18
4729	Cable—2-conductor shielded cable—From range switch to resistor board	.20
2747	Cap—Contact cap—Package of 5	.50
3861	Capacitor — Adjustable trimmer capacitor (C20)	.78
4442	Capacitor—50 mmfd. (C47)	.22
4662	Capacitor—80 mmfd. (C37)	.24
4413	Capacitor—360 mmfd. (C21)	.22
4412	Capacitor—1120 mmfd. (C23)	.25
4634	Capacitor—1120 mmfd. (C50)	.35
4515	Capacitor—1160 mmfd. (C34)	.22
4670	Capacitor—2250 (C14)	.30
4523	Capacitor—2400 mmfd. (C17)	.26
4524	Capacitor—2850 mmfd. (C25)	.35
4435	Capacitor—.02 mfd. (C39)	.25
4518	Capacitor—.05 mfd. (C35)	.52
4417	Capacitor—.05 mfd. (C4, C12, C29)	.25
3877	Capacitor—.1 mfd. (C40)	.32
4415	Capacitor—.1 mfd. (C6, C15, C30)	.30
4645	Capacitor—.1 mfd. (C7, C26)	.25
3597	Capacitor—.25 mfd. (C38, C45)	.40
4525	Capacitor—4.0 mfd. (C36)	.70
4428	Capacitor—8 mfd. (C44)	1.05
7790	Capacitor—10 mfd. (C43)	1.05
4692	Capacitor pack—Comprising one 0.035 mfd. and one 0.005 mfd. capacitors (C41, C42)	.30
7589	Capacitor Pack—Comprising two 4. mfd. capacitors (C16, C46)	1.64
4358	Clamp—Electrolytic capacitor mounting clamp	.15
4516	Coil—Antenna coil "PB" (L3, L4, C2)	1.65
7803	Coil—Antenna coil "B & SW" (L1, L2, L5, L6, C1, C3)	1.82
4514	Coil—Detector Coil "PB" (L9, L10, C10)	1.65
7805	Coil—Detector coil "B & SW" (L7, L8, L11, L12, C8, C9, C11)	2.15
7807	Coil—Oscillator coil "B & SW" (L13, L14, L17, L18, C19, C24)	1.62
4511	Coil—Oscillator coil "PB" (L15, L16, C22)	1.52
7801	Condenser—3-gang variable tuning condenser (C5, C13, C18)	4.42
4340	Lamp—Dial lamp—Package of 5	.60
3632	Resistor—500 ohms—Carbon type—1 watt (R24)—Package of 5	$1.10
3218	Resistor—600 ohms—Carbon type—¼ watt (R2, R6, R8)—Package of 5	1.00
4370	Resistor—1000 ohms—Carbon type—¼ watt (R3, R7)—Package of 10	2.00
3997	Resistor—4000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
6318	Resistor—10,000 ohms (R21)	.80
3114	Resistor—50,000 ohms—Carbon type—¼ watt (R16, R18)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R5)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1, R4)—Package of 5	1.00
3116	Resistor—200,000 ohms—Carbon type—¼ watt (R15)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R17)—Package of 5	1.00
3033	Resistor—1 megohm—Carbon type—¼ watt (R10)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R11, R13)—Package of 5	1.00
3413	Resistor—5000 ohms—Carbon type—½ watt (R22, R23)—Package of 5	1.00
4513	Resistor — 30,000 ohms—Carbon type—3 watt (R20)	.25
4521	Shield—Antenna R. F. or oscillator coil shield	.42
3942	Shield—First detector or output Radiotron shield	.18
7487	Shield—I. F. amplifier Radiotron shield	.25
4705	Shield—R. F. amplifier Radiotron shield	.30
3782	Shield—Second detector Radiotron shield	.26
3529	Socket—Dial lamp socket	.32
3859	Socket—4-contact Radiotron socket	.30
6676	Socket—6-contact output Radiotron socket	.40
7485	Socket—6-contact Radiotron socket	.40
3572	Socket—7-contact Radiotron socket	.38
4379	Strip—Antenna terminal engraved "ANT-GND"	.20
4684	Switch—Operating switch (S11)	.45
4728	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10)	4.32
4517	Tone control (R19)	.90
4431	Transformer — First intermediate frequency transformer (L19, L20, C27, C28, C48)	2.28
4433	Transformer—Second intermediate frequency transformer (L21, L22, C31, C32, C33, R9)	2.15

REPLACEMENT PARTS (Continued)

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
9511	Transformer—Power transformer 105–125 volts, 50–60 cycles (T1)	$4.78
9512	Transformer—Power transformer 105–125 volts, 25–40 cycles	6.58
9513	Transformer—Power transformer—105–250 volts—40–60 cycles	4.85
4519	Volume control (R12)	1.25
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	.28
10194	Ball—Steel ball for condenser drive assembly—Package of 20	.25
4422	Clutch—Clutch drive assembly for variable condenser drive	.88
4510	Drive—Tuning condenser drive assembly	2.42
4704	Indicator—Band indicator (celluloid)	.12
3943	Screen—Dial light screen (celluloid)—Package of 2	.18
3993	Screw—Number 6–32–5/32 square head set screws for band indicator operating arm—Package of 10	.25
4669	Screw—Number 8–32–5/32 set screw for variable condenser drive assembly—Package of 10	.25
4377	Spring—Band indicator and arm tension spring—Package of 5	.25
4378	Stud—Band indicator operating arm stud—Package of 5	.25
	REPRODUCER ASSEMBLY TABLE MODEL	
4526	Cable—3-conductor—Reproducer cable	$0.32
7818	Reproducer complete	6.58
	REPRODUCER ASSEMBLY CONSOLE MODEL	
4473	Board—Terminal board assembly	.26
9460	Coil—Field coil, magnet and cone support (L24)	6.00
8935	Cone—Reproducer cone (L23)—Package of 5	5.25
9527	Reproducer—Complete	8.00
4472	Transformer—Output transformer (T2)	1.40
	MISCELLANEOUS ASSEMBLY	
4677	Bezel—Station selector dial (escutcheon) bezel	.56
4661	Dial—Station selector dial	.62
6614	Glass—Station selector dial glass	.30
4520	Indicator—Station selector indicator pointer	.18
4449	Knob—Station selector, volume control, tone control, range switch or operating switch knob—Package of 5	.60
4678	Ring—Dial glass retaining ring—Package of 5	.34
4527	Screw—Chassis mounting screw assembly comprising 4 spacers, 4 screws, 4 lockwashers, 4 washers, 8 cushions—For table model	.40
4685	Screw—Chassis mounting screw assembly—Comprising 4 spacers, 4 screws, 4 lockwashers, 4 washers and 8 cushions—For console model	.40
4613	Screw—Number 8–32–7/16 headless set screw for knobs—Package of 10	.25

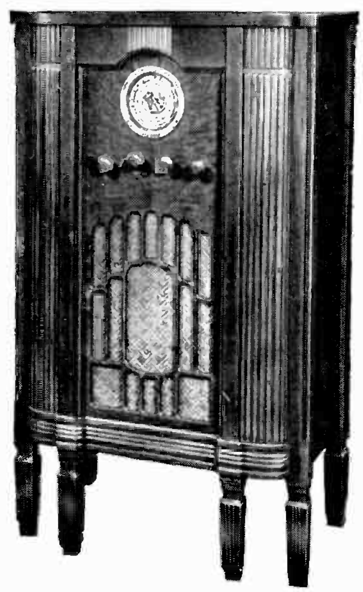
Printed in U. S. A

RCA Victor

Battery Radios 135-B and 235-B

Seven-Tube, Two Band Super-Heterodyne Receivers

SERVICE NOTES



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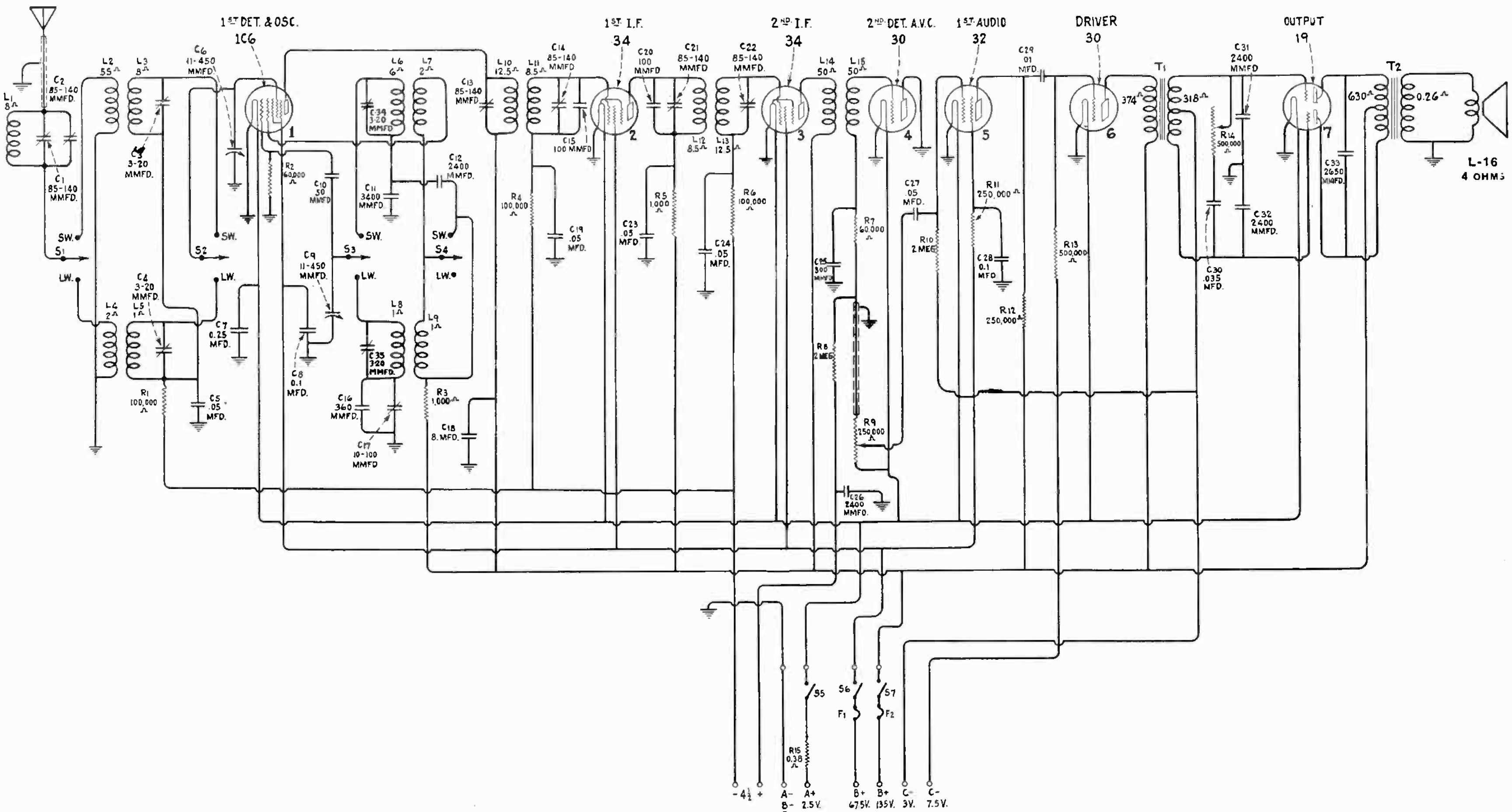

Figure 1—Schematic Circuit Diagram

RCA VICTOR MODELS 135-B AND 235-B

Seven-Tube, Two-Band Battery Receivers

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Type and Number of Radiotrons	1 RCA-1C6, 2 RCA-34, 2 RCA-30, 1 RCA-32, 1 RCA-19—Total, 7
Total "A" Battery Current	0.68 Ampere
Maximum "B" Battery Current	25 M. A.
Tuning Ranges	540 K. C.–1720 K. C.—5400 K. C.–18,000 K. C.
Maximum Undistorted Output	1.2 Watts
Maximum Output	2.2 Watts
Line-up Frequencies	460 K. C., 600 K. C., 1720 K. C. and 18,000 K. C.

PHYSICAL SPECIFICATIONS

	Model 135-B	*Model 235-B*
Height	17½ Inches	41 Inches
Width	14½ Inches	24½ Inches
Depth	10 Inches	14¼ Inches

These seven-tube, two-band battery operated Superheterodyne receivers provide excellent reception of both standard-wave and short-wave broadcasting stations. High sensitivity, excellent selectivity and good fidelity characterize this receiver. Outstanding features include a permanent magnet dynamic type loudspeaker, continuously variable tone control, Class "B" output stage, two-speed vernier drive and excellent mechanical construction. The chassis is unusually accessible for repair or replacement of parts. A fuse in each "B" battery lead provides protection for the Radiotrons in event of short circuits or wrong battery connections. Figure 1 shows the schematic diagram, while Figure 2 shows the chassis wiring.

DESCRIPTION OF ELECTRICAL CIRCUIT

The circuit is of the superheterodyne type and consists of a combined oscillator-detector stage, two I. F. amplifying stages, a combined second detector and automatic volume control, a two-stage audio amplifier and a Class "B" output stage. Separate coil systems are used for each band, in conjunction with a push-pull type Range Switch. A three-pole operating switch opens one "A" and two "B" battery leads when the switch is at the "off" position.

The signal enters the receiver through a shielded antenna lead and trap circuit and is applied through the antenna transformer to the tuned grid circuit of the first detector. The trap circuit is tuned to 460 K. C. and reduces the effect of signals at or near the I. F. frequency. The grid circuit of the first detector is tuned to the desired signal. The RCA-1C6, which functions as the first detector, also functions as the local oscillator for producing a signal, 460 K. C. higher in frequency than the incoming signal. The combined signals after passing through the first detector produce the I. F. signal.

The I. F. amplifier uses two RCA-34 Radiotrons in conjunction with three transformers. Two of the transformers are tuned very accurately to the I. F. frequency (460 K. C.) by means of suitable trimmer capacitors. The third transformer is untuned and couples the output of the second stage to the input of the second detector.

The output of the I. F. amplifier is applied to the grid circuit of the RCA-30, which functions as a combined diode second detector and automatic volume control. The plate of this tube is grounded. The automatic volume control action is due to the voltage drop of a portion of the rectified signal across resistor R-9. The voltage drop constitutes the automatic bias voltage for the first detector and I. F. stages and thereby gives the automatic volume control action of the receiver.

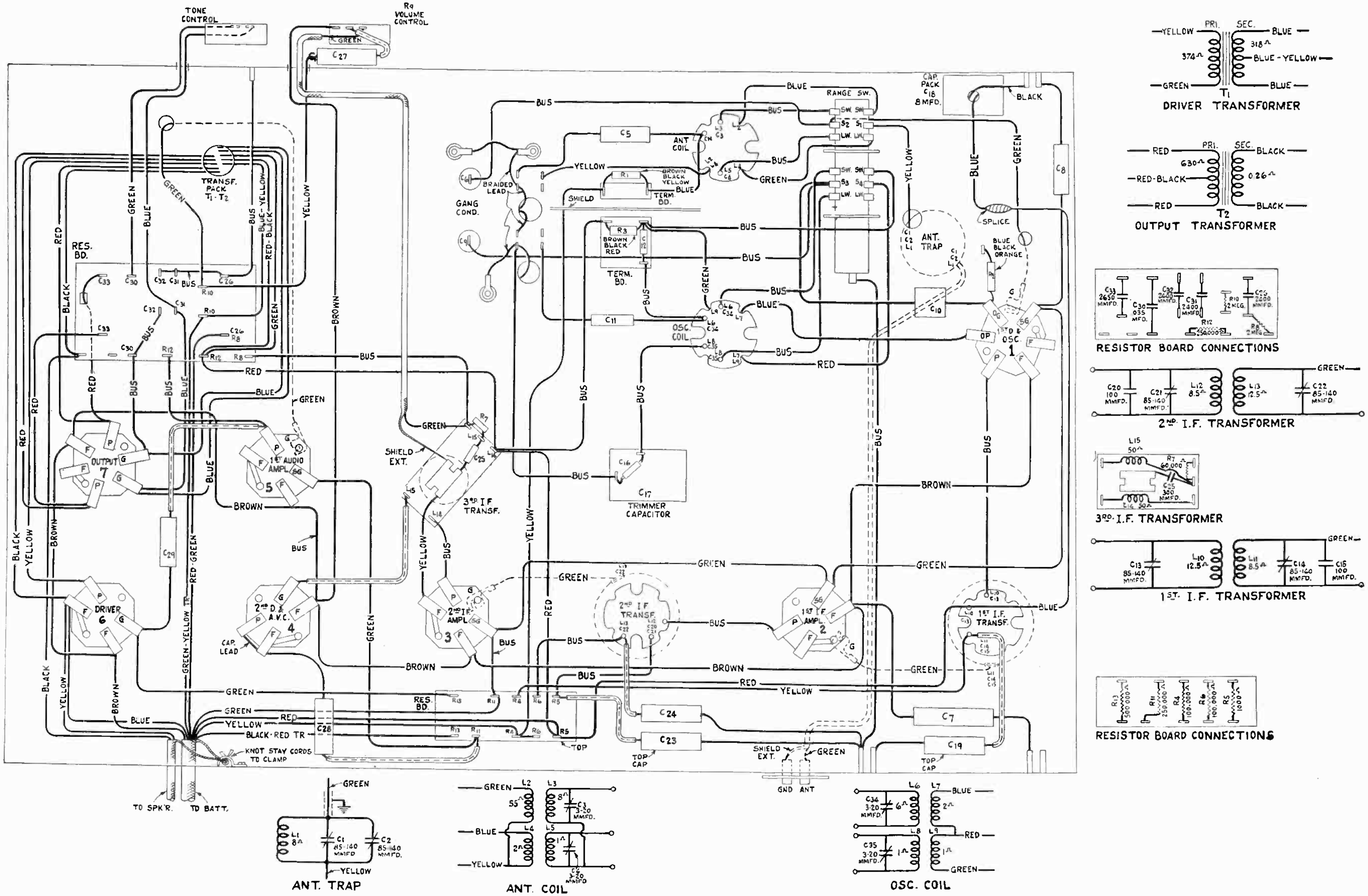

Figure 2—Wiring Diagram

The volume control selects the desired amount of audio signal from the drop across R-9 and applies it to the grid circuit of the first audio stage, RCA-32.

The output of the first audio stage is resistance coupled to the grid circuit of the RCA-30 driver stage, which is transformer coupled to the Class "B" output stage. The output stage utilizes the twin amplifier Radiotron RCA-19, which has two separate sets of elements and eliminates the necessity of having two separate tubes for a Class "B" output stage. The plate circuit of this tube is transformer coupled to the cone coil of the permanent magnet dynamic loudspeaker.

Plate, grid and filament voltages are supplied by individual batteries. The +A lead provided includes a resistor for use in conjunction with a 2.5 volt "aircell." The resistor is easily removed when operation from a storage cell is desired.

SERVICE DATA

(1) Line-Up Capacitor Adjustments

To properly align this receiver, it is essential that a modulated R. F. oscillator of suitable frequency range such as Stock No. 9050, an output indicator, Stock No. 4317, and an alignment tool, Stock No. 4160, be available. Figure 4 shows the location of the various line-up capacitors.

I. F. Tuning Adjustments

The I. F. amplifier comprises two stages which have three transformers. The third transformer is untuned so that only a total of four tuned circuits is used. Refer to Figure 4 and proceed as follows:

(a) Short-circuit the antenna and ground terminals and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the ground terminal.

(b) Connect the test oscillator output between the first detector control grid and chassis ground. Connect the output indicator across the voice coil of the loudspeaker and adjust the oscillator output so that, with the receiver volume control at maximum, a slight deflection is obtained in the output meter.

(c) Adjust the secondary and primary of the first and then the second I. F. transformers until a maximum deflection is obtained. The third transformer is untuned and does not require adjusting. Keep the oscillator output at a low value so that only a slight indication is obtained on the output meter at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. adjustments.

R. F. and Oscillator Adjustments

The R. F. line-up capacitors are located at the bottom of the coil assemblies instead of their usual position on the gang capacitor. They are all accessible from the bottom of the chassis except the 600 K. C. series capacitor, which is accessible from the top of the chassis. Proceed as follows:

(a) Connect the output of the oscillator to the antenna and ground terminals of the receiver. Check the position of the indicator pointer when the tuning capacitor plates are fully meshed. It should be coincident with the radial line adjacent to the dial reading of 540.

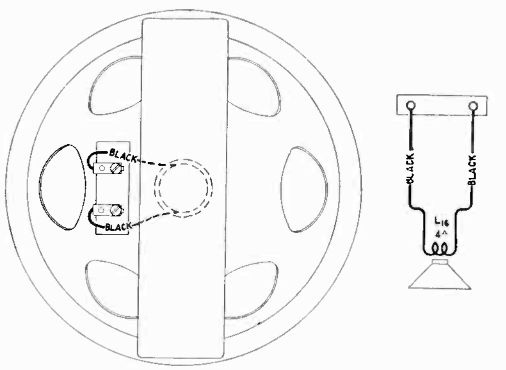

Figure 3—Loudspeaker Wiring

(b) Then set the Test Oscillator at 1720 K. C., the dial indicator at 1720, the Range Switch at the "in" position, and adjust the oscillator output so that a slight deflection will be obtained in the output meter when the volume control is at its maximum position.

Adjust the two trimmers under the two R. F. coils, designated as BC in Figure 4, until a maximum deflection is obtained in the output meter. Then shift the Test Oscillator frequency to 600 K. C. The trimmer capacitor, accessible from the top of the chassis, should now be adjusted for maximum output while rocking the main tuning capacitor back and forth through the signal. Then repeat the 1720 K. C. adjustment.

(c) Now place the Range Switch at the "out" position, shift the Test Oscillator to 18,000 K. C. and set the dial at 18M. Adjust the two trimmer capacitors designated as SW in

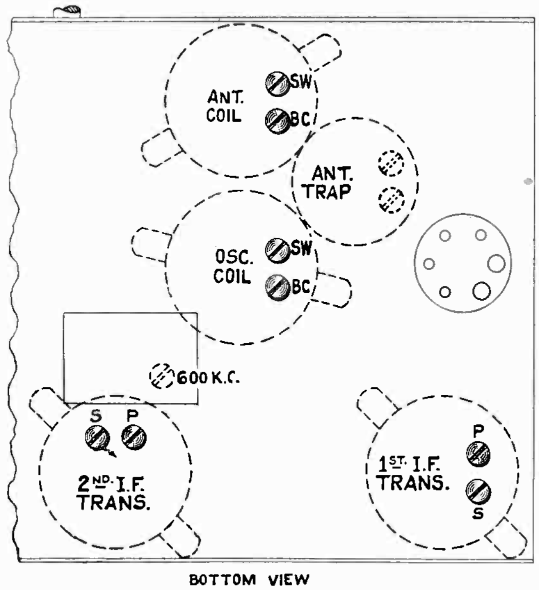

Figure 4—Location of Line-Up Capacitors

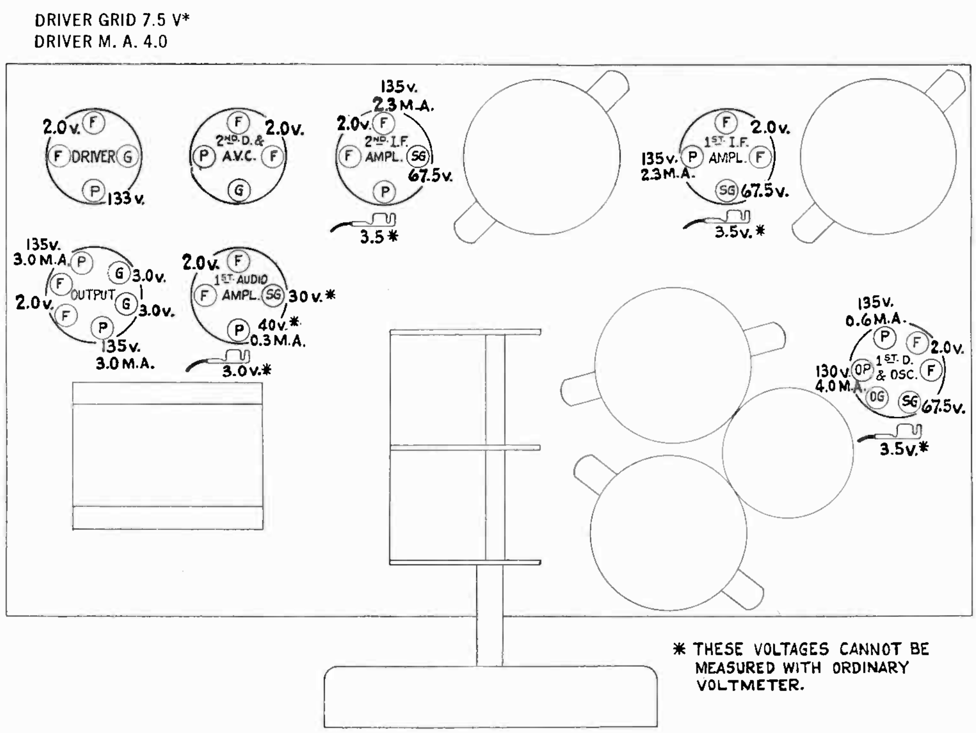

Figure 5—Radiotron Socket Voltages

Figure 4 for maximum output, beginning with the oscillator trimmer. It will be noted that the oscillator and first detector trimmers will have two positions at which the signal will give maximum output. The position which uses the lower trimmer capacitance, obtained by turning the screw counter-clockwise, is the proper adjustment for the oscillator, while the position that uses a higher capacitance is correct for the detector. The detector trimmer *must* be adjusted for maximum output while rocking the main tuning capacitor back and forth through the signal. *Both of these adjustments must be made as indicated.*

The important points to remember are the need for using the minimum oscillator output to obtain a deflection in the output meter with the volume control at its maximum position and the manner of obtaining the proper high-frequency oscillator and detector adjustments. Also the proper peak on the high-frequency adjustments must be used and the tuning capacitor rocked back and forth as indicated.

Trap Circuit Adjustment

A trap circuit, tuned to the I. F. frequency (460 K. C.) is used in the antenna circuit to reduce interference from signals approximately the same frequency as that of the I. F. amplifier. Two parallel trimmers are used and adjustment may be made by means of either or both. Proceed as follows:

(a) Place the receiver in operation and connect the test oscillator output from the antenna to ground terminals of the receiver. Adjust the test oscillator frequency to 460 K. C. and connect the output indicator across the cone coil of the reproducer.

(b) Adjust either or both of the trap circuit trimmers, accessible from the top of the chassis, Figure 4, until a *minimum* output from the receiver is obtained. The point of minimum output is the proper adjustment.

It should be remembered that the trimmers provide an adjustment over a small range. However, in event constant interference is experienced at a slightly different frequency from 460 K. C., adjusting the trap to the frequency of the interference will materially reduce its effect.

(2) Radiotron Socket Voltages

The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if lower resistance meters are used, such allowances must be made:

RADIOTRON SOCKET VOLTAGES

Volume Control at Maximum—No Signal—135 Volt "B" Battery—4.5 and 7.5-Volt Bias Batteries

Radiotron No.		Control Grid to Ground	Screen Grid to Ground	Plate to Ground	Plate, M. A.	Filament Volts
RCA-1A6	1st Detector	3.5*	67.5	135	0.6	2.0
	Oscillator	—	—	130	4.0	
RCA-34—I. F.		3.5*	67.5	135	2.3	2.0
RCA-34—I. F.		3.5*	67.5	135	2.3	2.0
RCA-30—Detector AVC		—	—	—	—	2.0
RCA-32—Audio		3.0*	30*	40*	0.3	2.0
RCA-30—Driver		7.5*	—	133	4.0	2.0
RCA-19—Power		3.0	—	135	3.0	2.0

*These voltages cannot be measured with ordinary voltmeter.

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4427	Bracket—Volume or tone control mounting bracket	$0.18
2747	Cap—Contact cap—Package of 5	.50
4498	Capacitor—8 mfd. (C18)	1.25
4442	Capacitor—50 mmfd. (C10)	.22
3981	Capacitor—300 mmfd. (C25)	.30
4413	Capacitor—360 mmfd. (C16)	.22
2749	Capacitor—2400 mmfd. (C26)	.35
4440	Capacitor—2400 mmfd. (C12, C31, C32)	.26
4529	Capacitor—2650 mmfd. (C33)	.32
4439	Capacitor—3400 mmfd. (C11)	.35
4212	Capacitor—0.01 mfd. (C29)	.30
4518	Capacitor—0.05 mfd. (C27)	.52
4417	Capacitor—0.05 mfd. (C5, C19, C23, C24)	.25
4643	Capacitor—0.035 mfd. (C30)	.30
3877	Capacitor—0.1 mfd. (C8, C28)	.32
4537	Capacitor—0.25 mfd. (C7)	.38
3861	Capacitor — Adjustable trimmer capacitor (C17)	.78
4430	Coil—Antenna coil (L2, L3, L4, L5, C3, C4)	1.92
4432	Coil—Oscillator coil (L6, L7, L8, L9)	1.65
4539	Coil and shield assembly—Antenna trap circuit (L1, C1, C2)	2.05
4504	Condenser—2-gang variable tuning condenser (C6, C9)	2.78
4687	Resistor—1,000 ohms—Carbon type—¼ watt—Package of 10 (R3, R5)	2.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R2, R7)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1, R4, R6)—Package of 5	1.00
3744	Resistor—250,000 ohms—Carbon type—¼ watt (R11, R12)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R13)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R8, R10)—Package of 5	1.00
4521	Shield—Antenna, oscillator or I. F. transformer shield	.42
4103	Shield—Driver Radiotron shield	.20
4145	Shield—First detector and oscillator Radiotron shield	.30
3056	Shield—First I. F. amplifier Radiotron shield—Package of 2	.40
4530	Socket—4-contact Radiotron socket	.28
4532	Socket—4-contact audio amplifier—Radiotron socket	.28
4232	Socket—6-contact Radiotron socket	.35
4531	Socket—6-contact output Radiotron socket	.30
4534	Switch—Range switch (S1, S2, S3, S4, SW, LW)	3.64
4536	Tone control (R14)	.95
4431	Transformer—First intermediate transformer (L10, L11, C13, C14, C15)	2.28
7840	Transformer — Second intermediate transformer (L12, L13, C20, C21, C22)	2.35
4538	Transformer—Third intermediate frequency transformer (L14, L15)	2.15
4533	Transformer pack—Audio transformer pack—Comprising driver and output transformer (T1, T2)	3.98
4535	Volume control (R9)	1.40
	REPRODUCER ASSEMBLIES (CONSOLE MODEL)	
4541	Cable—2-conductor reproducer cable	.38
9432	Cone—Reproducer cone (L16)	1.88
7820	Magnet—Cone housing and magnet assembly	8.98
7819	Reproducer complete	12.18
4234	Rivet—Cone mounting rivet—Package of 100	.66
	REPRODUCER ASSEMBLIES (TABLE MODEL)	
9539	Cone—Reproducer cone—Package of 5	$4.30
9540	Magnet assembly—Comprising cone bracket core and magnet	5.72
9538	Reproducer complete	7.65
	DRIVE ASSEMBLY	
4422	Clutch—Condenser drive clutch assembly complete	.88
4641	Dial—Station selector dial (console model)	.80
4588	Dial—Station selector dial (table model)	.80
4586	Drive—Variable tuning condenser drive assembly complete	2.42
4587	Pointer—Station selector pointer (table model)	.18
4363	Pointer—Station selector pointer (console model)	.18
	MISCELLANEOUS ASSEMBLIES	
6706	Bezel—Metal bezel (escutcheon) for station selector dial glass (table model)	.42
6840	Bezel—Metal bezel (escutcheon) for station selector dial glass (console model)	.56
4289	Body—Fuse connector body—Package of 10	.35
4642	Cable—Battery cable—8-conductor—Complete with switch and connectors (table model)	3.60
4542	Cable—8-conductor battery cable complete with switch and connectors (console model)	3.82
4288	Cap—Fuse connector cap—Package of 10	.36
6516	Connector—Fuse connector complete	.16
6176	Escutcheon—"OFF-ON" operating switch escutcheon—Package of 5	.50
4286	Ferrule—Fuse connector ferrule and bushing—Package of 10	.38
3748	Fuse—0.5 ampere—Package of 5	.40
6614	Glass—Station selector dial glass (console model)	.30
6707	Glass—Station selector dial glass (table model)	.20
4290	Insulator—Fuse connector insulator—Package of 10	.35
3088	Knob—Operating switch knob—Package of 5	.50
4449	Knob—Station selector, volume control, tone control or range switch knob—Package of 5	.60
4644	Resistor—0.42 ohms—Flexible type—Filament series (R15)—Package of 5	.80
6615	Ring—Retaining ring for dial glass—Package of 5 (console model)	.34
6708	Ring—Retaining ring for dial glass—Package of 5 (table model)	.44
4638	Screw—Chassis mounting screw assembly—Comprising eight cushions, four screws, four washers, four lockwashers and four spacers	.52
3238	Screw—6-40-17/32" knurled head—Set screw for operating switch knob No. 3088—Package of 10	.25
4613	Screw—8-32-7/16" headless set screw for station selector volume control, tone control or range switch knob—Package of 10	.25
4284	Spring—Fuse connector spring—Package of 10	.30
4540	Switch—Operating switch	2.28
4285	Washer—Fuse connector insulating washer—Package of 10	.22

Printed in U. S. A

RCA Victor "All-Wave"

Models 140, 141, 141-E and 240

Eight-Tube Superheterodyne Receivers

(External I. F. Transformers)

INSTRUCTIONS

RCA Victor Company, Inc.

CAMDEN, N. J., U. S. A.

INTRODUCTION

This "all-wave" radio receiver embodies the widely-recognized superheterodyne circuit and is capable of operation through a continuous tuning range of from 540 to 18,000 kilocycles (555 to 16.7 meters). Certain models intended primarily for European destinations are operable through an additional range of from 150 to 410 kilocycles (2000 to 732 meters) for long-wave services. All facilities provided in this instrument for reception beyond the limits of the standardized broadcast band (540 to 1500 kilocycles) are built-in as integral parts of the radio chassis—not simply connected to an existing chassis as a short-wave adaptor—resulting in distinctly superior performance.

To facilitate tuning as far as possible, the complete main tuning range is divided into four overlapping steps, each spread over the full span of the dial. These steps, or frequency bands, together with the long-wave range provided in some models, are quickly interchangeable by means of a switch located on the front of the cabinet. Also contributing to tuning ease and accuracy are the clock-type "full-vision" illuminated dial which is calibrated throughout in frequency, and the associated vernier (double-reduction ball-bearing) tuning drive.

The technically-informed user of this instrument naturally will be interested in its many advanced engineering features. Of chief importance is the use of *tuned-radio-frequency amplification* preceding the heterodyne circuit to minimize extraneous signal interference (image-frequency response, etc.) and to improve the "signal-noise" ratio. Two t-r-f stages are included, one being common to all bands and the second used only in conjunction with the highest-frequency band to compensate for the inherently greater circuit losses obtained in that range. Additional features of note are: (1) Its efficient automatic volume control operating uniformly at all carrier frequencies and (2) its high-powered (Class B) audio-output system utilizing the new "twin-amplifier" Radiotron RCA-53. In general, all of the best practices observed heretofore in modern, high-grade receivers of the standard broadcast type are incorporated in this "all-wave" instrument, thus insuring excellent performance over the entire tuning range.

INSTALLATION

Location—The instrument should be placed convenient to the antenna and ground connections and near an electrical outlet.

Tubes—The instrument is equipped and tested at the factory with RCA Radiotrons and is shipped with these tubes installed. Before making the required external connections, however, it will be advisable to examine the tube installation. as one or more of the tubes, shields or dome terminal clips may have been jarred loose in shipment. Refer to the tube location diagram printed on the instrument label inside the cabinet and ***make certain:***

(1) That all tubes are in the proper sockets and pressed down firmly.

(2) That all shields are rigidly in place over the tubes represented by double circles on the diagram.

(3) That the spring connectors of the short flexible (grid) leads, shown on the diagram, are securely attached to the dome terminals of the proper tubes.

NOTE—The grid lead for the RCA-2B7 Radiotron must be enclosed by the cylindrical tube shield. A slot is provided at the bottom of this shield for entrance of the lead.

Antenna and Ground—The efficiency of any antenna varies greatly with the frequency of incoming radio waves, a given length being excellent at certain frequencies and comparatively poor at others. For uniform results throughout a wide tuning range such as found in this instrument, therefore, an antenna of adjustable length would be desirable theoretically. From a practical standpoint, however, very good results will be obtained using two antennas of different length, one 24–29 feet for short-wave reception, and the other 50–100 feet for reception in the long-wave, standard broadcast and police bands, the lead-in considered as part of the total length in each case.

The shorter antenna may be used alone if preferred, but probably will not be satisfactory for receiving distant or low-powered stations in the standard broadcast band. Further, no advantage will be gained by its use on the shorter wavelengths unless it can be installed so that the majority of its length is unshielded (not contained in a building of metallic construction) and sufficiently remote from sources of man-made interference (such as housewiring, power lines, street-railways and passing automobiles) to prevent excessive noise. If these conditions cannot be fulfilled, it will be preferable to erect a single antenna of compromise length (100–105 feet overall) which, in addition to providing excellent results in the standard broadcast band, will also favor reception in the short-wave broadcast bands located at 49, 31, 25 and 19 meters.

Best performance of this receiver on the shorter wavelengths can be insured by installation of the recently introduced "World-Wide" antenna system, available from your dealer as a convenient accessory kit. The advantages of this system are two-fold, its use providing: (1) A great improvement in efficiency, as evidenced by increased signal strength—often several times that obtainable with the conventional single-wire type and (2) a considerable decrease in local electrical interference (man-made static) which is apt to be objectionably severe at the higher frequencies. For densely-populated districts, therefore, this system is virtually a necessity.

Good reception in many installations will be obtained without connecting the instrument to an external ground, since the power-line characteristics often render a separate radio ground unnecessary. In any case, however, best results will be insured by grounding the set in the conventional manner to a water-pipe or radiator or to a metallic pipe or stake driven from five to eight feet into the soil. The ground lead when used should be short, preferably not more than 15 feet in length, and connected to a clean portion of the pipe or stake surface by means of an approved ground clamp.

A terminal board is provided at the rear of the receiver chassis for connection to the antenna and ground. Attach the antenna wire or lead-in to the left-hand terminal (marked "ANT") and the ground wire to the right-hand terminal (marked "GND"). Tighten both terminals with a screw-driver to insure permanent electrical connections.

Power Supply—The instruments in this series are supplied in either of two alternating-current power-supply ratings:

(1) 100–125/200–250 volts, 50–60 cycles and (2) 100–125 volts, 25–60 cycles (see instrument-label rating which corresponds to rating symbol on chassis). To insure correct tube operating voltages, both types are equipped to permit rearrangement of the internal connections to conform with the actual voltage available. Thus, the 50–60 cycle models may be adapted for 100–115, 115–125, 200–230 or 230–250 volts; and the 25–60 cycle models for either 100–115 or 115–125 volts.

Standard models of both types are connected correctly at the factory for operation at 115–125 volts; models of either type when connected for any other voltage range are so designated *by means of a tag attached to the power cord*. Hence, if the local voltage does not lie within the present range of the instrument, the proper alternative form of connection must be substituted. Consult your power company if you are in doubt as to the specific voltage of the supply. Reconnections when required should be performed by your dealer, to whom complete technical information is available in a separate booklet known as the Service Notes.

After making certain that the instrument has been connected for the proper voltage, attach the power cord to the electrical outlet.

OPERATION

Controls—The four control knobs on the front panel of the cabinet serve the following purposes:

(1) ***Range Switch*** (Left-hand Knob)—This switch converts the receiver for operation within any of the tuning ranges provided. As indicated on the selector dial, the letters on the switch escutcheon signify:

X—*Long-Wave Range*—150 to 410 kilocycles (2000 to 732 meters). This range is included only in certain models of the instrument (see "Introduction").

A—*Standard Broadcast Band*—540 to 1500 kilocycles (555 to 200 meters).

B—*Police Band*—1500 to 3900 kilocycles (200 to 77 meters). Services available within this band include police calls at 1574, 1712 and 2450 kilocycles, amateur radio "phone" communications between 1800 and 2000 kilocycles, and aviation communications (phone) between 2500 and 3500 kilocycles.

C—*Short-Wave Range*—3900 to 10,000 kilocycles (77 to 30 meters). Within the limits of this range are included two of the internationally-assigned short-wave broadcast bands. These are known as the 49 and 31 meter bands. (The portion of this range from 8000 to 10,000 kilocycles, which includes the latter band, is preferably received on range D.)

D—*Short-Wave Range* — 8,000 to 18,000 kilocycles (37.5 to 16.7 meters). This range embraces four of the standardized short-wave broadcast bands located at 31, 25, 19 and 16 meters, respectively.

(2) ***Station Selector*** (Upper Middle Knob with Crank)—Scale X (when included) and scales A and B on the illuminated dial are calibrated in kilocycles and traversed by the lower end of the moving pointer. The upper end of the pointer traverses scales C and D which are calibrated in megacycles (affix three ciphers to convert to kilocycles). The scale portions covered by the police bands on scale B and by the standardized short-wave broadcast bands on scales C and D are bracketed and clearly identified; each police band is designated by the letter "P" and each broadcast band by numerals corresponding to the wavelength followed by the letter "M" (meters), such as "49M".

(3) ***Power Switch and Tone Control*** (Lower Middle Knob)—The power switch operates at the counter-clockwise end of the control range. A slight clockwise rotation actuates the switch, causing illumination of the dial—indicative of normal operation. Treble response increases gradually to a maximum with continued clockwise rotation.

(4) ***Volume Control*** (Right-hand Knob)—Sound level (volume) increases with rotation of this control in a clockwise direction.

Procedure—The actual operation is simple and not unlike that of more conventional instruments designed for the reception of standard broadcast programs alone. However, the full possibilities of any short-wave receiver cannot be attained unless the user has a practical knowledge of short-wave transmission behavior and operating schedules. It is therefore recommended that the appended Notes on Short-Wave Reception and the inserted Short-Wave Broadcasting Station List and Program Schedule be studied carefully.

A brief outline of the recommended operating procedure should suffice:

1. Set the Range Switch for the frequency range within which the desired station is included.

2. Turn the Power Switch "on" and the Tone Control fully clockwise—*for full-range reproduction*. Wait a few seconds in order that the tubes may attain the proper temperature before attempting further operation.

3. Advance the Volume Control to a position near the middle of its range and rotate the Station Selector until the dial indicator assumes a position coincident with the listed frequency of the desired station (on that scale which is designated by the letter corresponding to the range switch setting). Then turn the selector *very slowly* over a narrow range on each side of that setting, advancing the Volume Control further in a clockwise direction and repeating the tuning process, if necessary, until the signal is heard.

NOTE—This procedure is important—especially so for short-wave reception. Because of the wide band of frequencies covered by the short-wave ranges, tuning is critical (sharp). A station of suitable strength often will be imperceptible if passed through rapidly or in a haphazard manner.

4. After receiving the signal, turn the Volume Control counter clockwise until the volume is reduced to a low level. Then readjust the Station Selector accurately to the position mid-way between the points where the quality becomes poor or the signal disappears. *This setting minimizes the proportion of background noise (static) and provides the fine quality of reproduction possible with this instrument.*

5. Adjust the Volume Control to the desired volume level.

NOTE—The automatic volume control built into this instrument maintains the volume level substantially constant irrespective of normal fluctuations of signal strength (fading). Also, other stations with good signal strength will be received at approximately the same volume without readjustment of the Volume Control.

6. If less treble response is preferred, rotate the Tone Control counter-clockwise to obtain the most pleasing quality of reproduction; static interference, when excessive, also may be reduced in this manner.

7. When through operating, turn the Tone Control fully counter-clockwise, thus switching "off" the power.

NOTES ON SHORT-WAVE RECEPTION

While the design of this instrument is such that no previous experience or special skill is required for proper operation, its full possibilities can be realized only by those familiar with the general characteristics of transmission on the shorter wave-lengths. The following notes are a summary of extensive data compiled mainly by experimentation and should be found both interesting and helpful. especially to beginners in the field of short-wave reception.

Broadcast transmission at 49 meters is most reliable when received from a distance of 300 miles (500 kilometers) or more, although good reception at distances greater than 1500 miles (2400 kilometers) can be expected only when a large portion of the signal path lies in darkness.

Thirty-one (31) meter stations afford greatest reliability of service to receivers situated at a distance exceeding 800 miles (1300 kilometers). Good reception from distant stations in this band is possible both day and night.

Reception from stations operating in the 25 meter band is most common when a span of 1000 miles (1600 kilometers) or more separates the receiver and transmitter. Such transmission over distances of less than 2000 miles (3200 kilometers) will be received best during daylight hours. The more distant stations, however, can still be heard well after nightfall under favorable conditions.

In the 19 meter band, stations situated at a distance of 1500 miles (2400 kilometers) or greater will be found most satisfactory. Signals in this band will generally be heard during daylight hours—rarely after nightfall or when any appreciable portion of the transmission path is in darkness. Wave-lengths below 19 meters are useful only when transmitted entirely through daylight and over long distances (2000 miles or more); ordinarily they cannot be received after sunset.

Transmitted signals of any wave-length are known to divide into two components—the "ground" wave and the "sky" wave. The former remains close to the earth's surface, providing reliable service only over short distances from the broadcasting station. The sky wave, however, travels into the higher layers of the atmosphere and is reflected back to the earth's surface at an appreciable distance from the station. With short-wave signals, the sky wave usually does not return within the radius covered by the ground wave, resulting in a so-called dead-spot region within which reception is impossible or extremely unsatisfactory. The length of the region wherein such conditions are effective is known as the skip distance, varying greatly from day to night and from summer to winter approximately as shown in Table I.

When attempting to receive distant or foreign stations, the time standards observed at various longitudes throughout the world must be considered. At 8:00 P. M. in New York or 7:00 P. M. in Chicago, it is of the next day—1:00 A. M. in London, 2:00 A. M. in most of Europe and 11:00 A. M. in Australia. On the American continents, therefore, regular evening broadcasts from Europe will be received in the late afternoon and from Australia in the early morning. Special programs, however, are frequently transmitted from European stations at times chosen for evening reception in America.

Although reception on the short wave-lengths is less affected by atmospherics or static and good results may be had in midsummer even during a thunder storm, the reverse is true of man-made interference. Electrical machinery such as trolleys, dial telephones, motors, electric fans, automobiles, airplanes, electrical appliances, flashing signs and oil burners create far more interference to the shorter waves than to frequencies in the standard broadcast band (200 to 555 meters).

While the foregoing statements are valid, many other factors may so influence the transmission of short waves that exceptions are probable in certain locations. Experience in the operation of short-wave receivers in a given location is the best guide as to what to expect in reception at various times.

Any person interested primarily in short-wave reception will find membership in the International Short-Wave Club of great value. The club is a non-commercial organization and issues a monthly magazine (International Short-Wave Radio) which contains up-to-date information pertaining to short-wave broadcasting, amateur activities and commercial, police and aircraft services. The annual membership fee, including the magazine subscription, is one dollar ($1.00), U. S. Currency; single copies of the periodical may be procured by non-members for ten cents ($0.10). U. S. Currency, each. Address International Short-Wave Club, P. O. Box 713, Klondyke, Ohio, U. S. A.

Table I—Effect of Time of Day and Season of Year on Short-Wave Transmission*

Wave-length (Meters)	Ground-Wave Range		Sky Wave (Mid-Summer) Approximate Range				Sky Wave (Mid-Winter) Approximate Range			
			Noon		Midnight		Noon		Midnight	
	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.
100	90	145	—90	—145	90—600	145—960	90—100	145—160	90—2500	145—4000
49	75	120	100—200	160—320	250—5000	400—8000	200—600	320—960	400—∞	640—∞
31	60	97	200—700	320—1125	1000—∞	1600—∞	500—2000	800—3200	1500—∞	2400—∞
25	50	80	300—1000	480—1600	1500—∞	2400—∞	600—3000	960—4800	2000—∞	3200—∞
19	35	56	400—2000	640—3200	2500—∞	4000—∞	900—4000	1450—6400	X	X
15	15	24	700—4000	1125—6400	X	X	1500—∞	2400—∞	X	X

∞—Unlimited distance. X—Ordinarily cannot be heard.

* Time and season apply to transmitting station. Distances specified are based on relatively high-power transmission and favorable conditions of reception.

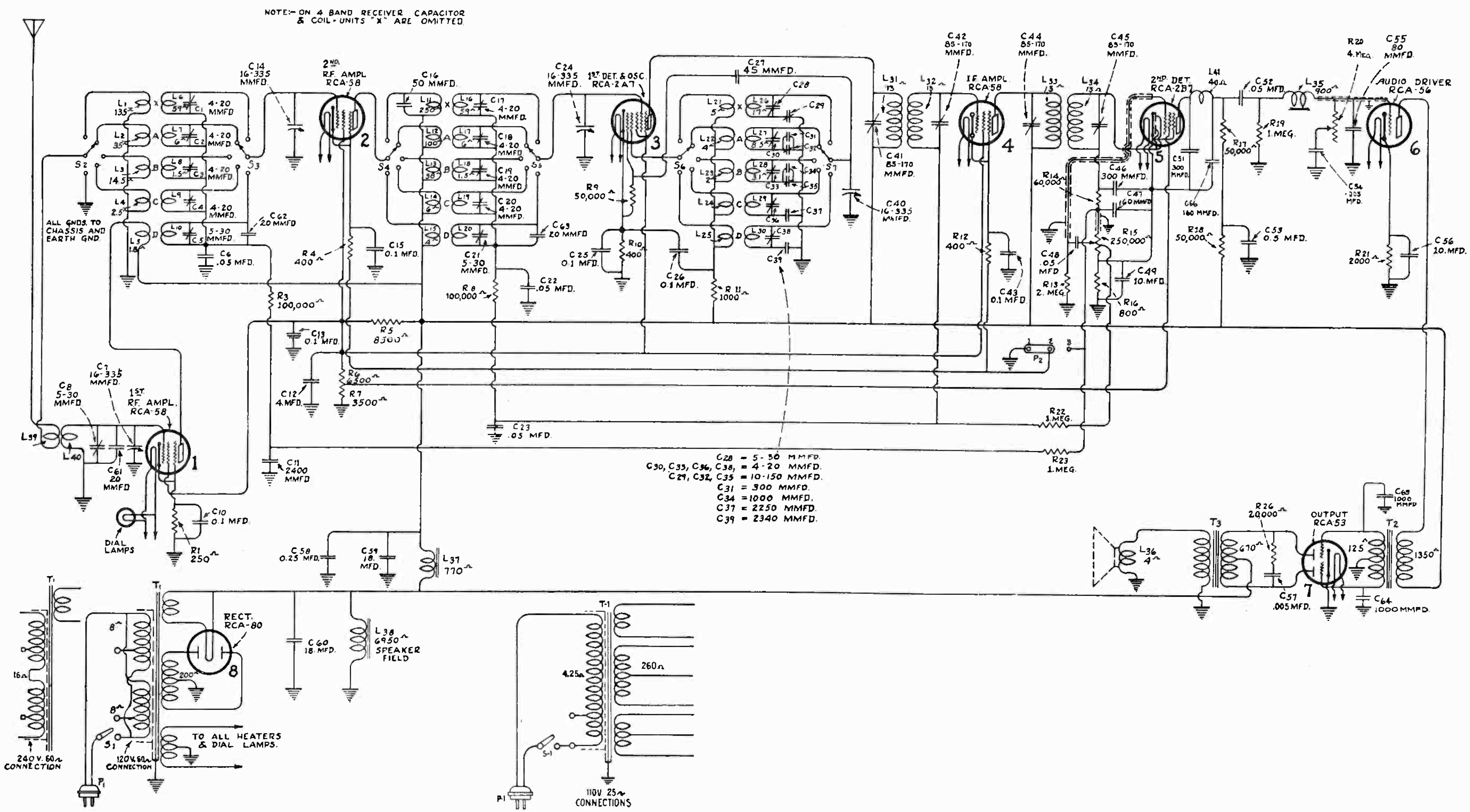

Figure A—Schematic Circuit Diagram

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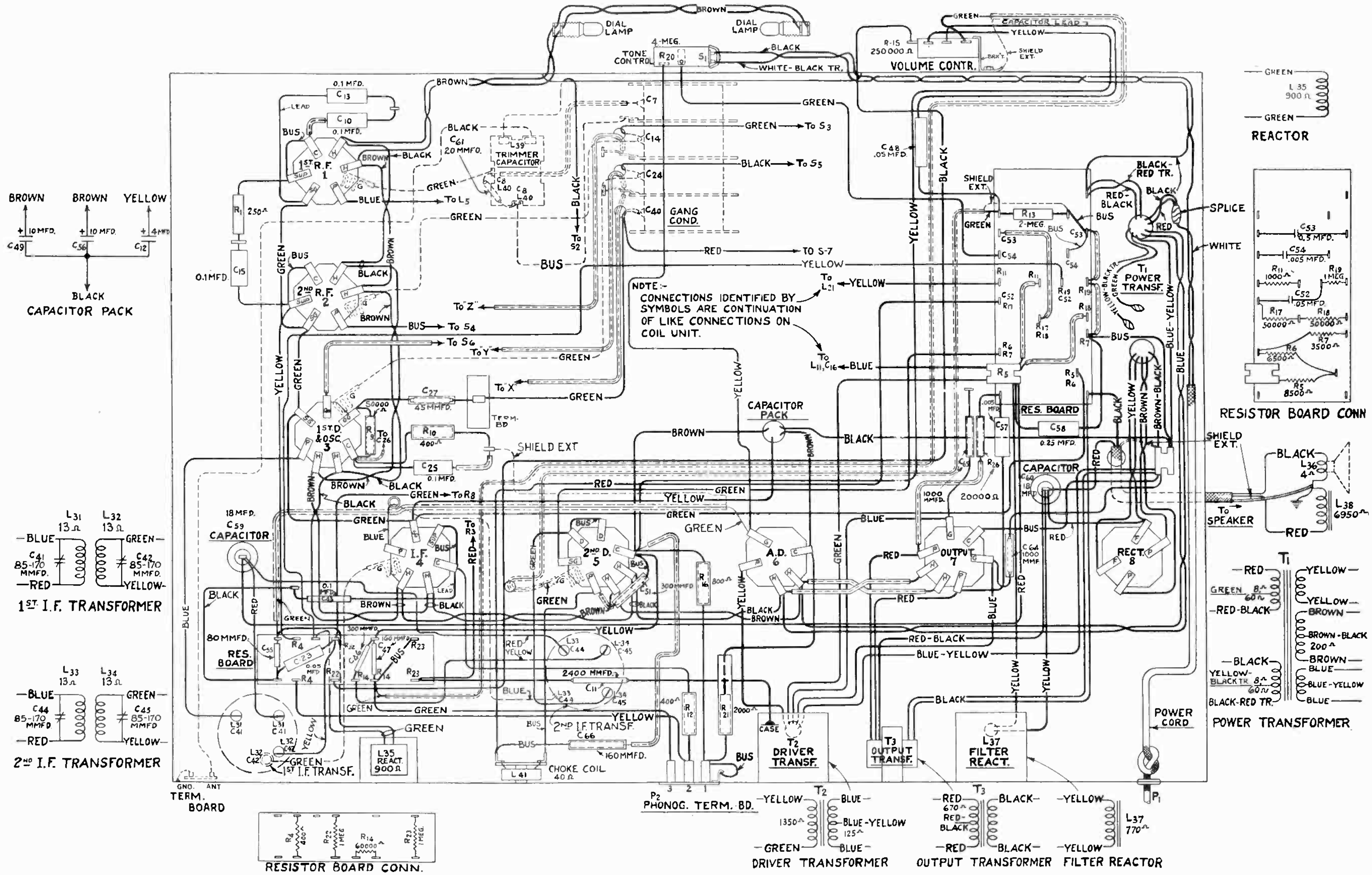

Figure B—Chassis Wiring

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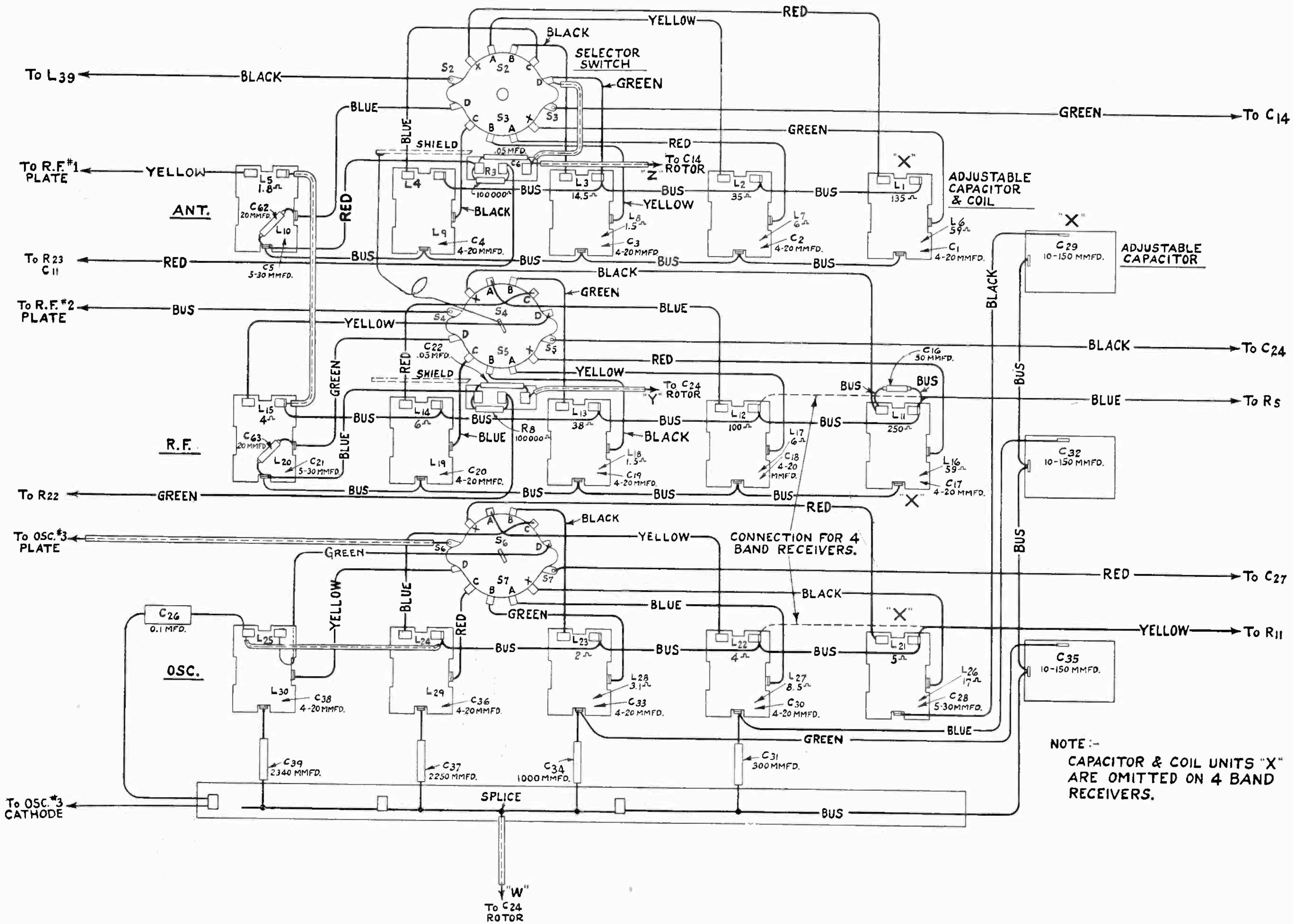

Figure C—Wiring Diagram of Coil Assembly

SERVICE DATA

Electrical Specifications

Voltage Rating............100–125 Volts and 200–250 Volts

Frequency Rating
25–60 (100–125 Volts Only) and 50–60 Cycles

Power Consumption..........................110 Watts

Type and Number of Radiotrons
3 RCA-58, 1 RCA-2A7, 1 RCA-2B7, 1 RCA-56, 1 RCA-53, 1 RCA-80—Total, 8

Type of Circuit
Straight Super-Heterodyne for all frequencies with Class "B" Output Stage.

Undistorted Output...........................6 Watts

This all-wave super-heterodyne receiver is of the continuous tuning type, utilizing a straight super-heterodyne circuit in all bands. The bands are as follows:

Selector Switch Position	*Frequency Range (Kilocycles)*	*Wave-Length Range (Meters)*
X	150–410	2000–732
A	540–1500	555–200
B	1500–3900	200–77.0
C	3900–10000	77.0–300
D	8000–18000	37.5–16.7

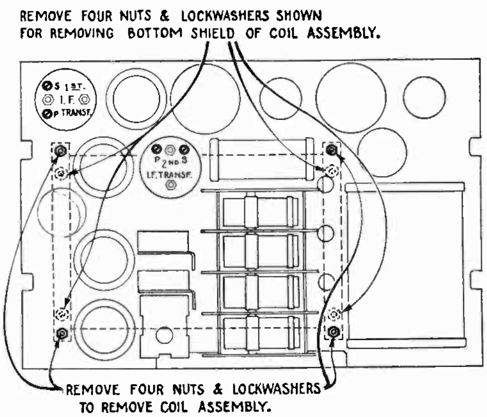

Figure D—Location of nuts and lockwashers holding coil assembly

This receiver will be supplied in two models, one including all bands and one with band X omitted. These instructions, however, will cover both types of the receiver. The variations in the wiring for the two models are plainly shown in the illustrations. Figures A, B and C show the schematic circuit and wiring diagrams.

The circuit consists of an R. F. stage using Radiotron RCA-58, a combined oscillator and first detector using Radiotron RCA-2A7, an I. F. stage using RCA-58, a second detector and A. V. C. using RCA-2B7, an A. F. driver using RCA-56, and a Class "B" output stage using an RCA-53. The RCA-80 functions as the rectifier in the power supply circuits.

The foregoing tubes and circuit functions apply to bands X, A, B and C only. In the case of band D, an additional R. F. stage utilizing an additional Radiotron RCA-58 is used. This is to increase the sensitivity and image frequency selectivity and to reduce the interference caused by tube hiss and signals corresponding to the intermediate frequency.

The intermediate frequency is 445 K. C. The use of this frequency gives an especially good image frequency ratio and facilitates alignment of the oscillator at the higher frequency bands.

Mechanical Construction

The chassis consists of two major assemblies, which must be disassembled for certain repair work. These assemblies consist of the chassis proper, including the main frame, power transformer, etc., and the coil assembly. The coil assembly consists of fifteen transformers supported upon individual tubular bakelite forms, each fastened to a separate porcelain strip upon which the coil terminals are mounted with their associate trimmer capacitor. This entire assembly, with the selector switch, is grouped in a shielded compartment which is mounted in the base of the main chassis assembly.

In order to remove this assembly it is necessary to remove the four nuts shown in Figure D and unsolder the connections of the fifteen leads shown in Figure C at the points where they connect to the main chassis. The leads should be allowed to remain on the coil assembly. After this is done, the coil assembly may be removed and repairs to it or to the main chassis may be easily made. If a coil or its associated trimmer is to be replaced, then only the bottom shield of the coil assembly must be removed. This is done by removing the four nuts that hold it to the chassis studs. This is shown in Figure D.

Line-Up Capacitor Adjustments

This receiver is aligned in a similar manner to that of a standard broadcast band receiver. That is, the three main tuning capacitors are aligned by means of three trimmers in each band and, on the three lowest frequency bands, a series trimmer is adjusted for aligning the oscillator circuit. The other two bands do not require this low-frequency trimmer, it being fixed in value. In the case of band D, it is necessary to adjust four trimmers, due to the additional F. R. stage used.

TUBE SOCKET VOLTAGES

120 Volt A. C. Line

Radiotron No.	Control Grid to Cathode, Volts	Screen Grid to Cathode, Volts	Plate to Cathode Volts	Plate Current M. A.	Filament or Heater Volts
RCA-58, R. F.	**2.0	100	255	6.0	2.6
RCA-58, S. W. R. F.	**2.0	100	255	6.0	2.6
RCA-2A7, Det.-Osc.	**2.5	100	250	*5.0	2.6
RCA-58, I. F.	**2.0	100	255	6.0	2.6
RCA-2B7, 2nd Det.-AVC	**1.5	35	105	1.5	2.6
RCA-56, A. F. Driver	**12.0	—	245	6.0	2.6
RCA-53, Output	0	—	300	36.0	2.6
RCA-80, Rectifier	640 R. M. S. Plate to Plate			130 per Plate	5.0

* Voltages and current apply to detector portion of tube.

** These voltages cannot be measured because of the high resistance of the circuits.

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The intermediate frequency amplifier is aligned in a similar manner to that of standard broadcast receivers except that it is aligned at 445 K. C. In order to properly align the receiver, it is essential that the Stock No. 9050 Test Oscillator be used. This oscillator covers the frequencies of 90 K. C. to 25,000 K. C., continuously, has good stability and includes an attenuator. In addition to the oscillator, a 300-ohm resistor, for use as a "dummy" antenna, a non-metallic screw-driver such as Stock No. 4160, and an output meter are required. The output meter should be preferably a thermocouple galvanometer connected either across or in place of the cone coil of the loudspeaker.

To align the intermediate frequency circuits, connect the output of the external oscillator to the grid of the first detector. For the R. F. and oscillator adjustments, the oscillator output should be connected to the antenna and ground terminals of the receiver with a 300-ohm resistor inserted in

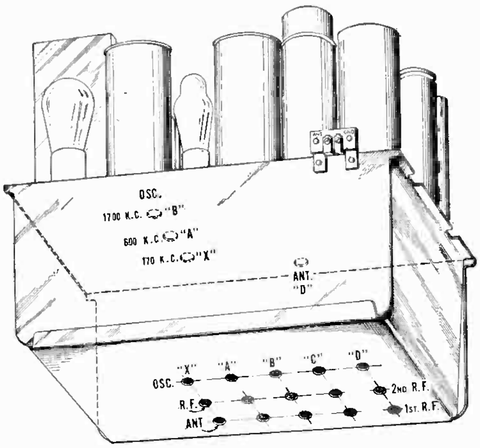

Figure E—Location of line-up capacitors

series with the antenna lead. In many cases, however, the signal strength obtained with this direct connection will be too great to permit proper alignment, even at the minimum setting of the oscillator attenuator. When this is true, the external oscillator must be loose-coupled to the receiver. This is done by connecting the 300-ohm resistor between the antenna and ground terminals of the receiver and attaching a short length of wire to the antenna post. Lay the free end of this wire across the oscillator case, adjusting its position as necessary to obtain the degree of pickup required.

The output of the external oscillator should be at the minimum value necessary to obtain a deflection in the output meter when the volume control is at its maximum position. All adjustments are made for a maximum deflection in the output meter.

The accuracy of line-up of each band may be checked without touching the trimmer condensers, by the use of the tuning wand, Stock No. 6679.

One end of the wand consists of a brass cylinder. When this is inserted in a coil the effective inductance of the coil is lowered.

The other end of the wand contains a special finely divided iron suitable for use at radio frequencies. When this is inserted in a coil the inductance is raised.

To use the tuning wand a signal is first tuned in at the frequency at which a check is desired on alignment. The wand is then inserted slowly in the Antenna and R. F. transformers, using first one end and then the other end of the wand. Unless the alignment is perfect, it will be found that the power output indicated by the meter will be increased to a peak for a critical position of the wand in the coils.

The end of the wand required indicates whether the coil is high or low.

Of course, alignment correction at the high-frequency end of a tuning range should be accomplished by the use of the trimmer condenser. If alignment correction should be required at the low-frequency end of a tuning range, it may be accomplished by sliding the end coil of the transformer. The winding farthest from the trimmer panel is pushed toward the trimmer panel to increase the inductance, and farther away to decrease the inductance. On band D coils, the last two or three turns may be pushed in a similar manner to obtain the proper inductance.

This adjustment should not be attempted unless a quite appreciable improvement will result (as shown by the tuning wand).

The following chart gives the details of all line-up adjustments. The receiver should be lined up in the order of the adjustments given on the chart. Refer to Figure E for the location of the line-up capacitors.

Pickup Connections

A terminal board is provided at the rear of the chassis for attaching a magnetic pickup to this instrument. Such connections are shown in Figures F, G and H.

Transformer Connections

The power transformer of the 50–60 cycle receiver uses two tapped primary windings. By connecting them in parallel or in series, the receiver may be used either on 110 or 220 volt lines. Figure J shows the proper manner of making the various connections possible for this transformer.

The 25–60 cycle transformer uses only one 100–125-volt winding, a tap being provided for the lower voltages. Normally the transformer is connected for 115–125-volt lines, but the connection shown in Figure I may be used for 100–115-volt lines.

External Oscillator Frequency	Dial Setting	Location of Line-Up Capacitors	Position of Selector Switch	Adjust for	Number of Adjustments To be Made
445 K. C.	Any setting that does not bring in station.	At rear of chassis.	Any position that does not bring in station.	Maximum output.	4
370 K. C.	370 K. C.	Bottom of chassis.	X	Maximum output.	3
175 K. C.	Set for signal.	Top of chassis.	X	Maximum output while rocking dial back and forth.	1
1400 K. C.	1400 K. C.	Bottom of chassis.	A	Maximum output.	3
600 K. C.	Set for signal.	Top of chassis.	A	Maximum output while rocking dial back and forth.	1
3900 K. C.	3900 K. C.	Bottom of chassis.	B	Maximum output.	3
1710 K. C.	Set for signal.	Top of chassis.	B	Maximum output while rocking dial back and forth.	1
10 M. C.	10 M. C.	Bottom of chassis.	C	Maximum output. (See Note.)	3
15 or 18 M. C.	15 or 18 M. C.	Bottom and top.	D	Maximum output. (See Note.)	4

NOTE—It is important to note, when aligning bands C and D, that two peaks will be observed on the trimmers for the oscillator and for the first detector. The correct oscillator peak is the one obtained using the lower trimmer capacitance, whereas the correct detector peak is the one obtained with the greater capacitance. It is essential that the proper peak be chosen, as otherwise tracking and sensitivity will be very poor at other frequencies. When adjusting the detector trimmer, the tuning capacitor should be rocked, since there is a reaction on the oscillator tuning.

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REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
2747	Contact cap—Package of 5	$0.50
2816	Resistor—1,000 ohms—Carbon type—½ watt (R11)—Package of 5	1.00
3056	Shield—Output Radiotron shield—Package of 2	.40
3076	Resistor—1 megohm—Carbon type—½ watt (R19, R22, R23)—Package of 5	1.00
3114	Resistor—50,000 ohms—Carbon type—¼ watt (R9)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R3, R8)—Package of 5	1.00
3435	Resistor—250 ohms—Carbon type—½ watt (R1)—Package of 5	1.00
3470	Resistor—6,500 ohms—Carbon type—1 watt (R6)—Package of 5	1.10
3526	Resistor—2,000 ohms—Carbon type—½ watt (R21)—Package of 5	1.00
3527	Resistor—800 ohms—Carbon type—½ watt (R16) Pkg. of 5	1.00
3529	Socket—Dial lamp socket	.32
3555	Capacitor—0.1 mfd. (C26)	.36
3572	Socket—7-contact Radiotron socket—First detector and oscillator	.38
3594	Resistor—50,000 ohms—Carbon type—½ watt (R17, R18)—Package of 5	1.00
3597	Capacitor—0.25 mfd. (C58)	.40
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
3616	Capacitor—300 mmfd. (C51)	.34
3622	Shield—Second detector Radiotron shield	.36
3641	Capacitor—0.1 mfd. (C10, C15, C25)	.35
3643	Capacitor—.005 mfd. (C57)	.25
3711	Capacitor—80 mmfd. (C55)	.40
3719	Socket—7-contact Radiotron socket	.30
3771	Resistor—8,500 ohms—Carbon type—3 watt (R5)	.25
3845	Capacitor—2,340 mmfd. (C39)	.50
3846	Capacitor—2,250 mmfd. (C37)	.50
3848	Capacitor—300 mmfd. (C31)	.30
3849	Capacitor—50 mmfd. (C16)	.30
3861	Capacitor—Adjustable trimmer (C29, C32, C35)	.78
3863	Resistor—400 ohms—Carbon type—½ watt (R4, R10, R12)—Package of 5	1.00
3864	Capacitor—300 mmfd. (C46)	.30
3865	Capacitor—160 mmfd. (C47)	.30
3888	Capacitor—.05 mfd. (C6, C22, C23, C52)	.25
3901	Capacitor—.05 mfd. (C48)	.36
3931	Capacitor—45 mmfd. (C27)	.30
3932	Capacitor—.0024 mfd. (C11)	.30
3973	Capacitor—1,000 mmfd. (C64, C65)	.34
4019	Capacitor—1,000 mmfd. (C34)	.34
4030	Bracket—Tone or volume control mounting bracket	.10
4033	Capacitor—20 mmfd. (C61, C62, C63)	.34
4103	Shield—First detector and R. F. Radiotron shield	.20
4104	Shield—I. F. Radiotron shield	.20
4205	Coil—Second detector choke (L41)	.50
4207	Capacitor—0.1 mfd. (C13, C43)	.34
6136	Resistor—3,500 ohms—Carbon type—1 watt (R7)—Package of 5	1.10
6188	Resistor—2 megohms—Carbon type—½ watt (R13)—Package of 5	1.00
6300	Socket—4-contact Radiotron socket	.35
6303	Resistor—20,000 ohms—Carbon type—½ watt (R26)—Package of 5	1.00
6512	Capacitor—.005 mfd. (C54)	.28
6603	Condenser—4-gang variable tuning condenser (C7, C14, C24, C40)	3.80
6604	Capacitor—0.5 mfd. (C53)	.50
6605	Transformer—Output transformer (T3)	1.48
6606	Reactor—Filter reactor (L37)	1.66
6607	Reactor—Tone control reactor (L35)	1.14
6608	Transformer—Audio driver transformer (T2)	2.04
6609	Capacitor—18. mfd. (C59)	1.10
6612	Volume control (R15)	1.20
6613	Drive—Variable condenser drive assembly—Complete	1.00
6626	Capacitor pack—Comprising one 4. mfd., and two 10. mfd., capacitors (C12, C49, C56)	1.86
6628	Capacitor and coil—Antenna coil and capacitor assembly—8,000–18,000 kilocycles—4- or 5- band (L39, L40, C8)	1.50
6629	Switch—5-band selector switch	3.48
6630	Switch—4-band selector switch	3.48
6631	Coil and capacitor assembly—Antenna coil and capacitor—150–410 kilocycles—5-band (L1, L6, C1)	$2.16
6632	Coil and capacitor—R. F. coil and capacitor assembly—150–410 kilocycles—5-band (L11, L16, C17)	2.10
6633	Coil and capacitor—Oscillator coil and capacitor assembly—150–410 kilocycles—5-band (L21, L26, C28)	1.40
6634	Coil and capacitor—Antenna coil and capacitor assembly—540–1,500 kilocycles—4- or 5-band (L2, L7, C2)	1.86
6635	Coil and capacitor—R. F. coil and capacitor assembly—540–1,500 kilocycles—4- or 5-band (L12, L17, C18)	2.00
6636	Coil and capacitor—Oscillator coil and capacitor assembly—540–1,500 kilocycles—4- or 5-band (L22, L27, C30)	1.40
6637	Coil and capacitor—Antenna coil and capacitor assembly—1,500–4,000 kilocycles—4- or 5-band (L3, L8, C3)	1.56
6638	Coil and capacitor—R. F. coil and capacitor assembly—1,500–4,000 kilocycles—4- or 5-band (L13, L18, C19)	1.66
6639	Coil and capacitor—Oscillator coil and capacitor assembly—1,500–4,000 kilocycles—4- or 5-band (L23, L28, C33)	1.40
6640	Coil and capacitor—Antenna coil and capacitor assembly—4,000–10,000 kilocycles—4- or 5-band (L4, L9, C4)	1.54
6641	Coil and capacitor—R. F. coil and capacitor assembly—4,000–10,000 kilocycles—4- or 5-band (L14, L19, C20)	1.60
6642	Coil and capacitor—Oscillator coil and capacitor assembly—4,000–10,000 kilocycles—4- or 5-band (L24, L29, C36)	1.34
6643	Coil and capacitor—R. F. coil and capacitor assembly—8,000–18,000 kilocycles—4- or 5-band (L5, L10, C5—L15, L20, C21)	1.52
6644	Coil and capacitor—Oscillator coil and capacitor assembly—8,000–18,000 kilocycles—4- or 5-band (L25, L30, C38)	1.54
6675	Shaft—Shaft for condenser drive assembly—Comprising shaft, ball race with retainer and set screw	.35
6679	Wand—Tuning wand for R. F. and oscillator adjustments	.75†
6889	Capacitor—18. mfd. (C60)	1.55
6890	Transformer—First intermediate frequency transformer (L31, L32, C41, C42)	2.40
6891	Transformer—Second intermediate frequency transformer (L33, L34, C44, C45)	2.40
6892	Tone control (R20)	1.50
6955	Shield—Second R. F. Radiotron shield	.25
6956	Shield—Radiotron shield top	.15
7065	Screwdriver—Combination insulated screwdriver and alligator jaw end wrench for R. F. or I. F. adjustment	.80
7484	Socket—5-contact Radiotron socket	.35
7485	Socket—6-contact Radiotron socket	.40
9042	Transformer—Power transformer—105–250 volts—50–60 cycles (T1)	6.84
9046	Transformer—Power transformer—105–125 volts—25–40 cycles	9.22
9050	Oscillator—Test oscillator—150 to 25,000 K. C.	29.50†
10194	Ball—Steel ball for condenser drive assembly—Package of 20	.25
	MISCELLANEOUS	
3829	Knob—Volume control or tone control knob—Package of 5	1.10
3830	Knob—Station selector knob—Package of 5	1.08
3831	Knob—Range switch knob—Package of 5	1.08
3876	Cable—3-conductor for loudspeaker—4-band	.60
3878	Screws—No. 4–40–$\frac{1}{8}$ fillister head screw and washer for fastening station selector pointer—Package of 20	.25
3952	Escutcheon—Volume control escutcheon	.10
3953	Escutcheon—Range switch escutcheon—5-band	.10
3992	Escutcheon—Range switch escutcheon—4-band	.10
4160	Screwdriver—Combination insulated screwdriver and socket wrench for I. F. and R. F. adjustments	1.00
6112	Cushions—Rubber cushions for chassis—Package of 4	.25
6614	Glass—Station selector dial glass	.30
6615	Ring—Retaining ring for dial glass—Package of 5	.34
6616	Bezel—Metal bezel for station selector dial (RCA)	.50
6671	Cable—2-conductor shielded for loudspeaker—5-band	.36
6672	Screen—Translucent celluloid screen—For dial lamps—Package of 5	.30
6673	Pointer—Station selector pointer—Package of 5	.64
6677	Dial—Station selector dial—5-band—Package of 5	2.90
6678	Dial—Station selector dial—4-band—Package of 5	2.80
6756	Bezel—Metal bezel for station selector dial (Plain)	.50
	REPRODUCER ASSEMBLIES	
8969	Cone—Reproducer cone complete (L36)—Package of 5	6.35
9438	Reproducer complete	6.88
9439	Coil assembly—Field coil, magnet and cone support (L38)	5.22

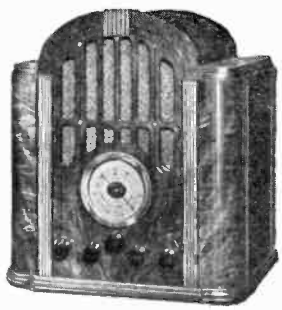
0869 † Full discount not allowed.

Printed in U. S. A.

RCA Victor
Models 143 and 242

Eight-Tube, Four-Band A. C. Receivers

SERVICE NOTES



SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

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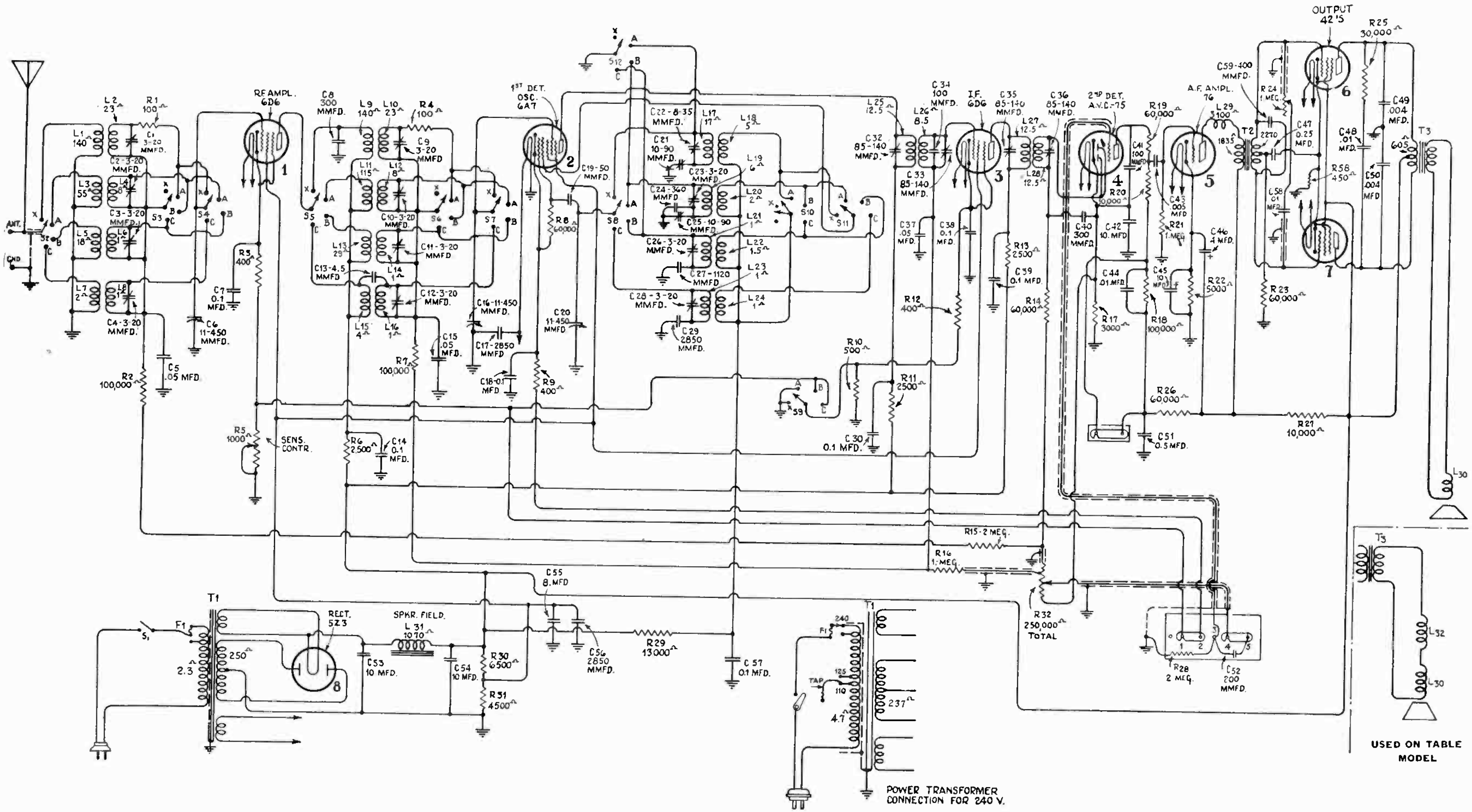


Figure 1—Schematic Circuit Diagram—Sensitivity Control Change with Band position

RCA VICTOR MODELS 143 AND 242

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Voltage Rating	105–125 Volts and 100–130/195–250 Volts (Double Range)
Frequency Rating	25–60 and 50–60 Cycles
Power Consumption	130 Watts (All Frequencies)
Type and Number of Radiotrons	2 RCA-6D6, 1 RCA-6A7, 1 RCA-75, 1 RCA-76, 2 RCA-42, 1 RCA-5Z3—Total, 8
Tuning Frequency Range	Band X— 140 K. C.– 410 K. C. Band A— 540 K. C.– 1720 K. C. Band B—1720 K. C.– 5400 K. C. Band C—5400 K. C.–18000 K. C.
Line-up Frequencies	175 K. C., 410 K. C., 460 K. C., 600 K. C., 1720 K. C., 5160 K. C., 18000 K. C.
Maximum Undistorted Output	4.0 Watts
Maximum Output	5.0 Watts

PHYSICAL SPECIFICATIONS

	Model 143	*Model 242*
Height	20 3/16 Inches	41 1/2 Inches
Width	17 7/8 Inches	26 Inches
Depth	14 11/32 Inches	14 Inches

This eight-tube, four-band Superheterodyne receiver is of the "all-wave" type, having a continuous tuning range extending from 140 K. C. to 18,000 K. C., except for one break between 410 K. C. and 540 K. C. Such a tuning range permits the listener to receive all of the important broadcasting, police, aircraft and amateur call bands used throughout the world.

Excellent sensitivity, selectivity and tone quality, together with a high output (4 watts undistorted), Class A amplifier gives the receiver outstanding performance. Operating features include an "airplane" type dial, a double-ratio vernier drive, a visual band indicator, and a special "second hand" on the dial for logging short-wave stations. Other important features include automatic volume control, sensitivity control, large loudspeaker unit and a terminal board for easily attaching a magnetic pickup.

DESCRIPTION OF ELECTRICAL CIRCUIT

The general circuit arrangement consists of an R. F. stage, a combined oscillator and first detector, an I. F. stage, a combined second detector and automatic volume control, a first audio stage and a push-pull Pentode output stage. An RCA-5Z3 rectifier, together with a suitable filtering system, provides plate and grid voltages for all tubes and field excitation for the loudspeaker. Figures 1 and 2 show the schematic diagrams, Figures 5 and 7 the chassis wiring, and Figures 3 and 4 the loudspeaker wiring.

The signal enters the receiver through a shielded antenna lead and is applied to the grid of the R. F. tube through the antenna coupling transformer. The secondary of this transformer is tuned to the signal frequency by means of one unit of the gang capacitor. The output of this stage is transformer coupled to the grid circuit of the first detector, which is also tuned to the signal frequency by a unit of the gang capacitor.

Combined with the signal in the first detector is the local oscillator, which is always at a 460 K. C. frequency difference (higher) from the signal frequency. A separate coil system and the third unit of the gang capacitor are used in this circuit.

In conjunction with these three tuned circuits, it is well to point out that four different groups of tuned circuits are used, one for each tuning band. A four-position selector switch is provided for selecting the band in which the desired signal is located. In addition to selecting the desired coil system, additional groups of contacts are provided for short-circuiting the preceding lower frequency R. F. and detector coils and the two preceding oscillator coils. This is to prevent "dead" spots due to the absorption effects caused by the coils, the natural period of which, with the tuning capacitor disconnected, falls in the next higher frequency band.

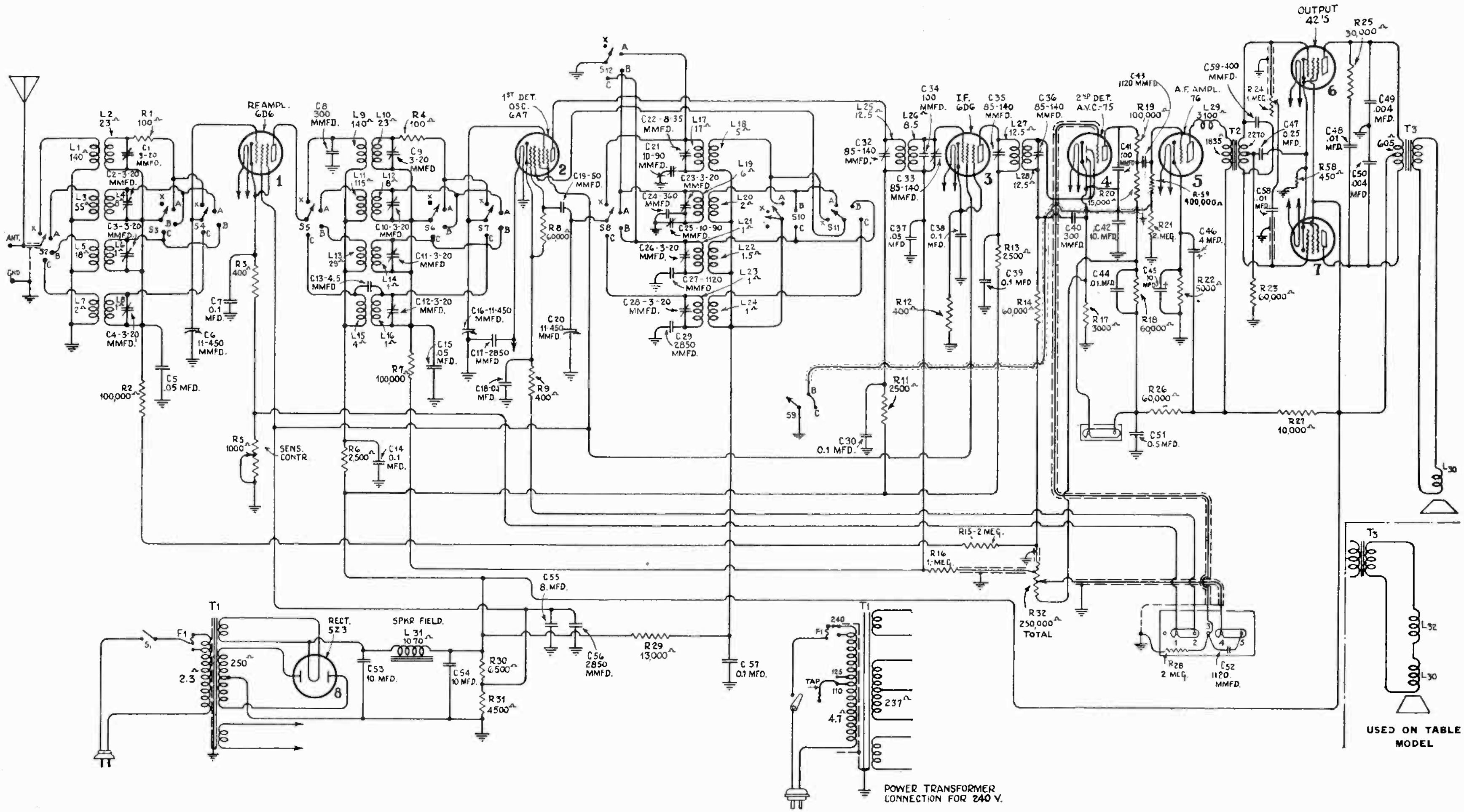


Figure 2—Schematic Circuit Diagram—Fidelity Change with Band position

The output of the first detector, which is the I. F. signal (460 K. C.), is fed directly through two tuned circuits to the grid of the I. F. amplifier stage. The I. F. stage, which utilizes Radiotron RCA-6D6, uses two transformers, which consist of four tuned circuits, all of which are tuned to 460 K. C.

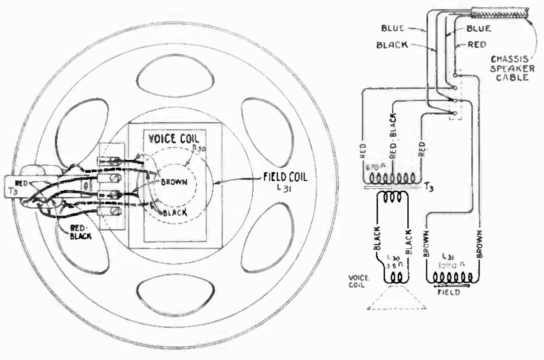


Figure 3—Console Loudspeaker Wiring

The output of the I. F. amplifier is then applied to the diode electrodes of the RCA-75, which is a combined second detector, automatic volume control and A. F. amplifier. The direct current component of the rectified signal produces a voltage drop across resistor R-32. The full voltage drop constitutes the automatic bias voltage for the R. F. while a tap is provided for the first detector and I. F. voltage. These automatic bias voltages for the R. F., first detector and I. F. give the automatic volume control action of the receiver. The volume control selects the amount of audio voltage that is applied to the grid of the RCA-75 and thereby regulates the audio output of the entire receiver.

The output of the detector is resistance coupled to the grid of the RCA-76, first audio stage, which is transformer coupled to the push-pull output stage. On some models the grid coupling resistor between the detector and audio stage is 1 megohm (R-21, Figure 1). Other models have two resistors, R-59, 400,000 ohms, and R-21, 2 megohms (Figure 2), with the band selector switch shorting out R-21 in bands B and C. The purpose of this latter type of connection is to reduce the low frequency output in bands B and C, thereby improving the performance of the receiver in these bands.

The output stage uses two RCA-42's, which give a low distortion, high audio output to the loudspeaker. A high frequency tone control, which consists of a variable resistor and capacitor, is connected across the grids of the output stage. At the minimum resistance position of the variable resistor, maximum attenuation of the high audio frequencies is obtained.

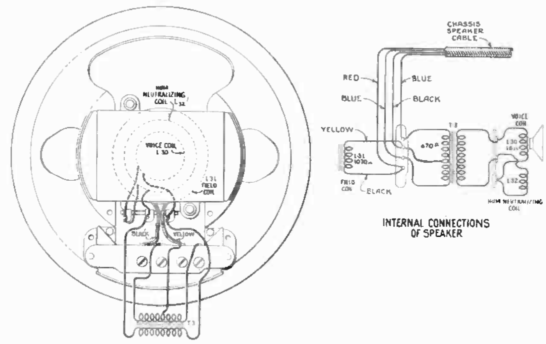


Figure 4—Table Loudspeaker Wiring

The plate circuit of the output stage is matched to the cone coil of the reproducer by means of a step-down transformer.

Plate and grid voltages for all tubes are supplied from the output of the rectifier-filter system. An RCA-5Z3 is used as a rectifier and a suitable network of capacitors and resistors gives the necessary filtering and voltages. The loudspeaker field is used as a filter reactor.

SERVICE DATA

(1) LINE-UP PROCEDURE

The line-up procedure of this receiver is somewhat involved and it is important that these instructions be carefully followed when making adjustments. Properly aligned, this receiver has outstanding performance; improperly aligned, it may be impossible to receive signals on all bands.

Equipment

To properly align this receiver, proper test equipment must be used. This consists of a modulated R. F. oscillator having proper frequency range, an output indicator, an alignment tool and a tuning wand. These parts, which are shown on page 15, have been developed by the manufacturer of this receiver for use by service men to duplicate the original factory adjustments.

Checking With Tuning Wand

Before making any R. F., oscillator or first detector adjustments, the accuracy of the present adjustments may be checked by means of the tuning wand (Stock No. 6679). The tuning wand consists of a bakelite rod having a brass cylinder at one end and a special finely divided iron insert at the other end. Inserting the cylinder into the center of a coil lowers its inductance,

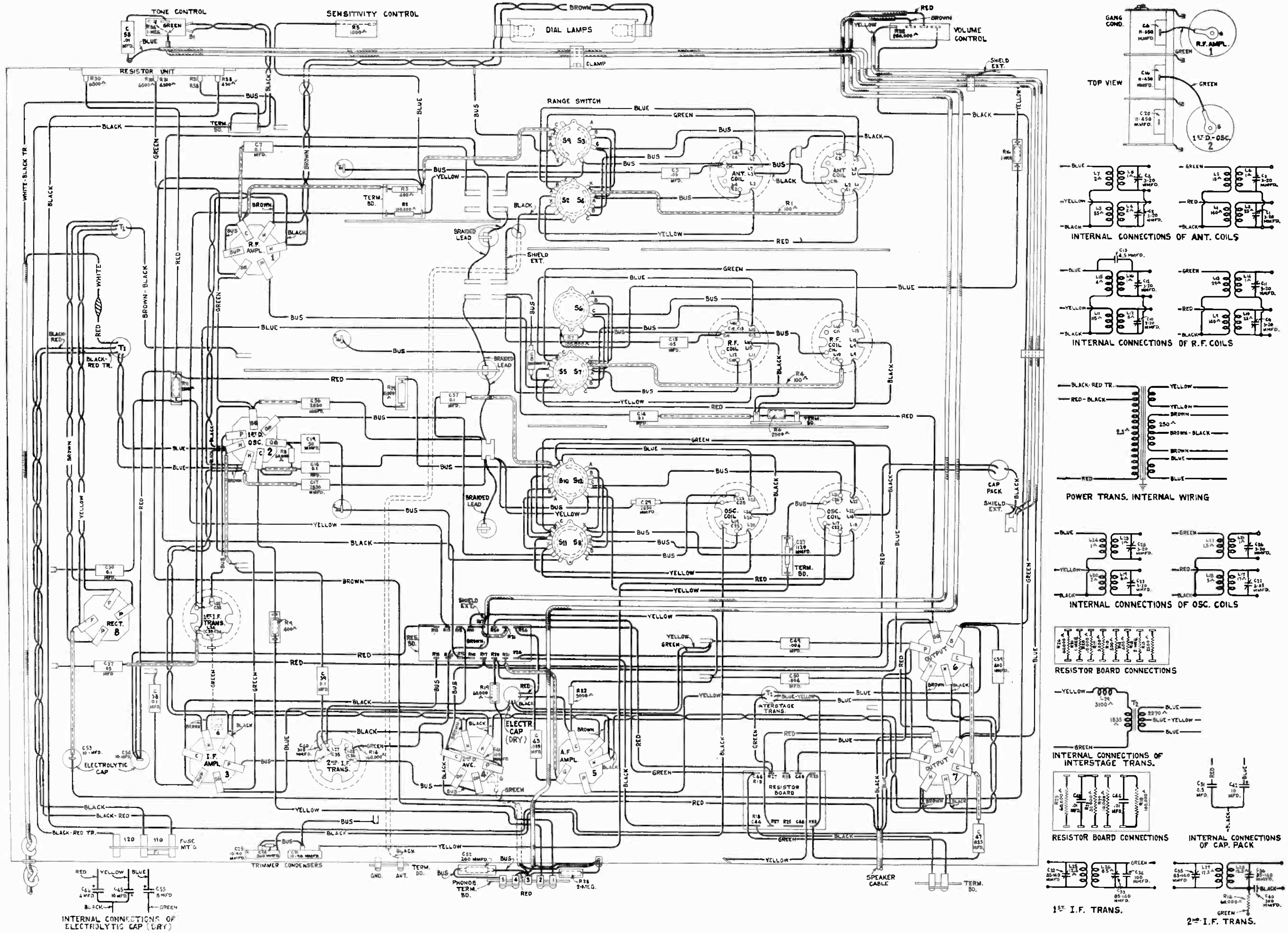


Figure 5—Wiring Diagram—Sensitivity Control Change with Band position

while inserting the iron end increases its inductance. From this, it is seen that unless the trimmer adjustment for a particular coil is perfect at alignment frequencies, inserting one end of the wand may increase the output of a particular signal. A perfect adjustment is evidenced by a lowering of output when either end of the wand is inserted into a coil.

The shields over the R. F. coil assembly have a hole at their top for entrance of the tuning wand. The location of the various coils inside of the shield is shown in Figure 6. An example of the proper manner of using the tuning wand would be to assume the external oscillator were set at 1720 K. C. and the signal tuned in, and the output indicator connected across the voice coil of the loudspeaker. Then the tuning wand should be inserted, first one end and then the other end, into the top of the three transformers at the left of the R. F. assembly, facing the front of the chassis. A perfect adjustment of the trimmer would be evidenced by a reduction in output when each end of the wand is inserted in each of the three transformers. If one end—for example, the iron end—when inserted in one coil caused an increase in output, then that circuit is low. An increase in the trimmer capacitance would be the proper remedy.

(2) I. F. TUNING CAPACITOR ADJUSTMENTS

This receiver has one I. F. stage with two transformers having four adjustable capacitors that may require adjustment. The transformers are all peaked at 460 K. C.

A detailed procedure for making this adjustment follows:

(a) Connect the output of an external oscillator tuned to 460 K. C. between the first detector grid and ground. Connect the output indicator across the voice coil of the loudspeaker.

(b) Place the oscillator in operation at 460 K. C. Place the receiver in operation and adjust the station selector until a point is reached (Band A) where no signals are heard and turn the volume control to its maximum position. Reduce the oscillator input until a slight indication is obtained in the output indicator.

(c) Refer to Figure 8. Adjust each trimmer of the I. F. transformers until maximum output is obtained. Go over the adjustments a second time.

This completes the I. F. adjustments. However, it is good practice to follow the I. F. adjustments with the R. F. and oscillator adjustments due to interlocking which always occurs.

(3) R. F., OSCILLATOR AND FIRST DETECTOR ADJUSTMENTS

Four R. F., oscillator and first detector adjustments are required in Bands "A" and "X." Three are required in Bands "B" and "C."

To properly align the various bands, each band must be aligned individually. The preliminary set-up requires the external oscillator to be connected between the antenna and ground terminals of the receiver and the output indicator across the voice coil of the loudspeaker. The volume and sensitivity controls must be at the maximum position and the input from the oscillator must be at the minimum value possible to get an output indication under these conditions. In the high frequency bands, it may be necessary to disconnect the oscillator from the receiver and place it at a distance in order to get a sufficiently low input to the receiver.

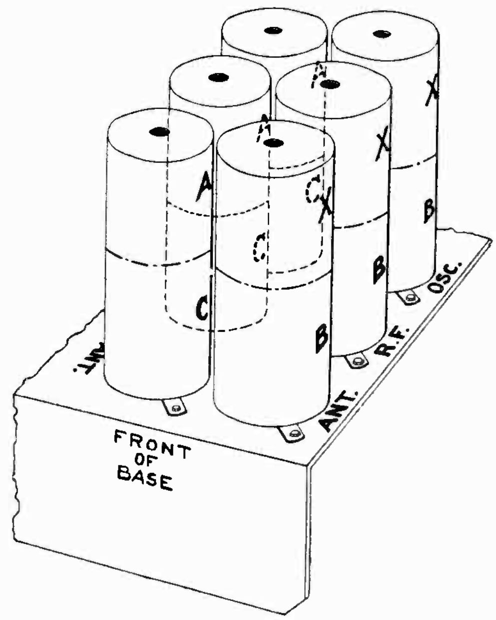


Figure 6—Location of Coils in Shields

The dial pointer must be properly set before starting any actual adjustments. This is done by turning the variable capacitor until it is at its maximum capacity position. One end of the pointer should point exactly at the horizontal line at the lowest frequency end of Band "A," while the other end should point to within 1/64 inch of the horizontal line at the highest frequency end of Band "A."

Figure 8 shows the location of the trimmers for each band. Care must be exercised to only adjust the trimmers in the band under test.

Band "X"

(a) Set the band switch at "X."

(b) Tune the external oscillator to 410 K.C., set the dial pointer at 410 K.C. and adjust the oscillator, detector and R.F. trimmers for maximum output.

(c) Shift the external oscillator frequency to 175 K.C. Tune in the 175 K.C. signal irrespective of scale calibration and adjust the series trim-

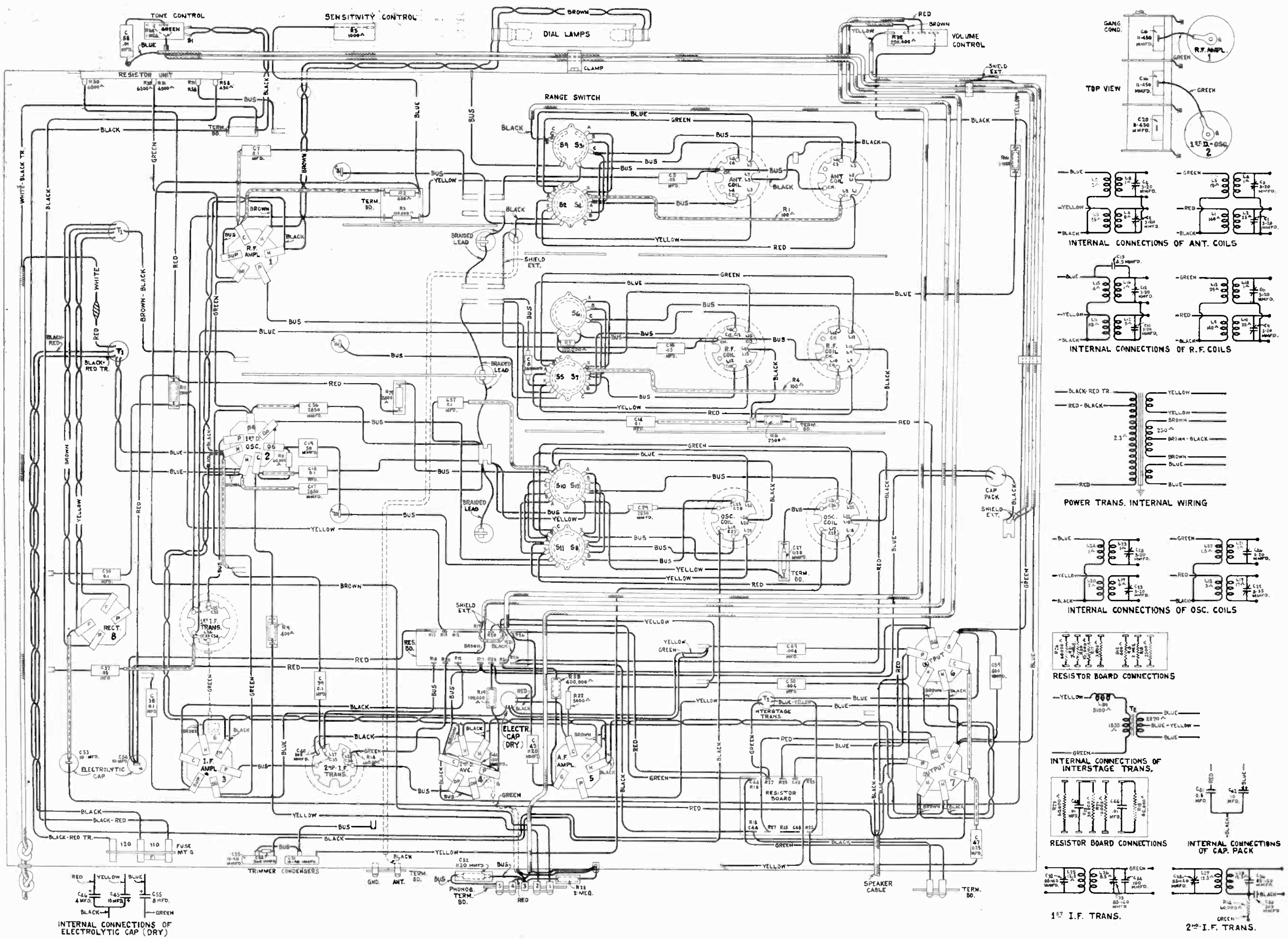


Figure 7—Wiring Diagram—Fidelity Change with Band position

mer, marked 175 K.C. on Figure 8, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 410 K.C. as described in (b).

Band "A"

(a) Set the band switch at "A."

(b) Tune the external oscillator to 1,720 K.C., set the pointer at 1,720 K.C. and adjust the oscillator, detector and R.F. trimmers for maximum output.

(c) Shift the external oscillator frequency to 600 K.C. Tune in the 600 K.C. signal, irrespective of scale calibration, and adjust the series trimmers, marked 600 K.C., Figure 8, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 1,720 K.C. as described in (b).

Band "B"

(a) Set the band switch at "B."

(b) Tune the external oscillator to 5,160 K.C. and set the pointer at 5,160 K.C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(c) Check for the image signal, which should be received at approximately 4,240 K.C. on the dial. It will be necessary to increase the external oscillator output for this check.

(d) The antenna and detector trimmers should now be peaked for maximum output.

Band "C"

(a) Set the band switch at "C."

(b) Tune the external oscillator to 18,000 K.C. and set the pointer at 18 M. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(c) Check for the image signal, which should be received at approximately 17,080 on the dial. It may be necessary to increase the external oscillator output for this check.

(d) Reduce the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal disappears. The first detector circuit is then at the oscillator frequency and the RCA-6A7 tube is blocked. Then increase the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal is peaked for maximum output.

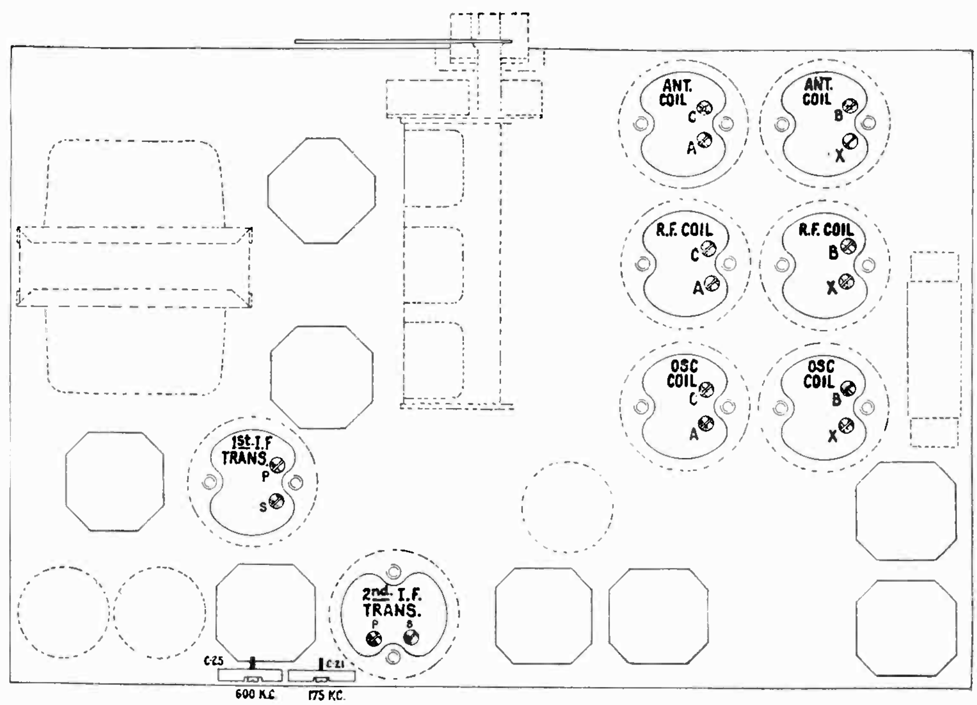


Figure 8—Location of Trimmer Capacitors

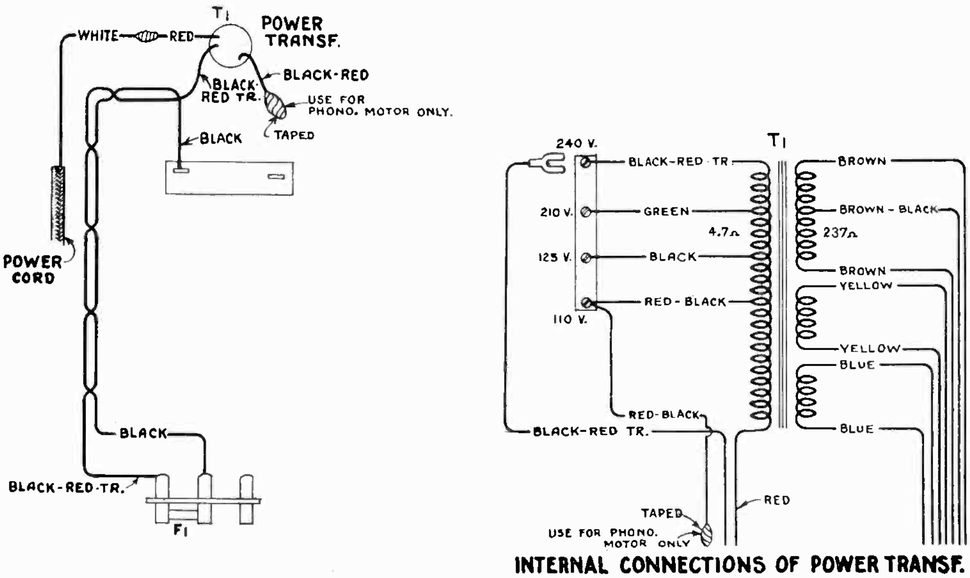
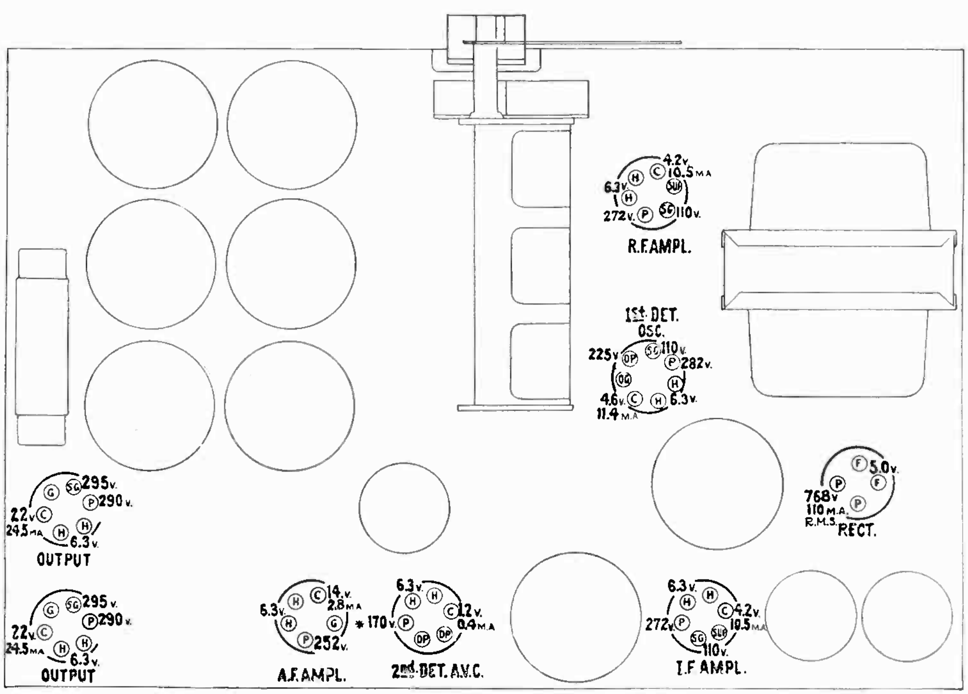


Figure 9—Universal Power Transformer Connections



* CANNOT BE MEASURED WITH ORDINARY VOLTMETER

ALL D. C. VOLTAGES ARE TO GROUND

Figure 10—Radiotron Socket Voltages

(e) The antenna trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

(4) POWER TRANSFORMER CONNECTIONS

The 220-volt power transformer furnished with some instruments includes taps for operating on 110-volt lines. Figure 9 shows the schematic circuit of the transformer and the proper voltage to be applied to the various taps. The taps are located on the power transformer assembly and are accessible without removing the chassis from the cabinet.

(5) MAGNETIC PICKUP CONNECTIONS

A Terminal Board is provided at the rear of the chassis for adding phonograph facilities to this instrument. Figure 11 shows the various types of connections that will be required for the different turntable assemblies.

(6) VARIATIONS IN MODELS

There are four slight variations in the electrical circuits of these receivers, which should be noted in event service work is necessary in the circuits that differ from the diagrams.

Group 1—C-52 1120 mmfd.
R-18 60,000 ohms
R-19 100,000 ohms
R-20 15,000 ohms

Group 2—C-52 200 mmfd.
R-18 100,000 ohms
R-19 60,000 ohms
R-20 10,000 ohms

Group 3—R-28 and C-52 are removed from the resistor board inside of chassis and mounted externally on phonograph terminal board. No. 3 terminal has been added to terminal board. Electrically, this group is identical with Group 2, the schematic and wiring diagrams being shown in Figures 1 and 5.

Group 4—Resistor R-10 has been removed. Resistor R-59 has been added and Resistor R-21 has been changed to 2 megohms. Capacitors C-52 and C-43 have been changed to 1120 mmfd. Figures 2 and 7 show the schematic and wiring diagrams of the models having these changes.

(7) FIDELITY LINK

It will be noted that a small link is mounted on the rear apron of the chassis which is closed on table models and open on console models. The purpose of the link is to increase the low frequency output of the receiver when open.

(8) VOLTAGE READINGS

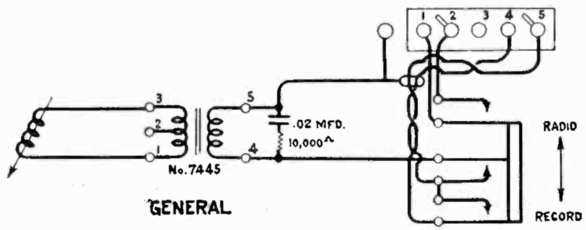
The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if low-resistance meters are used, such allowances must be made.

RADIOTRON SOCKET VOLTAGES

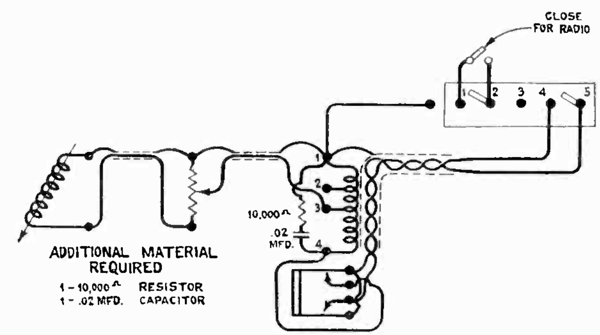
120-Volt A.C. Line—Maximum Volume and Sensitivity—No Signal

Radiotron No.		Cathode to Ground Volts, D. C.	Screen Grid to Ground Volts, D. C.	Plate to Ground Volts, D. C.	Cathode Current, M. A.	Heater Volts, A. C.
RCA-6D6 R. F.		4.2	110	272	10.5	6.3
RCA-6A7	Oscillator	—	—	225	11.4	6.3
	1st Detector	4.6	110	282		
RCA-6D6 I. F.		4.2	110	272	10.5	6.3
RCA-75 2nd Det.		1.2	—	170*	0.4	6.3
RCA-76 A. F.		14.0	—	252	2.8	6.3
RCA-42 Power		22.0	295	290	24.5	6.3
RCA-42 Power		22.0	295	290	24.5	6.3
RCA-5Z3 Rectifier		—	—	768/384 R. M. S.	110.0	5.0

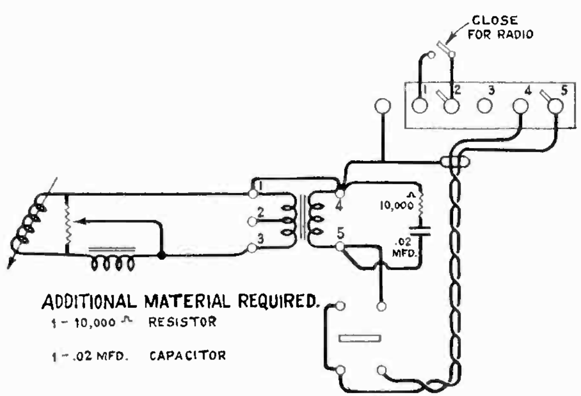
*Cannot be measured with ordinary voltmeter.



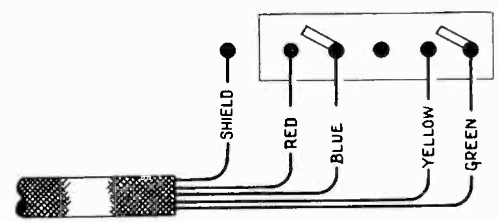
General Connections



End-Table Connections



Portable Turntable Connections



Junior "Duo" Connections

Figure 11—Magnetic Pickup Connections—Place Range Switch in A or X position during record reproduction for models with fidelity switching

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4632	Board—Terminal board—Two terminals and link—For changing fidelity	$0.25
4379	Board—Antenna terminal board	.20
4427	Bracket—Volume control, tone control or noise suppressor mounting bracket	.18
4244	Cap—Contact cap—Package of 5	.20
3861	Capacitor — Oscillator trimmer capacitor (C21, C25)	.78
4633	Capacitor—50 mmfd. (C19)	.25
4635	Capacitor—100 mmfd. (C41)	.25
4697	Capacitor—200 mmfd. (C52)	.35
3937	Capacitor—300 mmfd. (C8)	.34
4413	Capacitor—360 mmfd. (C24)	.22
4183	Capacitor—400 mmfd. (C59)	.26
4412	Capacitor—1120 mmfd. (C27)	.25
4409	Capacitor—1120 mmfd. (C43)*	.35
4634	Capacitor—1120 mmfd. (C52)*	.35
4524	Capacitor—2850 mmfd. (C29)	.35
4615	Capacitor—2850 mmfd. (C17, C56)	.34
4628	Capacitor—0.004 mfd. (C49, C50)	.28
6512	Capacitor—0.005 mfd. (C43)	.28
3787	Capacitor—0.01 mfd. (C48)	.30
4212	Capacitor—0.01 mfd. (C44)	.30
4624	Capacitor—0.01 mfd. (C58)	.54
3888	Capacitor—0.05 mfd. (C37)	.25
4417	Capacitor—0.05 mfd. (C5, C15)	.25
3877	Capacitor—0.1 mfd. (C38)	.32
4415	Capacitor—0.1 mfd. (C18)	.30
4645	Capacitor—0.1 mfd. (C7, C14, C30, C39, C57)	.25
3750	Capacitor—0.25 mfd. (C47)	.36
7790	Capacitor—10 mfd. (C53, C54)	1.05
4619	Capacitor pack—Comprising one 0.5 mfd., one 10 mfd. capacitor (C42, C51)	1.44
4626	Capacitor pack—Comprising one 4 mfd., one 10 mfd. and one 8 mfd. capacitor (C45, C46, C55)	2.82
4358	Clamp—Electrolytic capacitor clamp—For capacitor stock No. 7790	.15
4693	Clamp—Electrolytic capacitor clamp—For capacitor stock No. 4626	.15
7810	Coil—Antenna coil "PB-LW" (L1, L2, L5, L6, C1, C3)	2.10
7803	Coil—Antenna coil "B.S.W." (L3, L4, L7, L8, C2, C4)	1.82
7808	Coil—Detector coil "P.B.-L.W." (L9, L10, L13, L14, C9, C11)	$2.05
7805	Coil—Detector coil "B.-S.W." (L11, L12, L15, L16, C10, C12, C13)	2.15
7807	Coil—Oscillator coil "B.S.W." (L19, L20, L23, L24, C23, C28)	1.62
7809	Coil—Oscillator coil "P.B.-L.W." (L17, L18, L21, L22, C22, C26)	1.70
7801	Condenser—3-gang variable tuning condenser (C6, C16, C20)	4.42
4371	Cover—Fuse mount cover	.15
4631	Cover—Terminal strip cover	.15
10907	Fuse—3-ampere—Package of 5	.40
3376	Mount — Fuse mount — 105–125-volt instrument	.40
4604	Mount—Fuse mount for 200–250-volt instrument	.35
4625	Resistor—Wire wound resistor—Comprising one 6500-ohm–4500-ohm and 450 section (R30, R31, R58)	.70
3704	Resistor—400 ohms—Carbon type—¼ watt—Package of 5 (R9, R3, R12)	1.00
4622	Resistor—500 ohms—Carbon type—¼ watt—Package of 10 (R10)	2.00
4338	Resistor — 2500 ohms — Carbon type — ¼ watt—Package of 10 (R6, R11, R13)	2.00
4242	Resistor — 3000 ohms — Carbon type — ¼ watt—Package of 5 (R17)	1.00
4436	Resistor — 5000 ohms — Carbon type — ¼ watt—Package of 10 (R22)	2.00
3381	Resistor—10,000 ohms—Carbon type—¼ watt (R20)—Package of 5	1.00
3998	Resistor—15,000 ohms—Carbon type—¼ watt—Package of 5 (R20)	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt—Package of 5 (R8, R18*, R19, R23, R26)	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt—Package of 5 (R2, R7, R18, R19*)	1.00
3619	Resistor—400,000 ohms—Carbon type—¼ watt (R59)—Package of 5	1.00
3033	Resistor — 1 megohm — Carbon type — ¼ watt—Package of 5 (R16, R21)	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt—Package of 5 (R15, R21,* R28)	1.00
3078	Resistor—10,000 ohms—Carbon type—½ watt—Package of 5 (R27)	1.00
4623	Resistor—13,000 ohms—Carbon type—½ watt—Package of 10 (R29)	2.00
2240	Resistor—30,000 ohms—Carbon type—1 watt (R25)	.22
4418	Resistor—100 ohms—Flexible type—Package of 10 (R1, R4)	1.50
4618	Rheostat—Sensitivity control (R5)	1.25

* R18—60,000 ohms—Some models.
* R19—100,000 ohms—Some models.

* R20—15,000 ohms—Some models.
* R21—2 megohms—Some models.
* C52—1120 mmfd.—Some models.

REPLACEMENT PARTS (Continued)

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
7800	Shield—Antenna, detector or oscillator coil shield	$0.45
4627	Shield—First detector—Oscillator Radiotron shield	.36
7488	Shield—First detector—Oscillator Radiotron shield top	.20
4452	Shield—I. F. amplifier Radiotron shield	.35
4629	Shield—I. F. amplifier Radiotron shield top	.15
4663	Shield—Oscillator coil wiring shield—Shields oscillator coil wiring from R. F. coil—Complete with terminal board, clamp and resistor	.32
4664	Shield—Oscillator wiring shield—Shields oscillator coil wiring from R. F. coil—Complete with terminal strip and resistor	.36
4630	Shield—R. F. amplifier—Radiotron shield	.36
4665	Shield—R. F. coil wiring shield with two resistors and terminal board	.50
3529	Socket—Dial lamp socket	.32
3859	Socket—4-contact Radiotron socket	.30
7484	Socket—5-contact Radiotron socket	.35
7485	Socket—6-contact Radiotron socket	.40
3572	Socket—7-contact Radiotron socket	.38
4617	Switch—Range switch (S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12)	3.32
4616	Tone control (R24, S1)	1.28
4431	Transformer—First intermediate frequency transformer (L25, L26, C32, C33, C34)	2.28
9505	Transformer—Power transformer—105–125 volts—50–60 cycles (T1)	6.35
9506	Transformer—Power transformer—105–125 volts—25–40 cycles	8.90
9507	Transformer—Power transformer—105–250 volts—40–60 cycles	6.40
4433	Transformer—Second intermediate frequency transformer (L27, L28, C35, C36, C40, R14)	2.15
4620	Transformer and reactor—Interstage transformer and reactor (T2, L29)	2.98
4519	Volume control (R32)	1.25
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	.28
10194	Ball—Steel ball for variable condenser drive assembly—Package of 20	.25
4422	Clutch—Tuning condenser drive clutch assembly—Comprising drive shaft, balls, ring, spring and washers assembled	.88
7799	Drive—Variable tuning condenser drive complete	2.45

Stock No.	Description	List Price
4364	Gear—Spring gear assembly complete with hub, pinion, gear, cover and spring	$0.96
4704	Indicator—Band indicator—Celluloid	.12
4367	Indicator—Station selector vernier pointer—Small	.15
4520	Indicator—Station selector main pointer—Large	.18
3943	Screen—Translucent screen for dial light—Package of 2	.18
3993	Screw—No. 6–32–5/32" square head set screw for band indicator operating arm or condenser drive—Package of 10	.25
4377	Spring — Band indicator and arm tension spring—Package of 5	.25
4360	Stem—Station selector pointer stem	.35
4378	Stud—Band indicator operating arm stud—Package of 5	.25
	REPRODUCER ASSEMBLY (TABLE MODEL)	
9534	Coil—Field coil (L31)	1.90
9533	Cone—Cone mounted and centered on housing (L30)	3.50
9532	Reproducer complete	7.50
9535	Transformer—Output transformer (T3)	1.50
	REPRODUCER ASSEMBLY (CONSOLE MODEL)	
4636	Cable—4-conductor—Reproducer cable	.50
9537	Coil—Field coil magnet and cone support (L31)	3.85
8969	Cone—Reproducer cone—Package of 5 (L30)	6.35
9536	Reproducer complete	8.40
4637	Transformer—Output transformer (T3)	1.50
	MISCELLANEOUS PARTS	
4677	Bezel—Metal bezel (escutcheon) for station selector dial	.56
4621	Dial—Station selector dial	.65
6614	Glass—Station selector dial glass	.30
4449	Knob—Station selector, volume control, tone control, noise suppressor rheostat on range switch knob—Package of 5	.60
4340	Lamp—Dial lamp—Package of 5	.60
4678	Ring—Retaining ring for dial glass—Package of 5	.34
4446	Screw assembly—Chassis mounting screw assembly—Comprising four screws, four lockwashers, four washers, four spacers and eight cushions	.28
4613	Screw—No. 8–32–$\frac{7}{16}$" headless set screw for knobs—Package of 10	.25

Instructions for

RCA Victor 221

Six-Tube "Selective Short-Wave" Superheterodyne

INTRODUCTION

This console radio receiver may be operated in either of two tuning ranges, one covering the usual band of from 540 to 1500 kilocycles and the other covering a band of from 5400 to 15,350 kilocycles. Between the limits of the latter range are included four of the internationally-assigned short-wave broadcast bands, located at 49, 31, 25 and 19 meters, respectively. Thus, in addition to providing entertainment from the accustomed broadcasting stations, this instrument permits direct reception of programs from the principal short-wave broadcast transmitters located in all parts of the world.

Short-wave facilities in this instrument are built-in as integral parts of the radio chassis—not simply connected to an existing chassis as a short-wave adaptor — resulting in distinctly superior performance. Both tuning ranges are quickly interchangeable by means of a push-pull switch on the front of the cabinet. Other features contributing to tuning ease and accuracy are: (1) the "vernier" dual-ratio station selector drive, permitting either rapid or fine adjustments independently; and (2) the clock-type "full-vision" illuminated dial, calibrated directly in frequency for both ranges.

INSTALLATION

Location—The instrument should be placed convenient to the antenna and ground connections and near an electrical outlet.

Tubes—The instrument is equipped and tested at the factory with RCA Radiotrons and is shipped with these tubes installed. Before making the required external connections, however, it will be advisable to examine the tube installation, as one or more of the tubes, shields or dome terminal clips may have been jarred loose in shipment. Refer to the tube location diagram printed on the rating label inside the cabinet and *make certain:*

(1) That all tubes are in the proper sockets and pressed down firmly.

(2) That all shields are rigidly in place over the tubes represented by double circles on the diagram.

(3) That the spring connectors of the short flexible (grid) leads shown on the diagram are securely attached to the dome terminals of the proper tubes.

NOTE—The grid lead for the RCA-2B7 must be enclosed by the cylindrical tube shield. A slot is provided at the bottom of this shield for entrance of the lead.

Antenna and Ground—The efficiency of any antenna varies greatly with the frequency of incoming radio waves, a given length being excellent at certain frequencies and comparatively poor at others. For uniform results throughout a wide tuning range such as found in this instrument, therefore, an antenna of adjustable length would be desirable theoretically. From a practical standpoint, however, very good results will be obtained using two antennas of different length, one 24–29 feet for short-wave reception and the other 50–100 feet for reception in the standard broadcast band (540–1500 kc.), the lead-in considered as part of the total length in each case.

The shorter antenna may be used alone if preferred, but probably will not be satisfactory for receiving distant or low-power stations in the standard broadcast band. Further, no advantage will be gained by its use on the shorter wavelengths unless it can be installed so that the majority of its length is unshielded (not contained in a building of metallic construction) and sufficiently remote from sources of man-made interference (such as house-wiring, power lines, street-railways and passing automobiles) to prevent excessive noise. If these conditions cannot be fulfilled, it will be preferable to erect a single antenna of compromise length (100–105 feet overall), which, in addition to providing excellent results in the standard broadcast band, will also favor reception in the short-wave broadcast bands located at 49, 31, 25 and 19 meters.

Good reception is many installations will be obtained without connecting the instrument to an external ground, since the power line characteristics often render a separate radio ground unnecessary. In any case, however, best results will be insured by grounding the set in the conventional manner to a water-pipe or radiator, or to a metallic pipe or stake driven from five to eight feet into the soil. The ground lead when used should be short, preferably not more than 15 feet in length, and connected to a clean portion of the pipe or stake surface by means of an approved ground clamp.

A terminal board is provided at the rear of the receiver chassis for connection to the antenna and ground. Attach the antenna wire or lead-in to the left-hand terminal (marked ANT.) and the ground wire to the right-hand terminal (marked GND.). Tighten both terminals with a screw-driver to insure permanent electrical connections.

Power Supply—Connect the power cord of the instrument to an electrical outlet supplying alternating current at the voltage and frequency (cycles) specified on the rating label. While any voltage within the specified limits may be employed, a change in the internal connections will be required if the local voltage is less than 110 (for 100–125 volt models) or 220 (for 200–250 volt models). The alternative connections are shown in the Service Data section of this booklet and the changeover, when necessary, preferably should be made by the dealer. Consult your power company if you are in doubt as to the specific voltage or frequency of the supply.

OPERATION

Controls—The four control knobs on the front of the cabinet, in sequence from left to right, are:

(1) ***Power Switch and Tone Control***—The power switch operates at the counter-clockwise end of the control range. A slight clockwise rotation actuates the switch, causing illumination of the dial—indicative of normal operation. Continued clockwise rotation increases the treble response gradually.

(2) ***Volume Control***—Sound level (volume) increases upon rotation of this control in a clockwise direction.

(3) ***Station Selector*** (Dual Knob)—The large knob (adjacent to panel) should be used for rapid approximate settings of the dial pointer and the small outer knob for accurate or "vernier" adjustments. The lower end of the pointer traverses a scale calibrated directly in kilocycles to facilitate the selection of stations transmitting in the standard broadcast band (540 to 1500 kc.). Stations in the short-wave range (5400 to 15,350 kc.), however, should be located with the upper end of the pointer which passes over a scale calibrated in "megacycles" (thousands of kilocycles). Bracketed segments adjacent to the upper scale indicate the positions and approximate spans of the short-wave broadcast bands, each being identified with respect to its nominal wavelength: 49 M, 31 M, 25 M and 19 M (meters).

(4) ***Range Switch***—This switch is of push-pull construction and adapts the receiver for operation within either tuning range as follows:

(a) *Inward Position*—For standard broadcast band (540 to 1500 kilocycles).

(b) *Outward Position*—For short-wave range (5400 to 15,350 kilocycles).

Procedure—The actual operation is simple and not unlike that of more conventional instruments designed for the reception of standard broadcast programs alone. However, the full possibilities of any short-wave receiver cannot be attained unless the user has a practical knowledge of short-wave transmission behavior and operating schedules. It is therefore recommended that the appended Notes on Short-Wave Reception and the inserted Short-Wave Broadcasting Station List and Program Schedule be studied carefully.

A brief outline of the recommended operating procedure should suffice:

1. Set the Range Switch for the frequency range within which the desired station is included.

2. Turn the Power Switch "on" and adjust the Tone Control to its extreme clockwise position—*for full-range reproduction.* Wait a few seconds in order that the tubes may attain the proper temperature before attempting further operation.

3. Advance the Volume Control to a position near the middle of its range and rotate the Station Selector until the dial indicator assumes a position coincident with the listed frequency of the desired station. Then with the vernier control (small knob), turn the selector *very slowly* over a narrow range on each side of that setting, advancing the Volume Control further in a clockwise direction and repeating the tuning process, if necessary, until the signal is heard.

NOTE—This procedure is important—especially so for short-wave reception. Because of the wide band of frequencies covered by the short-wave range, tuning is critical (sharp). A signal of suitable strength often will be imperceptible if passed through rapidly or in a haphazard manner.

4. After receiving the signal, turn the Volume Control counter-clockwise until the volume is reduced to a low level. Then readjust the Station Selector accurately to the position mid-way between the points where the quality becomes poor or the signal disappears. *This setting minimizes the proportion of background noise and provides the fine quality of reproduction possible with this instrument.*

5. Adjust the Volume Control to the desired volume level.

NOTE—The automatic volume control built into this instrument maintains the volume level substantially constant irrespective of normal fluctuations of signal strength (fading). Also, other stations with good signal strength will be received at approximately the same volume without readjustment of the Volume Control.

6. Turn the Tone Control counter-clockwise if decreased treble response is preferred or to reduce noise interference if excessive.

7. When through operating, return the Tone Control to its counter-clockwise extremity, thus switching "off" the power.

NOTES ON SHORT-WAVE RECEPTION

While the design of this instrument is such that no previous experience or special skill is required for proper operation, its full possibilities can be realized only by those familiar with the general characteristics of transmission on the shorter wave-lengths. The following notes are a summary of extensive data compiled mainly by experimentation and should be found both interesting and helpful, especially to beginners in the field of short-wave reception.

Broadcast transmission at 49 meters is most reliable when received from a distance of 300 miles (500 kilometers) or more, although good reception at distances greater than 1500 miles (2400 kilometers) can be expected only when a large portion of the signal path lies in darkness.

Thirty-one (31) meter stations afford greatest reliability of service to receivers situated at a distance exceeding 800 miles (1300 kilometers). Good reception from distant stations in this band is possible both day and night.

Reception from stations operating in the 25 meter band is most common when a span of 1000 miles (1600 kilometers) or more separates the receiver and transmitter. Such transmission over distances of less than 2000 miles (3200 kilometers) will be received best during daylight hours. The more distant stations, however, can still be heard well after nightfall under favorable conditions.

In the 19 meter band, stations situated at a distance of 1500 miles (2400 kilometers) or greater will be found most satisfactory. Signals in this band will generally be heard during daylight hours—rarely after nightfall or when any appreciable portion of the transmission path is in darkness. Wave-lengths below 19 meters are useful only when transmitted entirely through daylight and over long distances (2000 miles or more); ordinarily they cannot be received after sunset.

Transmitted signals of any wave-length are known to divide into two components—the "ground" wave and the "sky" wave. The former remains close to the earth's surface, providing reliable service only over short distances from the broadcasting station. The sky wave, however, travels into the higher layers of the atmosphere and is reflected back to the earth's surface at an appreciable distance from the station. With short-wave signals, the sky wave usually does not return within the radius covered by the ground wave, resulting in a so-called dead-spot region within which reception is impossible or extremely unsatisfactory. The length of the region wherein such conditions are effective is known as the skip distance, varying greatly from day to night and from summer to winter approximately as shown in Table I.

When attempting to receive distant or foreign stations, the time standards observed at various longitudes throughout the world must be considered. At 8:00 P. M. in New York or 7:00 P. M. in Chicago, it is of the next day—1:00 A. M. in London, 2:00 A. M. in most of Europe and 11:00 A. M. in Australia. On the American continents, therefore, regular evening broadcasts from Europe will be received in the late afternoon and from Australia in the early morning. Special programs, however, are frequently transmitted from European stations at times chosen for evening reception in America.

Although reception on the short wave-lengths is less affected by atmospherics or static and good results may be had in midsummer even during a thunder storm, the reverse is true of man-made interference. Electrical machinery such as trolleys, dial telephones, motors, electric fans, automobiles, airplanes, electrical appliances, flashing signs and oil burners create far more interference to the shorter waves than to frequencies in the standard broadcast band (200 to 555 meters).

While the foregoing statements are valid, many other factors may so influence the transmission of short waves that exceptions are probable in certain locations. Experience in the operation of short-wave receivers in a given location is the best guide as to what to expect in reception at various times.

Any person interested primarily in short-wave reception will find membership in the International Short-Wave Club of great value. The club is a non-commercial organization and issues a monthly magazine (International Short-Wave Radio) which contains up-to-date information pertaining to short-wave broadcasting, amateur activities and commercial, police and aircraft services. The annual membership fee, including the magazine subscription, is one dollar ($1.00), U. S. Currency; single copies of the periodical may be procured by non-members for ten cents ($0.10), U. S. Currency, each. Address International Short-Wave Club, P. O. Box 713, Klondyke, Ohio, U. S. A.

Table I—Effect of Time of Day and Season of Year on Short-Wave Transmission*

Wave-length (Meters)	Ground-Wave Range		Sky Wave (Mid-Summer) Approximate Range				Sky Wave (Mid-Winter) Approximate Range			
			Noon		Midnight		Noon		Midnight	
	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.
100	90	145	—90	—145	90—600	145—960	90—100	145—160	90—2500	145—4000
49	75	120	100—200	160—320	250—5000	400—8000	200—600	320—960	400—∞	640—∞
31	60	97	200—700	320—1125	1000—∞	1600—∞	500—2000	800—3200	1500—∞	2400—∞
25	50	80	300—1000	480—1600	1500—∞	2400—∞	600—3000	960—4800	2000—∞	3200—∞
19	35	56	400—2000	640—3200	2500—∞	4000—∞	900—1000	1450—6400	X	X
15	15	24	700—4000	1125—6400	X	X	1500—∞	2400—∞	X	X

∞—Unlimited distance. X—Ordinarily cannot be heard.

* Time and season apply to transmitting station. Distances specified are based on relatively high-power transmission and favorable conditions of reception.

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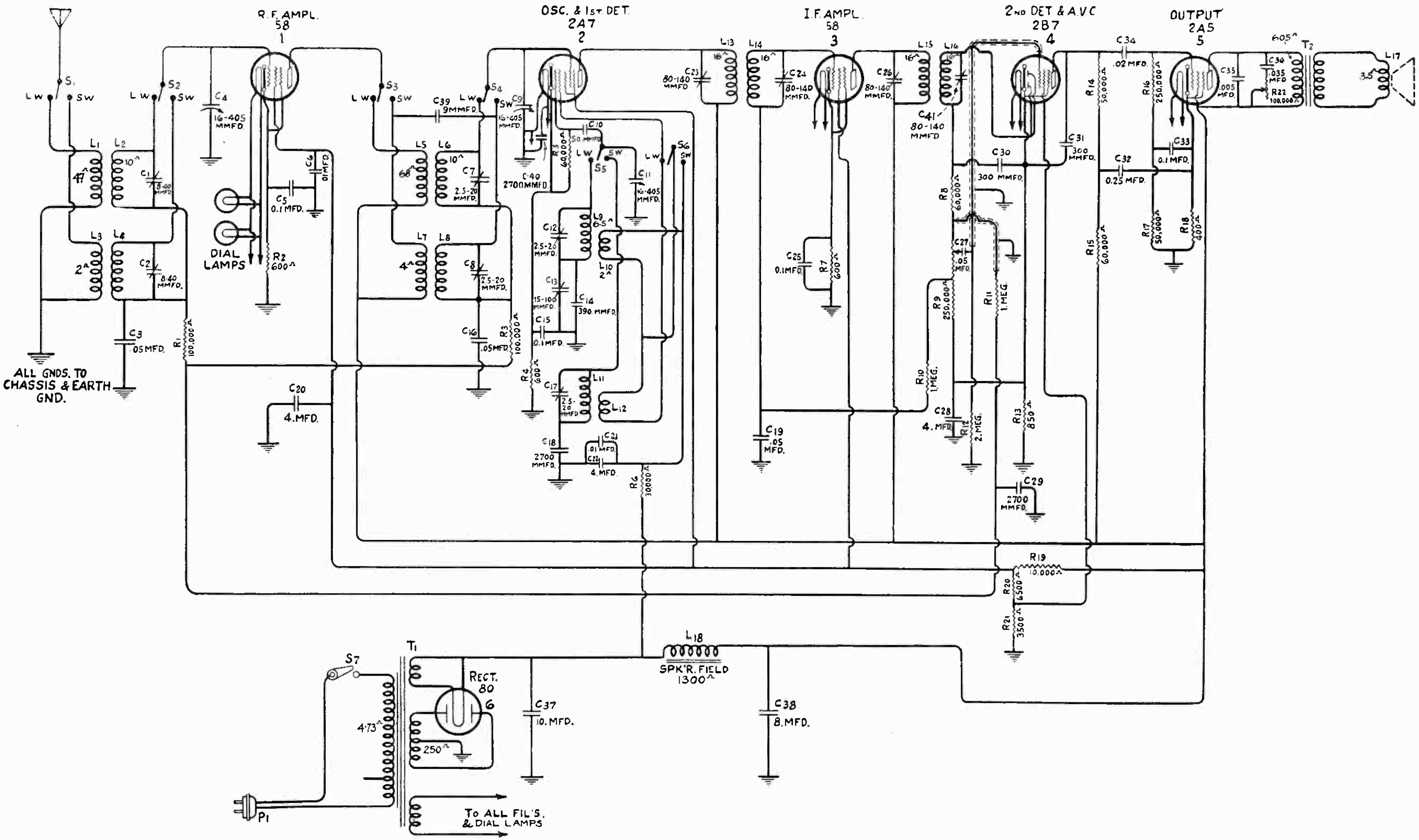


Figure A —Schematic Circuit Diagram

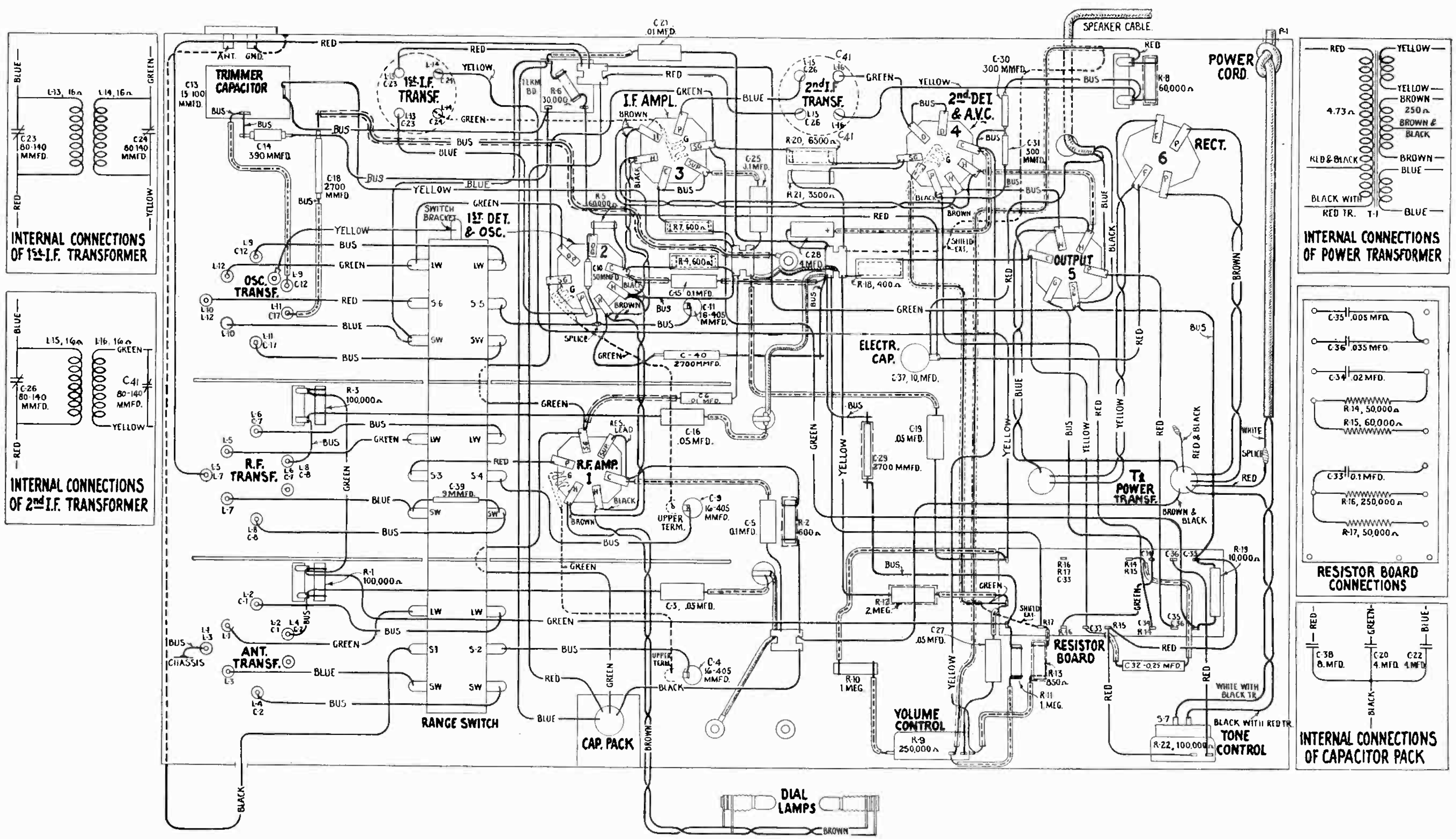


Figure B—Wiring Diagram

SERVICE DATA

Electrical Specifications

Voltage Rating..100–125 Volts
Frequency Rating.............................25–60 and 50–60 Cycle
Power Consumption............60 Cycle, 75 Watts; 25 Cycle, 80 Watts
Number and Type of Tubes.................................2 RCA-58, 1 RCA-2A7, 1 RCA-2B7, 1 RCA-2A5, 1 RCA-80—Total 6
Tuning Ranges.........540 K. C.–1500 K. C.—5400 K. C.–15,350 K. C.
Undistorted Output.......................................1.75 Watts

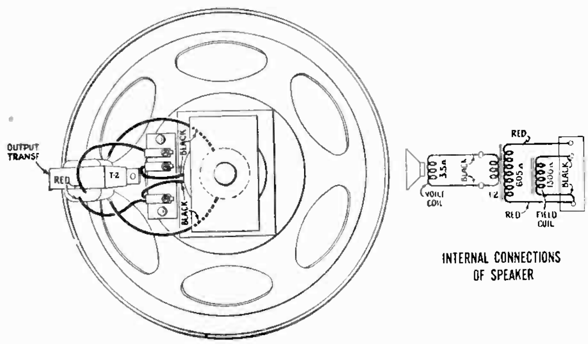


Figure C—Loudspeaker Wiring

This receiver is a six-tube two-band A. C. operated Superheterodyne Receiver combining the standard and short-wave broadcasting bands. The frequency ranges are selected by means of a two-position switch. Other features include a double reduction vernier drive using two concentric knobs giving a 10–1 and a 55–1 ratio of speed reduction, a continuously variable tone control, ten-inch electrodynamic loudspeaker, automatic volume control, single Pentode output tube and the inherent sensitivity, selectivity and tone quality of the Superheterodyne.

The chassis is of compact construction, affording unusual accessibility to all parts and adjustments. An "Airplane" type dial calibrated in frequency and showing the location of the short-wave bands is a special feature of this instrument. Figure A shows the schematic circuit, Figure B the wiring diagram and Figure C the loudspeaker wiring.

Line-Up Capacitor Adjustments

In order to properly align this receiver, it is essential that Stock No. 9050 Test Oscillator be used. This oscillator covers the frequencies of 150 K. C. to 20,000 K. C. continuously, has good stability and includes an attenuator. In addition to the oscillator, a non-metallic screwdriver such as Stock No. 7065 and an output meter are required. The output meter should be preferably a thermo-couple galvanometer connected across or in place of the cone coil of the loudspeaker.

I. F. Tuning Adjustments—Two transformers comprising four tuned circuits are used in the intermediate amplifier. These are tuned to 370 K. C. and the adjustment screws are accessible as shown in Figure D. Proceed as follows:

(a) Short-circuit the antenna and ground terminals and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the chassis.

(b) Connect the test oscillator output between the first detector control grid and chassis ground. Connect the output meter across the voice coil of the loudspeaker and adjust the oscillator output so that, with the receiver volume control at maximum, a slight deflection is obtained in the output meter.

(c) Adjust the secondary and primary of the first and then the second I. F. transformers until a maximum deflection is obtained. Keep the oscillator output at a low value so that only a slight deflection is obtained on the output meter at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. adjustments.

R. F. and Oscillator Adjustments—The R. F. line-up capacitors are located at the bottom of the coil assemblies instead of their usual position on the gang capacitor. They are all accessible from the bottom of the chassis except the 600 K. C. series capacitor, which is accessible from the rear of the chassis. Proceed as follows:

(a) Connect the output of the oscillator to the antenna and ground terminals of the receiver. Check the position of the indicator pointer when the tuning capacitor plates are fully meshed. It should be coincident with the radial line adjacent to the dial reading of 540. Then set the Test Oscillator at 1400 K. C., the dial indicator at 1400 and the oscillator output so that a slight deflection will be obtained in the output meter when the volume control is at its maximum position.

(b) With the Range Switch at the "in" position, adjust the three trimmers under the three R. F. coils, designated as L. W. in Figure D, until a maximum deflection is obtained in the output meter. Then shift the Test Oscillator frequency to 600 K. C. The trimmer capacitor, accessible from the rear of the chassis, should now be adjusted for maximum output while rocking the main tuning capacitor back and forth through the signal. Then repeat the 1400 K. C. adjustment.

(c) Now place the Range Switch at the "out" position, shift the Test Oscillator to 15,000 K. C. and set the dial at 15 on the megacycle scale. Adjust the three trimmer capacitors designated as S. W. in Figure D for maximum output, beginning with the oscillator trimmer. It will be noted that the oscillator and first detector trimmers will have two positions at which the signal will give maximum output. The position which uses the lower trimmer capacitance, obtained by turning the screw counter-clockwise, is the proper adjustment for the oscillator, while the position that uses a higher capacitance is correct for the detector. *Both of these adjustments must be made as indicated irrespective of output.* The R. F. is merely peaked. In conjunction with the detector adjustment, it is necessary to rock the main tuning capacitor back and forth while making the adjustment. This completes the line-up adjustments.

The important points to remember are the need for using the minimum oscillator output to obtain a deflection in the output meter with the volume control at its maximum position and the manner of obtaining the proper high frequency oscillator and detector adjustments.

Power Transformer Connections

The power transformer used in this model has a tapped primary winding. The transformer is normally connected for lines ranging in voltage from 110 to 125 volts. If for any reason the line is normally below 110 volts,

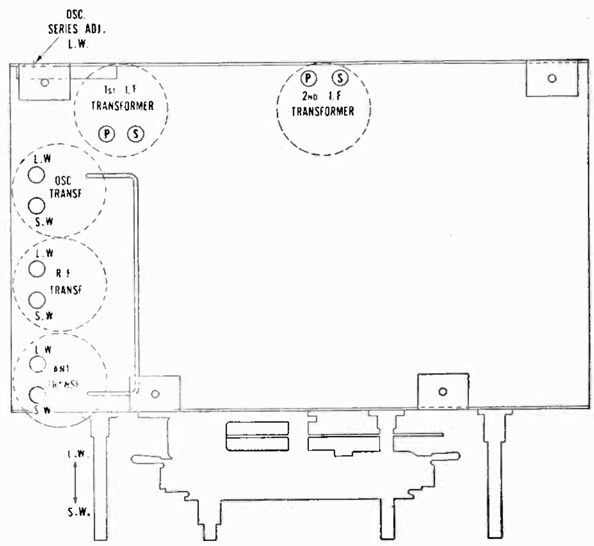


Figure D—Location of Line-Up Capacitors

the connections should be changed so the tap will be used. This is done by unsoldering the black with red tracer transformer lead connected to the power switch (on tone control) and substituting the red and black lead normally taped up. The black with red tracer lead should then be carefully taped to prevent short-circuit.

TUBE SOCKET VOLTAGES

115 Volts, A. C. Line—No Signal

Type No.	Cathode to Control Grid, Volts	Cathode to Screen Grid, Volts	Cathode to Plate, Volts	Plate Current M. A.	Heater Volts
1. RCA-58 R. F.	3.0	100	265	6.0	2.42
2. RCA-2A7 1st Det. Osc.	3.0	100*	265*	2.0*	2.42
3. RCA-58 I. F.	3.0	100	265	6.0	2.42
4. RCA-2B7 2nd Det. A. V. C.	1.5	35	100	1.5	2.42
5. RCA-2A5 Power	16.0	255	240	35.0	2.42
6. RCA-80 Rectifier	725 Volts R. M. S.—75 M. A. Total Current				4.80

* The voltages and current refer to the detector part of the tube.

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
2240	Resistor — 30,000 ohms — Carbon type — 1 watt (R6)	$0.22
2747	Cap—Contact cap—Package of 5	.50
3056	Shield—2nd detector Radiotron shield—Package of 2	.40
3076	Resistor—1 megohm—Carbon type—½ watt (R10, R11)—Package of 5	1.00
3252	Resistor—100,000 ohms—Carbon type—½ watt (R1, R3)—Package of 5	1.00
3470	Resistor—6,500 ohms—Carbon type—1 watt (R20)—Package of 5	1.10
3514	Resistor—250,000 ohms—Carbon type—½ watt (R16)—Package of 5	1.00
3529	Socket—Dial lamp socket	.32
3572	Socket—7-contact Radiotron socket	.38
3594	Resistor—50,000 ohms—Carbon type—½ watt (R14, R17)—Package of 5	1.00
3631	Resistor—850 ohms—Carbon type—½ watt (R13)—Package of 5	1.00
3639	Capacitor—.02 mfd. (C34)	.25
3683	Shield—Radiotron shield top	.20
3701	Capacitor—.01 mfd. (C6, C21)	.30
3702	Capacitor—.25 mfd. (C32)	.42
3768	Screw—Square head No. 6–32–¼″ set screw for condenser drive—Package of 10	.35
3796	Capacitor—4. mfd. (C28)	.60
3849	Capacitor—50 mmfd. (C10)	.30
3859	Socket—4-contact Radiotron socket	.30
3861	Capacitor—Adjustable capacitor (C13)	.78
3877	Capacitor—.1 mfd. (C5, C15, C25, C33)	.32
3878	Screw—No. 4–40–$\frac{3}{16}$″ screw for fastening station selector pointer—Package of 20	.25
3888	Capacitor—.05 mfd. (C19, C27)	.25
3892	Resistor—600 ohms—Carbon type—½ watt (R2, R4, R7)—Package of 5	1.00
3897	Resistor—400 ohms—Carbon type—1 watt (R18)—Package of 5	1.10
3901	Capacitor—.05 mfd. (C3, C16)	.36
3905	Screw—Chassis mounting screw assembly comprising 4 screws, 4 washers, and 4 cushions	.46
3906	Mounting assembly — Variable condenser mounting assembly comprising 3 bushings, 3 lockwashers, 3 nuts, and 3 washers	.28
3937	Capacitor—300 mmfd. (C30, C31)	.34
3938	Capacitor—9 mmfd. (C39)	.25
3939	Resistor — 3,500 ohms — Carbon type — ½ watt (R21)—Package of 5	1.00
3942	Shield—1st detector Radiotron shield	.18
3943	Screen—Translucent screen for dial light—Package of 2	.18
3944	Shield—Antenna, R. F. or oscillator coil shield	.28
3991	Resistor—10,000 ohms—Porcelain type (R19)	.60
4031	Capacitor—2,700 mmfd. (C18, C29, C40)	.50
4032	Capacitor—390 mmfd. (C14)	$0.34
4075	Knob—Range switch or tone control knob—Package of 5	1.00
4119	Screw—No. 8–32–¼″ headless cup point set screw for station selector knob—Package of 20	.38
4120	Knob—Volume control knob—Package of 5	1.18
4121	Knob—Station selector knob—Package of 5	1.18
6188	Resistor—2 megohm—Carbon type—½ watt (R12)—Package of 5	1.00
6282	Resistor—60,000 ohms—Carbon type—½ watt (R5, R8, R15)—Package of 5	1.00
6571	Capacitor—10 mfd. (C37)	1.20
6614	Glass—Station selector dial glass	
6615	Ring—Retaining ring for dial glass—Package of 5	.34
6620	Capacitor—Comprising one .005 mfd. and one .035 mfd. (C35, C36)	.50
6676	Socket—6-contact Radiotron socket—Output	.40
6694	Condenser—3-gang variable tuning condenser (C4, C9, C11)	3.75
6695	Volume control (R9)	1.20
6696	Switch—Range switch (S1, S2, S3, S4)	2.24
6697	Transformer—First intermediate frequency transformer (L13, L14, C23, C24)	1.80
6698	Transformer—Second intermediate frequency transformer (L15, L16, C26, C41)	1.78
6699	Coil—R. F. coil (L5, L6, L7, L8, C7, C8)	2.44
6700	Coil—Oscillator coil (L9, L10, L11, L12, C12, C17)	2.30
6701	Coil—Antenna coil (L1, L2, L3, L4, C1, C2)	2.64
6702	Drive—Variable tuning condenser drive assembly complete	1.86
6703	Capacitor pack—Comprising one 8. mfd. and two 4. mfd. capacitors (C20, C22, C38)	2.46
6704	Shaft—Tuning condenser drive assembly shaft	.64
6705	Tone control complete (R22)	1.20
6841	Dial—Station selector dial—Package of 5	2.74
6840	Bezel—Metal bezel for station selector dial	.56
6842	Pointer—Station selector pointer—Package of 5	.46
7485	Socket—6-contact Radiotron socket	.40
7487	Shield—I. F. and R. F. amplifier Radiotron shield	.25
9446	Transformer—Power transformer—105–125 volts 50–60 cycles (T1)	5.40
9451	Transformer—Power transformer—105–125 volts 25–40 cycles	5.40
10194	Ball—Steel ball for condenser drive assembly—Package of 20	.25
	REPRODUCER ASSEMBLIES	
6770	Transformer—Output transformer (T2)	2.00
6843	Cable—3-conductor reproducer cable	.38
8935	Cone—Reproducer cone (L17)—Package of 5	5.25
9460	Coil—Field coil, Magnet and cone support (L18)	6.00
9461	Reproducer complete	8.50

RCA Victor

32-Volt D. C. Receiver Model 223

6-Tube Broadcast and Police Call Super-Heterodyne

SERVICE NOTES

SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

A RADIO CORPORATION OF AMERICA SUBSIDIARY

REPRESENTATIVES IN PRINCIPAL CITIES

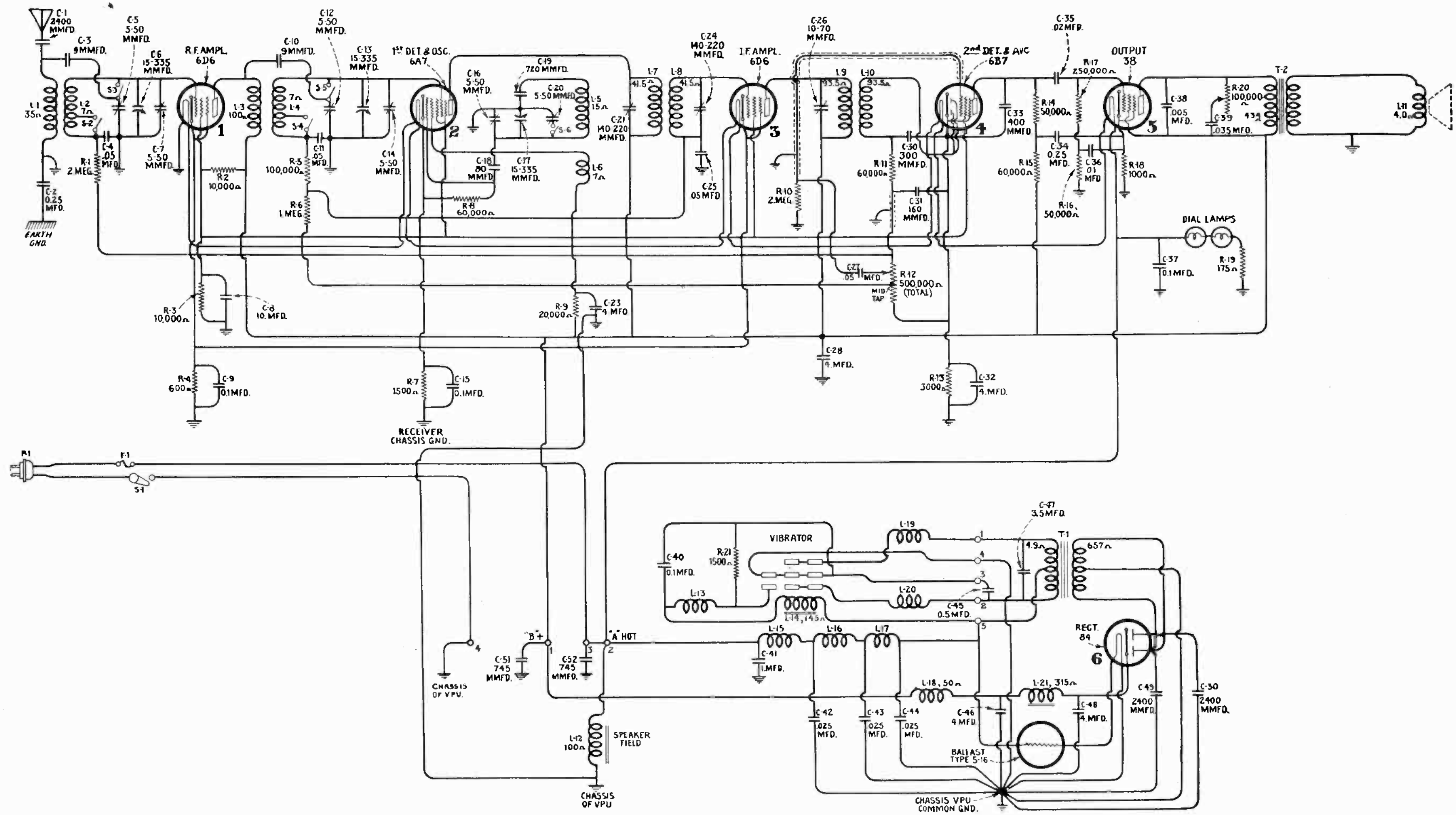


Figure 1—Schematic Circuit Diagram

RCA VICTOR MODEL 223
SERVICE NOTES

Electrical Specifications

Voltage Rating . . . . 26–40 Volts D. C.
Power Consumption . . . . 60 Watts at 32 Volts
Number and Types of Radiotrons . . . . . 2 RCA-6D6, 1 RCA-6A7, 1 RCA-6B7, 1 RCA-38, 1 RCA-84 —Total, 6
Type of Ballast Lamp . . . . Amperite 5-16
Undistorted Output . . . . 1.1 Watts (Max. 1.6 Watts)
Tuning Frequency Range . . . . . 540 K. C.–1500 K. C. and 1400 K. C.–2800 K. C.

This receiver is a six-tube, 32-volt D. C. superheterodyne designed primarily for operation from 32-volt farm lighting circuits. Excellent sensitivity and selectivity, large undistorted output and excellent tone quality are inherent features of this receiver. Other outstanding features include 10-inch electro-dynamic loudspeaker, wide tuning range (police, aviation and broadcast), ballast lamp for voltage fluctuations, and a separate power supply with a newly designed filter unit.

Figure 1 shows the schematic circuit diagram, Figures 2 and 3 the chassis and power unit wiring, and Figure 5 the assembly wiring diagram. The replacement parts are given on page 9.

Description of Circuit

The circuit of this receiver is similar in many ways to the usual six-tube superheterodyne, although the power supply differs in several respects. Chiefly among the differences is the use of a vibrator interrupter for obtaining alternating current and a tube rectifier for rectifying it at a higher voltage.

The R. F. stage uses Radiotron RCA-6D6, which is a six-volt heater type super-control R. F. amplifying tube. The function of this stage is to select and amplify the desired incoming signal and apply it to the first detector.

The next tube is a combined oscillator-detector which is known as the RCA-6A7 and which provides a local signal and a detector for obtaining an I. F. frequency. The local oscillator, due to the bridge circuits used, provides a signal that has a constant frequency difference from the incoming R. F. signal (175 K. C. higher) at all points throughout the tuning range. The detector portion of the tube serves to extract the beat frequency from the combined signals (oscillator and signal) and apply it to the grid of the I. F. stage.

The plate circuit of the first detector and the grid and plate circuits of the I. F. tube are all tuned by means of small adjustable capacitors to 175 K. C. This group of tuned circuits, together with the R. F. circuits, provides the high selectivity of the receiver. Radiotron RCA-6D6 is used in the I. F. stage.

Radiotron RCA-6B7 is used as a diode second detector, automatic volume control and audio amplifier. The D. C. component of the rectified I. F. signal on the second detector diode is used for automatic bias on the R. F., first detector and I. F. tubes. The audio component of the rectified signal is applied to the pentode section of the RCA-6B7 for further amplification at audio frequencies.

The output of the second detector is applied to the grid of Radiotron RCA-38, pentode output amplifier. Resistance coupling is used between the detector and the output tube while a step-down transformer serves as an impedance matching device between the plate circuit of the RCA-38 and the voice coil of the loudspeaker.

Field excitation for the loudspeaker is obtained by connecting it directly across the 32-volt direct current supply. Heater excitation for the tubes described is obtained by connecting them in series and placing the entire circuit across the 32-volt line.

Plate and grid voltages for all tubes are obtained from a special plate supply unit which consists of a vibrator, a tube rectifier, a thermal voltage regulator and a special filter network for reducing hum or vibrator interference to a negligible degree. The purpose of the vibrator is to interrupt the direct current and apply it first in one direction and then in the opposite direction across individual sections of the primary of the power transformer. The transformer steps the voltage up several times and applies it to the plates of the full-wave rectifier, Radiotron RCA-84. The filament of this tube is connected in series with the Amperite 5-16 voltage regulating tube. This regulating tube maintains a constant current through the rectifier filament over a wide variation of line voltages.

The range switch provides a quick means of shifting from one frequency band to the other. The regular band covers from 540 K. C. to 1500 K. C., while the police band covers from 1400 K. C. to 2800 K. C. This shift is accomplished in the following manner.

A tap is provided on the grid coils of the R. F. and first detector circuits. Also additional coupling capacitors are connected from the antenna to the R. F. grid and from the R. F. plate to the first detector grid. In the oscillator, R. F. and detector circuits, an extra trimmer capacitor is available for paralleling to the main tuning condenser. The effect of these various

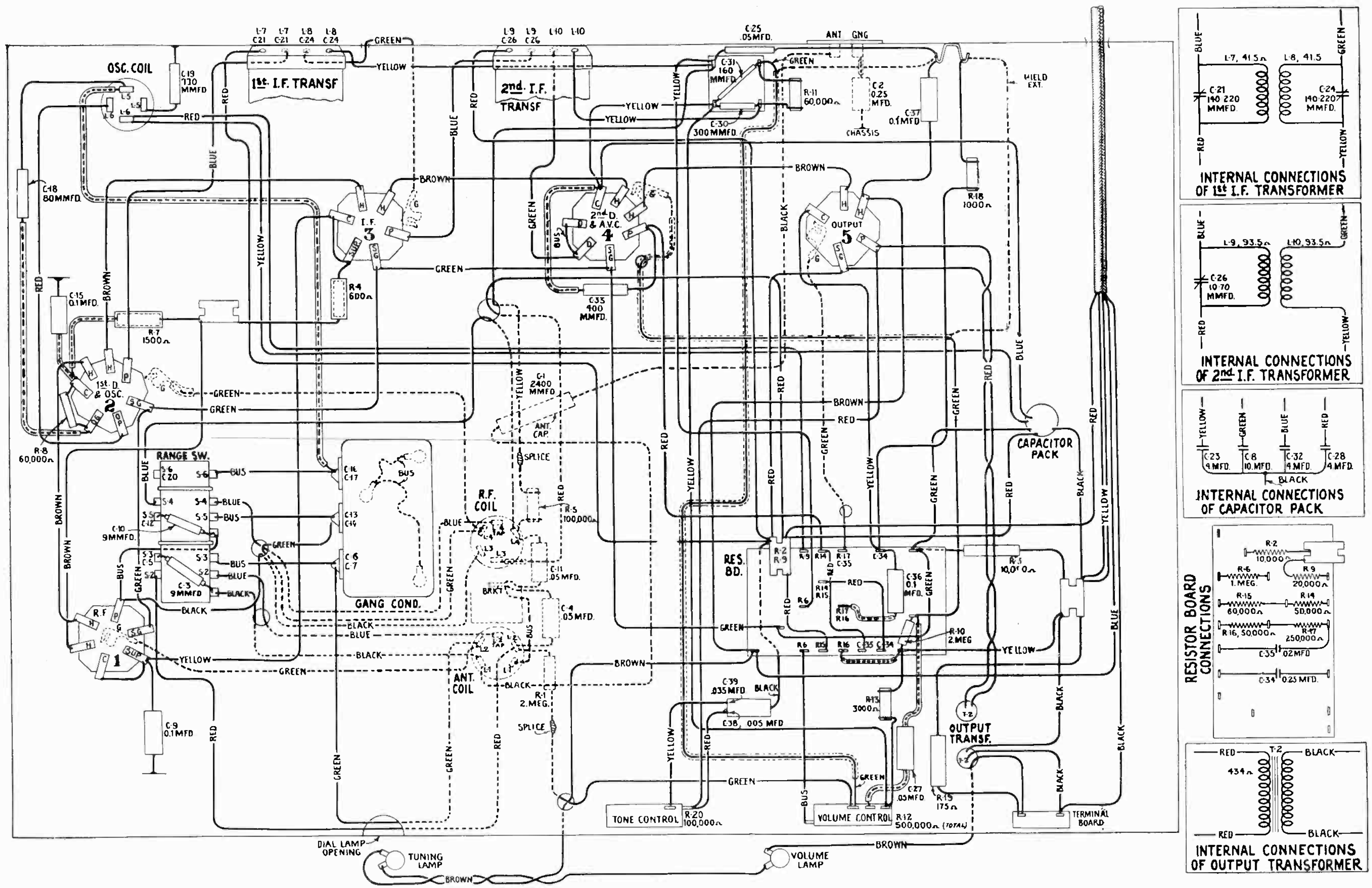


Figure 2—Chassis Wiring Diagram

taps and capacitors is to change the tuning range as follows:

1. At the broadcast position all of the additional circuits are open as shown in Figure 1.

2. At the police band position, all of the additional switches are closed. Shorting of turns in the grid coils reduces their inductance so that the tuning capacitors cover the high frequency range. Connecting the two coupling capacitors increases the coupling and thereby the sensitivity at the higher frequency position. The trimmer capacitor on the oscillator circuit provides proper tracking with the R. F. circuits.

Line-up Adjustments

Inoperation, poor tone quality, or lack of proper sensitivity and selectivity are direct results of lack of alignment. In event the receiver is to be aligned, carefully use the following procedure:

I. F. Tuning Adjustments—Two transformers comprising three tuned circuits (the secondary of the second transformer is untuned) are used in the intermediate amplifier. These are tuned to 175 K. C. and the adjustment screws are accessible as shown in Figure 4. Proceed as follows:

(a) Procure a modulated oscillator giving a signal at 175 K. C., a non-metallic screwdriver such as Stock No. 4160 and an output meter. Test Oscillator, Stock No. 9050, is suitable and recommended for making these adjustments.

(b) Short-circuit the antenna and ground terminals and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the chassis.

(c) Connect the oscillator output between the first detector control grid and chassis ground. Connect the output meter across the voice coil of the loudspeaker and adjust the oscillator output so that with the receiver volume control at maximum, a slight deflection is obtained in the output meter.

(d) Adjust the primary of the second, and the secondary and primary of the first I. F. transformers until a maximum deflection is obtained. Keep the oscillator output at a low value so that only a slight deflection is obtained on the output meter at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. adjustments.

R. F. and Oscillator Adjustments—The three-gang capacitor screws are accessible at the bottom of the chassis. The high frequency capacitor screws are located on the Range Switch. Proceed as follows:

(a) Procure a modulated oscillator giving a signal at 1400 and 2440 K. C. (Stock No. 9050), a non-metallic screwdriver such as Stock No. 4160, and an output meter.

(b) Connect the output of the oscillator to the antenna and ground terminals of the receiver. Check the dial at the extreme maximum position of the tuning capacitor. The indicator should be at the last division. Then set the dial at 140, the oscillator at 1400 K. C. and connect the output meter across the cone coil. Adjust the oscillator output so that a slight deflection is obtained when the receiver volume control is at maximum.

(c) With the Range Switch at the counter-clockwise position, adjust the three tuning condenser line-up capacitors until maximum deflection is obtained in the output meter. Then shift the oscillator to 2440 K. C., the Range Switch to the clockwise position and the dial to 120. The three line-up capacitors located on the Range Switch should then be adjusted for maximum output.

When making both the I. F. and R. F. adjustments, the important point to remember is that the receiver volume control must be at its maximum position. Also the minimum input signal necessary from the oscillator will permit a more accurate adjustment.

TUBE SOCKET VOLTAGES

32-Volt D.C. Input — No Signal — Volume Control at Minimum

Radiotron No.	Cathode to Ground, Volts	Cathode to Screen Grid, Volts	Cathode to Plate, Volts	Plate Current M. A	Heater Volts
RCA-6D6 R. F.	8.4	77	216	4.2	6.2
RCA-6A7—Osc. Det.	9.7	76	215	6.5	6.2
RCA-6D6 I. F.	8.4	77	216	4.2	6.2
RCA-6B7—2nd Det.	5.7	80	52	1.9	6.2
RCA-38 Pwr.	19.5	205	197	21.5	6.2
RCA-84 Rect.	244			50	6.5–7.0*

*Varies with ballast tubes and with time.

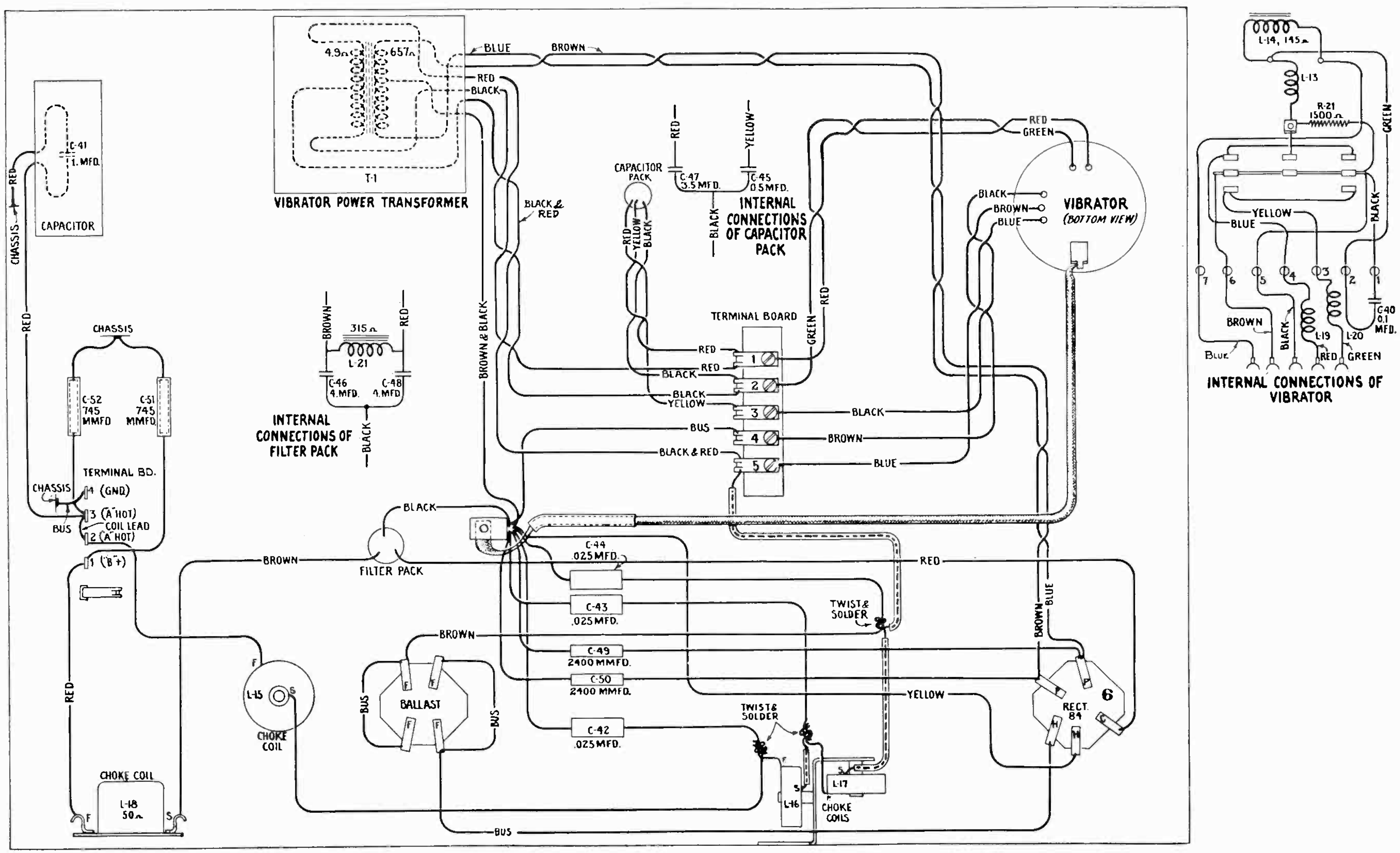


Figure 3—Power Unit Wiring Diagram

SUPPRESSION OF GENERATOR AND IGNITION INTERFERENCE

Operating this receiver while the 32-volt generator is running may present difficulties caused by the radiation of radio-frequency interference from the generator and gasoline engine. This interference usually travels over the lighting lines and is picked up by the antenna system of the receiver. There are two methods of reducing this interference, both of which may be required in bad cases.

1. Suppression of the interference at its source by means of the accessories furnished with the receiver.
2. Placing the antenna in such a position that the interference will not be picked up, and using a Stock No. 7718 Shield Kit for transmitting the signal from the antenna to the receiver without picking up noise on the lead-in.

Figure 4 shows a typical installation of the suppression equipment. This equipment is connected as follows:

Suppressor:—In single-cylinder installations, the suppressor is connected to the spark-plug for the suppression of the high-tension interference generated at this point. In twin-cylinder installations, the single-distributor type suppressor should be installed and should eliminate this interference. However, in some cases it may be necessary to install both distributor and plug suppressors.

Generator Capacitor:—A capacitor is connected from each brush of the generator to the generator frame, which must be grounded. This reduces the interference caused by sparking at the commutator of the generator. If excessive sparking occurs, it is very unlikely that the capacitors will reduce the noise sufficiently. In this case, the commutator must be thoroughly cleaned and sanded and the brushes reseated. In bad cases it is usually best to clean the foreign matter from between the commutator segments by means of a three-cornered file, and then sand the commutator by placing the sand-paper around a small block and holding it squarely against the commutator while it is running. *Never use emery cloth.*

Coil Capacitor:—Some installations will require a capacitor connected from the battery side of the ignition coil to ground. This reduces the interference caused by the primary breaker.

Grounds:—It is important that the frame of the generator be thoroughly grounded. A steel ground-rod, driven at least six feet in moist earth, provides a good ground. In event one side of the line is grounded, it is important that the ground be a good one. The ground should be applied at the generator, at the point where the line enters the building where the radio receiver is located and at the extreme far end of the line.

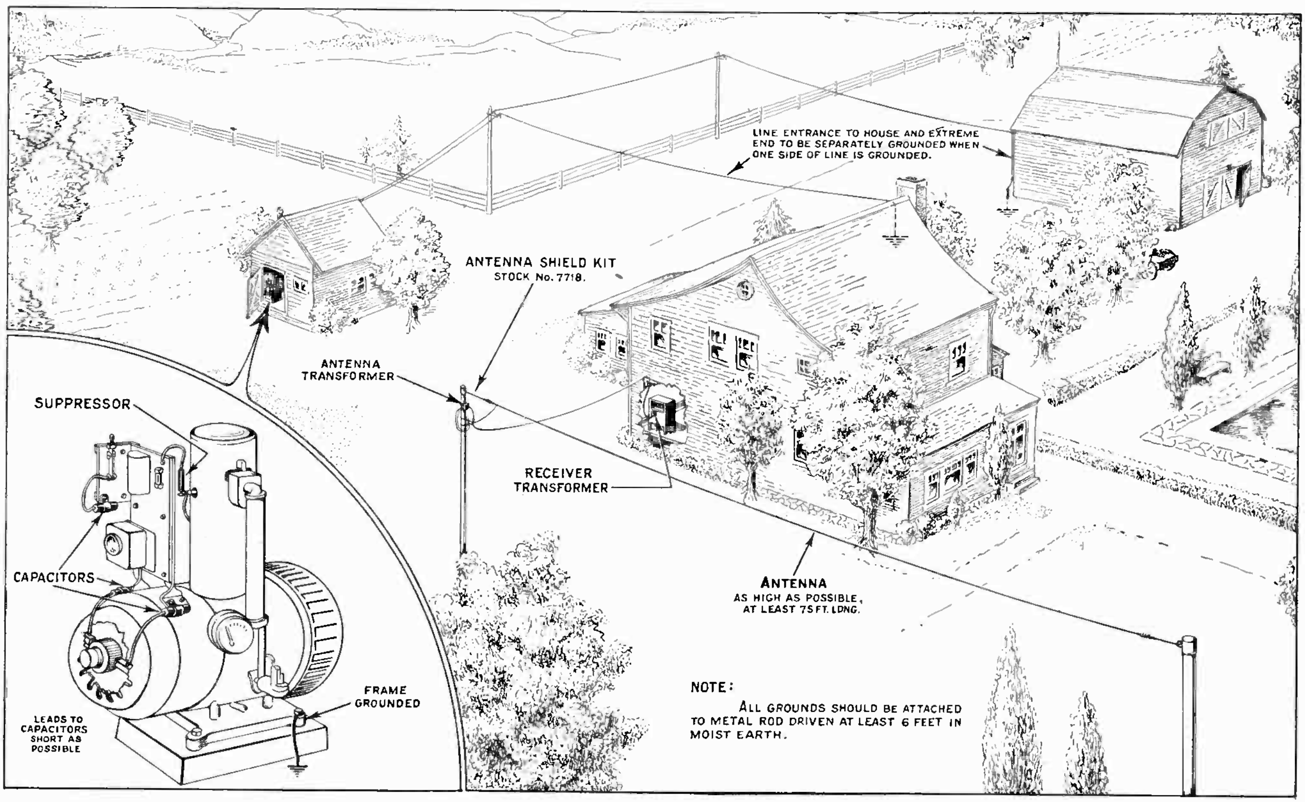


Figure 4—Typical Installation showing suppression equipment and proper antenna system

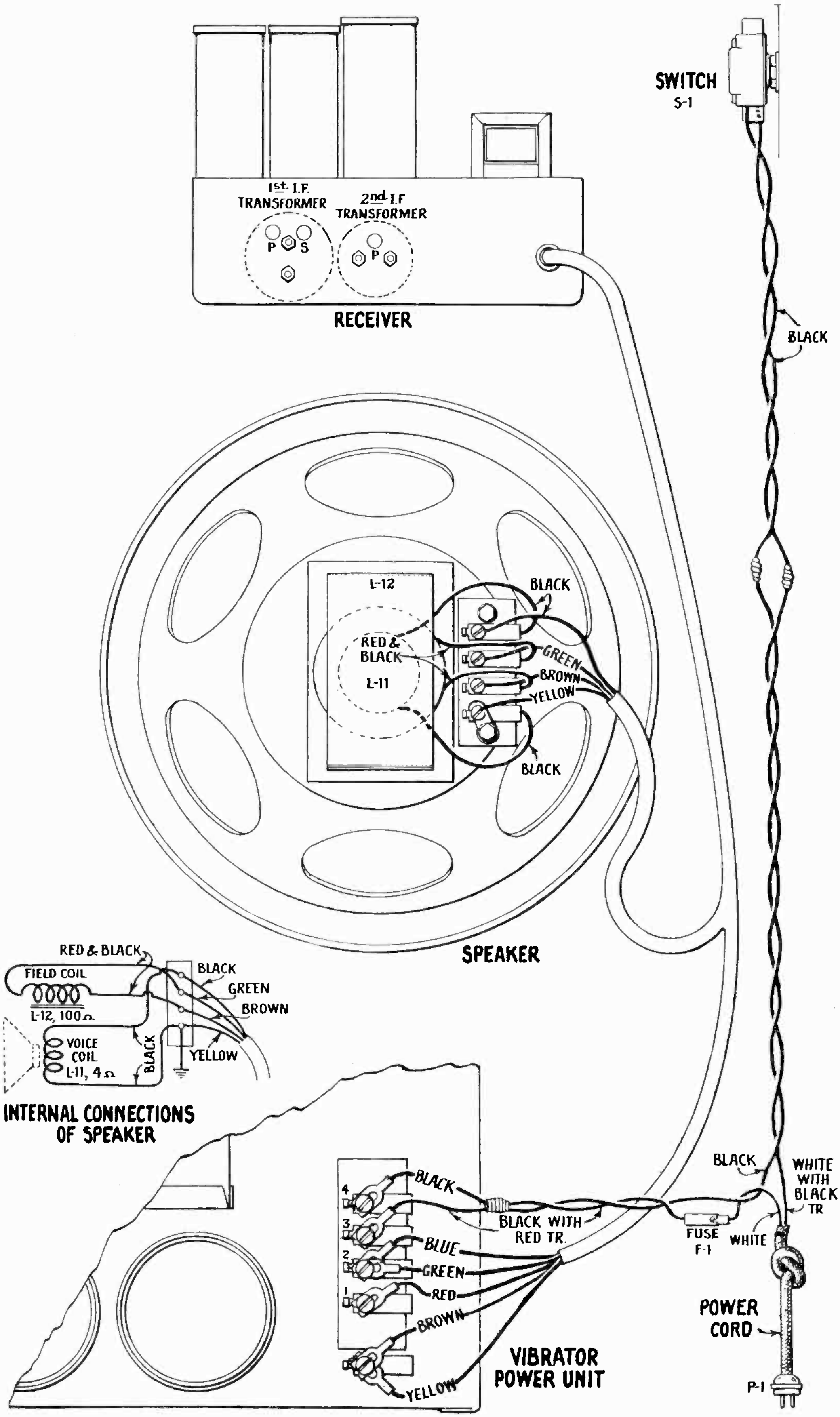


Figure 5—Assembly Wiring Diagram

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
2816	Resistor — 1,000 ohms — Carbon type — ½ watt (R18)—Package of 5	$1.00
3047	Resistor — 1,500 ohms — Carbon type — ½ watt (R7)—Package of 5	1.00
3076	Resistor—1 megohm—Carbon type—½ watt (R6)—Package of 5	1.00
3252	Resistor—100,000 ohms—Carbon type—½ watt (R5)—Package of 5	1.00
3358	Resistor — 3,000 ohms — Carbon type — ½ watt (R13)—Package of 5	1.00
3514	Resistor—250,000 ohms—Carbon type—½ watt (R17)—Package of 5	1.00
3572	Socket—7 Contact Radiotron socket	.38
3584	Ring—Antenna, R. F. or oscillator coil retaining ring—Package of 5	.40
3594	Resistor—50,000 ohms—Carbon type—½ watt (R14, R16)—Package of 5	1.00
3597	Capacitor—.25 mfd. (C34)	.40
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R8, R11)—Package of 5	1.00
3616	Capacitor—300 mmfd. (C30)	.34
3622	Shield—Antenna or R. F. coil shield	.36
3624	Socket—Dial lamp socket and bracket	.40
3625	Scale—Volume indicator scale assembly	.40
3626	Shield—Oscillator coil shield	.22
3630	Resistor—10,000 ohms—Carbon type—3 watt (R2, R3)	.25
3634	Capacitor—160 mmfd. (C31)	.34
3639	Capacitor—.02 mfd. (C35)	.25
3750	Capacitor—.25 mfd. (C2)	.36
3783	Capacitor—9 mmfd. (C3, C10)—Package of 2	.50
3877	Capacitor—.1 mfd. (C9, C15, C36, C37)	.32
3888	Capacitor—.05 mfd. (C4, C11, C25, C27)	.25
3892	Resistor—600 ohms—Carbon type—½ watt (R4)—Package of 5	1.00
3993	Screw—Set screw for volume control dial—Package of 10	.25
4046	Resistor—2 megohm—Carbon type—½ watt (R1)—Package of 5	1.00
4142	Mounting assembly for receiver chassis—Comprising 8 cushions, 8 washers, 4 spacers, 4 lockwashers and 4 screws	.38
4143	Capacitor—2400 mmfd. (C1)	.25
4144	Clamp—Capacitor mounting clamp—Package of 5	.20
4145	Shield—Radiotron shield	.30
4181	Capacitor—720 mmfd. (C19)	.30
4182	Capacitor—80 mmfd. (C18)	.25
4183	Capacitor—400 mmfd. (C33)	.26
4184	Capacitor pack—Comprising one .035 and one .005 mfd. capacitors (C38, C39)	.30
4185	Resistor—175 ohms—Wire wound (R19)	.78
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R10)—Package of 5	1.00
6282	Resistor—60,000 ohms—Carbon type—½ watt (R15)—Package of 5	1.00
6303	Resistor—20,000 ohms—Carbon type—½ watt (R9)—Package of 5	1.00
6471	Coil—Oscillator coil (L5, L6)	.74
6483	Transformer—First intermediate frequency transformer (L7, L8, C21, C24)	1.84
6484	Transformer—Second intermediate frequency transformer (L9, L10, C26)	1.70
6485	Volume control with mounting nut (R12)	$1.20
6527	Coil—Antenna coil (L1, L2)	1.08
6528	Coil—R. F. coil (L3, L4)	.94
6534	Switch—Range switch (S2, S3, S4, S5, S6, C5, C12, C20)	1.25
6598	Condenser—3-gang variable tuning condenser (C6, C7, C13, C14, C16, C17)	3.00
6622	Dial—Station selector dial scale and drive assembly	.95
6859	Capacitor—Comprising three 4 mfd. and one 10 mfd. capacitors (C8, C23, C28, C32)	2.85
6860	Tone control with mounting nut (R20)	1.15
6861	Transformer—Output transformer (T2)	1.36
7484	Socket—5-contact Radiotron socket	.35
7485	Socket—6-contact Radiotron socket	.40
	VIBRATOR POWER UNIT ASSEMBLIES	
3765	Capacitor—.025 mfd. (C42, C43, C44)	.34
3859	Socket—4-contact Radiotron socket	.30
3860	Socket—5-contact Radiotron socket	.32
4145	Shield—Radiotron shield—Rectifier	.30
4148	Suspension assembly—Comprising one bolt assembly, one "C" washer, two cup washers, two springs, two damping bushings	.40
4150	Clamp assembly—Vibrator mounting clamp assembly	.22
4186	Capacitor—2400 mmfd. (C49, C50)	.28
4187	Capacitor—745 mmfd. (C51, C52)	.25
6862	Filter pack—Comprising one reactor and two 4.0 mfd. capacitors (C46, C48, L21)	3.34
6863	Capacitor—Comprising one 3.5 mfd. and one .5 mfd. capacitors (C45, C47)	3.46
6864	Tube—Regulator tube	3.00
6865	Shield—Regulator tube shield	.22
6866	Coil—Line R. F. choke coil (L15)	.96
6867	Coil—Line R. F. choke coil	.54
6868	Coil—Line R. F. choke coil (L16)	.78
6869	Capacitor—1.0 mfd. capacitor (C41)	.88
6870	Shield—Outer shield with felt pad for vibrator assembly	.60
6871	Coil—Filter coil (L18)	.76
7734	Transformer—Power transformer (T1)	3.60
7735	Vibrator complete (L13, L14, L19, L20, C40, R21)	8.20
	REPRODUCER ASSEMBLIES	
4149	Shield—Terminal board shield	.20
8935	Cone—Reproducer cone (L11) Package of 5	5.25
9474	Reproducer complete	7.10
9475	Coil—Field coil magnet and cone support (L12)	4.55
	MISCELLANEOUS PARTS	
3592	Knob—Station selector—Volume control or tone control knob—Package of 5	.80
3615	Knob—Range switch knob—Package of 5	.60
3881	Escutcheon—Station selector escutcheon	.42
3899	Escutcheon—Volume control escutcheon	.42
4292	Capacitor—Generator capacitor—.5 mfd.	.90
6151	Suppressor—Spark plug suppressor	.56
6152	Suppressor—Distributor suppressor	.56
6516	Connector—Fuse connector complete	.16

RCA VICTOR SHIELD KITS

Stock Nos. 7717 and 7718

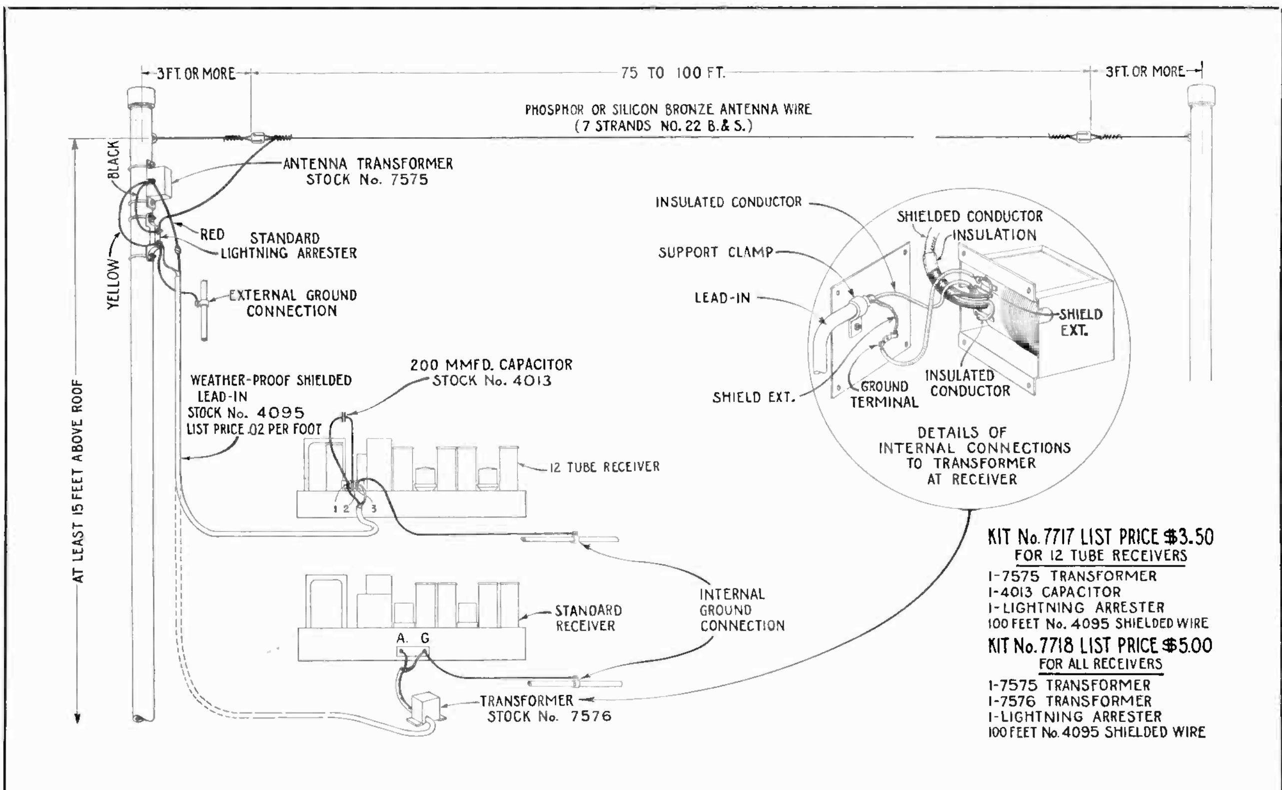
The RCA Victor Shield Kits, Stock Nos. 7717 and 7718, consist of an assembly of parts designed to be used in conjunction with radio receivers for the prevention of interference pickup by the lead-in portion of an antenna system. Inasmuch as the majority of man-made interference is picked up on the lead-in section of an antenna, installation of these kits greatly improves the ratio of signal to noise.

The Stock No. 7717 kit consists of an antenna transformer, 100 feet of low-impedance shielded lead-in wire, a 200 mmfd. capacitor and a lightning arrester. This kit is designed to be used with the RCA Victor Model 280 *only* and does not include a receiver coupling transformer. Such omission is made possible by the inclusion of a tap on the antenna coil of the Model 280, which matches the impedance of the shielded lead-in.

The Stock No. 7718 kit consists of an antenna transformer, 100 feet of shielded lead-in wire, a receiver transformer and a lightning arrestor. This kit is designed to be used with all types of broadcast receivers. The illustration below shows the proper manner of connecting these kits.

In conjunction with the Stock Nos. 7717 and 7718 kits, it must be remembered that these lead-in systems will not affect such conditions as natural atmospheric conditions which induce static into the antenna or any other noise that is picked up by the flat top portion of the antenna. To visualize the gain in these systems, the results will be approximately equal to the reception that would be obtained if the receiver were located at the top of the antenna pole.

These kits will give excellent results over the entire broadcast and police frequency bands. However, they are not recommended for the short-wave broadcasting bands.



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Proper Method of Connecting Kits to Antenna and Receivers

Instructions for

RCA Victor 261

Ten-Tube Double-Range Superheterodyne Console

INTRODUCTION

Excellent performance, including splendid voice and musical reproduction, characterizes this distinctive console radio receiver. In addition to a refined superheterodyne circuit, this instrument embodies such features as aural (automatic tone) compensation, automatic volume control, silent-tuning control and a push-pull power output stage using two pentode RCA-2A5 Radiotrons. Its tuning range is from 540 to 2800 kilocycles, permitting reception of municipal and state police calls together with amateur and other phone communications as a diversion from standard broadcast entertainment (540–1500 kc).

Aural compensation tends to maintain throughout the entire volume range the correct balance between the various tones of the musical scale, thereby insuring pleasing reproduction at any desired volume setting. This effect is achieved electrically, the volume control circuit serving to introduce compensation for variations in the sensitivity of the human ear throughout its frequency range. The automatic volume control built into this instrument minimizes fading effects and prevents "blasting" when the receiver is being tuned to or past a local or powerful station.

In addition to the foregoing features, this instrument may be adjusted for quiet tuning between station settings. While the intensity of background noise (static) is subject to wide variation because of local atmospheric influences, reproduction of that noise when tuning the receiver can be prevented by proper initial adjustment of the silent-tuning control.

INSTALLATION

Preliminary—Remove the internal packing material used to protect the tubes during shipment, then refer to the chassis diagram (printed on rating label attached to rear of receiver) and ***make certain:***

(a) That all tubes are in the proper sockets and pressed down firmly. *Never apply power to the instrument unless all tubes are in place.*

(b) That all shields are rigidly in place over the tubes represented by double circles on the diagram.

(c) That the spring connectors of the short flexible (grid) leads, shown on the diagram, are securely attached to the dome terminals of the proper tubes. It is important that the adjacent green and black leads shall be connected as indicated—that is, not reversed.

(d) That the lid is securely in place on the shield of that RCA-58 Radiotron designated by the heavy circle on the diagram.

Location—The instrument should be placed convenient to the antenna and ground connections and to an electrical outlet.

Antenna and Ground—An outdoor antenna of maximum convenient height and having a length of from 25 to 75 feet, including the lead-in and ground wiring, is recommended. The antenna should be well insulated from all objects and should run neither close nor parallel to electric circuits inside or outside the building. While an indoor antenna of short or medium length should provide generally satisfactory reception, best results will be obtained with a properly erected outdoor antenna. The latter is essential when the receiver is installed in a building of metallic construction and should prove advantageous in localities remote from broadcasting stations.

A *good* ground connection is necessary for best performance of this receiver. The ground lead should be as short as possible and preferably attached to a cold-water pipe. The pipe should be scraped clean and an approved ground clamp used to insure a tight and permanent connection.

A terminal board, located on the receiver chassis at the rear, is provided for connection to the antenna and ground. Attach the antenna lead to the left-hand terminal (marked "ANT") and the ground lead to the right-hand terminal (marked "GND"). Tighten the terminals securely with a screw-driver.

Power Supply—Connect the power cord to an electrical outlet supplying alternating current at the voltage and frequency (cycles) specified on the rating label.

OPERATION

The operating controls are shown in Figure 1. Proceed as follows:

1. Set the Frequency Range Switch as indicated below for reception in either band:

(a) *Counter-clockwise* — 540–1500 kilocycles (broadcast band). Using the large numerals, the dial scale reads directly in kilocycles for this band.

(b) *Clockwise*—1400–2800 kilocycles. Frequencies in this band are indicated approximately by the positions of the small numerals at the bottom of the dial (add two ciphers to obtain kilocycles). Available services therein include the following:

(1) **Police Calls**—Stations operating at 1574 and 1712 kilocycles and between 2400 and 2500 kilocycles.

(2) **Amateur Radio "Phone"**—Assigned band 1800–2000 kilocycles.

(3) **Aviation Communications "Phone"**—Between 2500 and 2800 kilocycles.

NOTE—The majority of stations in this range do not offer continuous programs. Police calls are usually intermittent, at regular or irregular intervals. Strong local stations in the broadcast band may be audible (sometimes at more than one point on the dial) when the Frequency Range Switch is set for 1400–2800 kilocycles.

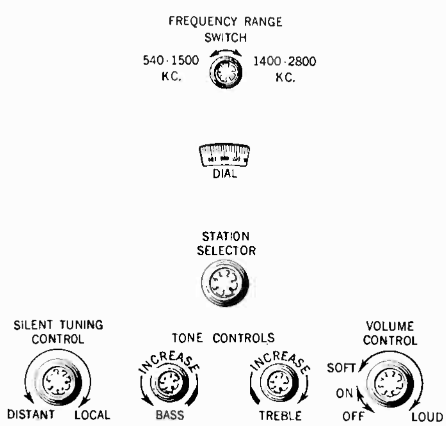

Figure 1

2. Apply power by turning the Volume Control knob clockwise from the "off" position. Set this control near the middle of its range. Wait a few seconds for the tubes to heat before attempting further operation.

3. With the Silent-Tuning Control set in the extreme counter-clockwise position, turn the Station Selector to a point, near the middle of the dial range, at which no station is heard within several scale divisions. Then turn the Silent-Tuning Control clockwise until the background noise (static) just disappears.

NOTE—The adjustment just described provides quiet tuning (that is, *suppression of background noise between station settings*) and permits reception of all stations whose signals are above the existing noise level.

4. Tune the receiver by rotating the Station Selector either at random until a desirable program is heard or in an endeavor to locate any particular station whose assigned frequency is known. In the latter case, turn the selector slowly throughout a narrow range on each side of that dial setting corresponding to the station frequency.

NOTE—In the event that any particular station cannot be reached in this manner, its signal intensity probably is below the prevailing level of background noise. If especially desired, however, weak signals often may be received by turning the Silent-Tuning Control gradually counter-clockwise, thus calling upon the reserve sensitivity of the instrument. Under such conditions, background noise reproduction naturally will be appreciably greater.

5. After locating a station, turn the Volume Control counter-clockwise (if necessary), until the sound level is fairly low and then adjust the Station Selector accurately to that position mid-way between the points on the dial at which the program becomes unintelligible or disappears. At this setting only will the fine quality of reproduction provided in this instrument be realized and least background noise interference be obtained.

6. Set the Volume Control for the desired sound level.

7. Adjust the two Tone Controls to obtain the tone shading preferred. The full range of musical reproduction is obtained with the right-hand knob turned fully clockwise and the left-hand knob turned to its counter-clockwise extremity. Modifications of the tone range may be obtained as follows:

(a) To reduce the high-frequency (treble) response, or to decrease the background noise (static) interference *on station settings*, turn the right-hand tone control knob counter-clockwise.

(b) To reduce the low-frequency (bass) response, or to decrease low-pitched hum present on the signals of some stations, turn the left-hand tone control knob clockwise.

8. When through operating, turn the Volume Control fully counter-clockwise, thus switching the power "off."

Tubes—Improved results may sometimes be obtained by interchanging tubes of the same type, either RCA-56 or RCA-58, in their sockets. Spare tubes should be kept on hand.

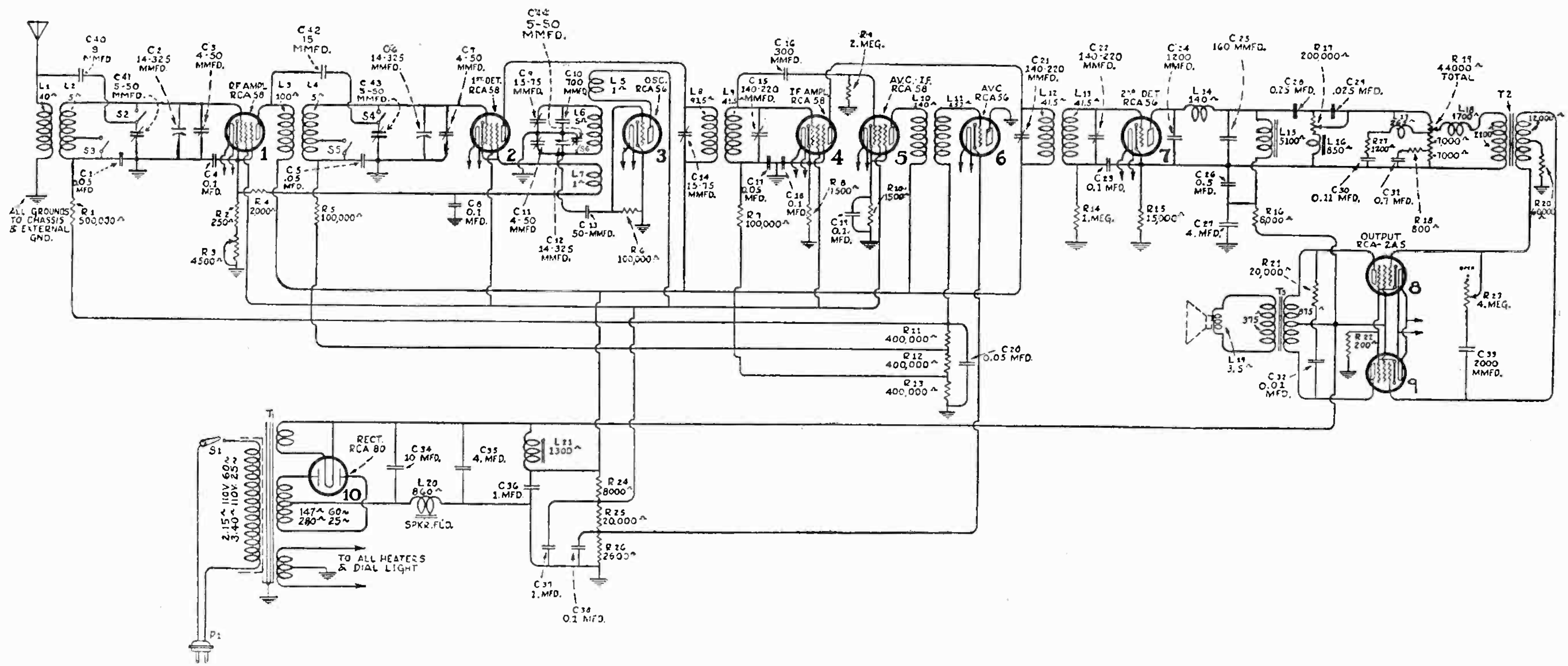

Figure A—Schematic Circuit Diagram

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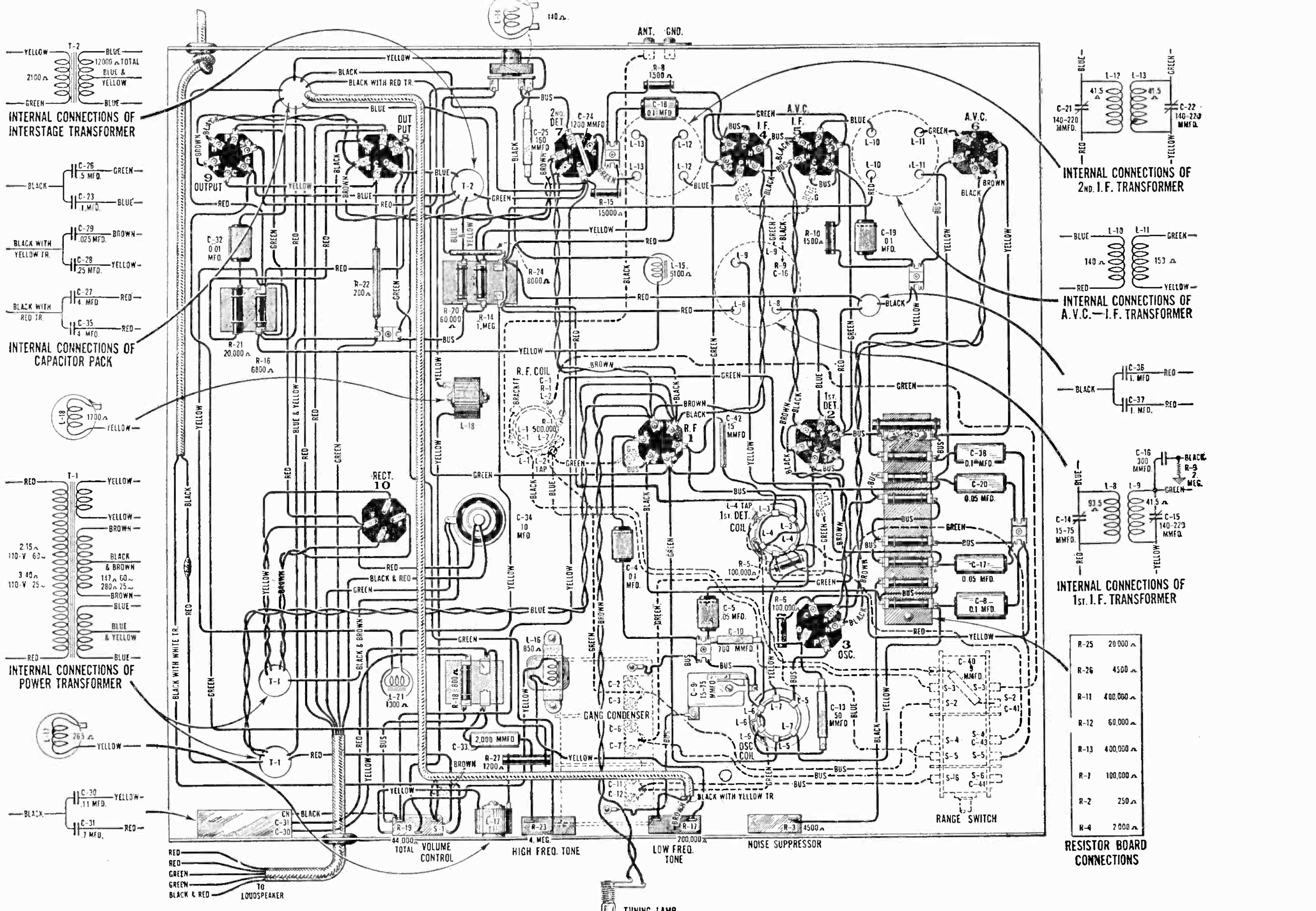


Figure B—Wiring Diagram

SERVICE DATA

Electrical Specifications

Voltage Rating ....105–125 Volts
Power Consumption ....120 Watts
Type and Number of Radiotrons 3 RCA-56,
4 RCA-58, 1 RCA-80, 2 RCA-2A5—Total, 10
Frequency Range ....540 K. C.—1500 K. C.
1400 K. C.—2800 K. C.
Undistorted Output ....4.0 Watts

This receiver is a ten-tube Superheterodyne radio receiver. Features such as improved automatic volume control, noise suppressor, compensated volume control, heater pentode output tubes operated as a push-pull stage and the inherent sensitivity, selectivity and tone quality of the Superheterodyne are included in this instrument.

A special feature is the Range Switch that allows reception of signals either of the broadcast band or higher frequencies. With the switch in the broadcast band position, the frequency range is from 540 to 1500 K. C. At the higher frequency position, the receiver covers the 1400 to 2800 K. C. band.

Figure A shows the schematic circuit, Figure B the wiring diagram, Figure C the location of the adjustable capacitors, and Figure D the loudspeaker wiring. The Radiotron socket voltages, the line-up procedure and the replacement parts are given on the following pages.

R. F. and Oscillator Line-up Capacitor Adjustments

Four adjustable capacitors are provided for aligning the R. F. circuits and adjusting the oscillator frequency so that the oscillator will maintain a constant frequency—175 K. C.—difference from that of the incoming signal. Poor quality, insensitivity, poor A. V. C. action and possible inoperation of the receiver may be caused by these capacitors being out of adjustment.

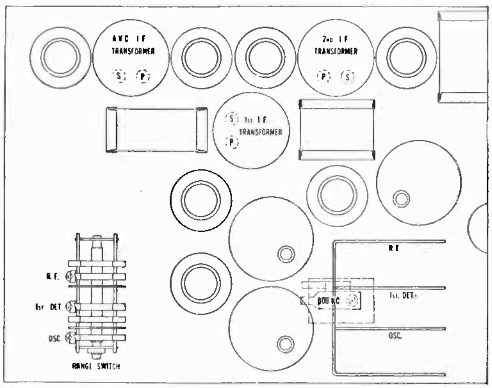


Figure C—Location of Adjustable Capacitors

If the other adjustments have not been tampered with—the intermediate transformer tuning capacitors—the following procedure may be used for aligning these capacitors:

(a) Procure an R. F. Oscillator such as Stock No. 9050 giving a modulated signal at 600 K. C., 1400 K. C. and 2440 K. C. Also procure a non-metallic screwdriver such as Stock No. 7065.

(b) An output meter is necessary. This may be a current squared galvanometer connected to the secondary of the output transformer instead of the cone coil, a 0.5 milliammeter connected in series with the plate supply to the second detector or a low range A. C. voltmeter connected across the reproducer unit cone coil.

(c) A dummy Radiotron RCA-56 is necessary to substitute for the one normally used in the A. V. C. socket. This should be a tube that is otherwise normal in all respects but having one heater prong removed. Insert this tube in the A. V. C. socket.

(d) First check the chassis and carefully ascertain that the dial pointer reads exactly at the first line on the scale when the tuning capacitor rotor plates are fully meshed with the stator plates.

(e) Place the oscillator in operation at exactly 1400 K. C. and couple its output to the antenna. Set the Range Switch counter-clockwise and the dial scale at exactly 1400. Connect the output meter to the set and place the volume control and suppressor control, if noise level will permit, at its maximum position. Adjust the oscillator input so that an excessive reading on the output meter is not obtained.

(f) With a suitable socket wrench—the nuts are at ground potential—adjust the oscillator, first detector and R. F. line-up capacitors, until a maximum deflection is obtained in the output meter.

(g) The high frequency band is adjusted at 2440 K. C. This is done in a similar manner to the R. F. adjustments except that the oscillator is set at 2440 K. C., the dial at 1200 and the Range Switch in the clockwise position. The line-up capacitors on the selector switch are adjusted for maximum output at this frequency.

(h) Set the oscillator at 600 K. C. Tune in the signal with the receiver until a maximum deflection is obtained in the output meter. Now adjust the 600 K. C. series capacitor, Figure C, until a maximum deflection is obtained in the output meter. Rock the tuning capacitor back and forth while making this adjustment, as the tuning capacitor and oscillator series capacitor adjustments interlock.

(i) Change the frequency of the oscillator to 1400 K. C. and set the dial at 1400. Again make the adjustments given under (f), (g) and then (h).

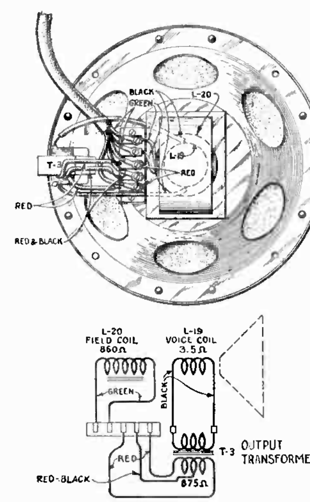


Figure D—Loudspeaker Wiring

So adjusted, the R. F. circuits are properly aligned and the oscillator will maintain a constant frequency difference from the incoming R. F. signal.

I. F. Tuning Capacitor Adjustments

Although this receiver has two I. F. stages, one for the second detector and one for the A. V. C., only two of the three I. F. transformers are tuned by adjustable capacitors and require adjustment. The stage used for the A. V. C. is broadly tuned and does not require any adjustment.

The transformers are all tuned to 175 K. C. and the circuits broadly peaked.

A detailed procedure for making this adjustment follows:

(a) Procure a modulated R. F. Oscillator that gives a modulated 175 K. C. signal. Also procure a non-metallic screwdriver such as Stock No. 7065.

(b) An output meter is necessary. This may be a current squared galvanometer connected to the secondary of the output transformer instead of the cone coil, a 0.5 milliammeter connected in series with the plate supply to the second detector or a low range A. C. voltmeter connected across the reproducer unit cone coil.

(c) A dummy Radiotron RCA-56 is necessary to substitute for the one normally used in the A. V. C. socket.

(d) Remove the oscillator tube and make a good ground connection to the chassis. Place the oscillator in operation and couple its output from the control grid of the first detector to ground. Adjust the oscillator output, with the receiver volume control at maximum, until a deflection is obtained in the output meter.

(e) Refer to Figure C. Adjust the secondary and primary of the second and then the first I. F. transformer until a maximum deflection is obtained in the output meter. Go through these adjustments a second time, as a slight readjustment may be necessary.

When the adjustments are made the set should perform at its maximum efficiency. However, due to the interlocking of adjustments, it is good practice to follow the I. F. adjustments with the R. F. and oscillator line-up capacitor adjustments. The correct method of doing this is given in the preceding section.

RADIOTRON SOCKET VOLTAGES

120 Volt, A. C.—No signal being received—Volume Control at minimum

Radiotron No.	Cathode to Control Grid Volts, D. C.	Cathode or Filament to Screen Grid Volts, D. C.	Cathode or Filament to Plate Volts, D. C.	Plate Current, M. A.	Heater or Filament Volts, A. C.
1. R. F.	3.0	100	230	7.0	2.4
2. 1st Detector	8.0	95	220	2.5	2.4
3. Oscillator	—	—	105	6.0	2.4
4. I. F.	7.5	100	225	2.5	2.4
5. A. V. C.—I. F.	7.5	100	225	2.5	2.4
6. A. V. C.	20.0	—	0	—	2.4
7. 2nd Detector	17.0	—	250	1.2	2.4
8. Power	18.0	255	245	33.0	2.4
9. Power	18.0	255	245	33.0	2.4

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
3024	Capacitor—9 mmfd. (C40)—Package of 2	$0.50
3047	Resistor — 1,500 ohms — Carbon type — ½ watt (R8, R10)—Package of 5	1.00
3076	Resistor — 1 megohm — Carbon type — ½ watt (R14)—Package of 5	1.00
3252	Resistor—100,000 ohms—Carbon type—½ watt (R5, R6, R7)—Package of 5	1.00
3435	Resistor—250 ohms—Carbon type—½ watt (R2)—Package of 5	1.00
3455	Capacitor—0.01 mfd. capacitor (C32)	.44
3460	Capacitor—1,200 mmfd. (C24)	.30
3513	Capacitor—700 mmfd. (C10)	.48
3526	Resistor — 2,000 ohms — Carbon type — ½ watt (R4)—Package of 5	1.00
3527	Resistor—800 ohms—Carbon type—½ watt (R18)—Package of 5	1.00
3530	Coil—Second detector plate choke coil (L14)	.72
3551	Screw assembly—Chassis mounting washer and screw assembly—Comprising 4 screws, 4 lock washers, 4 washers, 8 cushions and 4 spacers	.68
3552	Resistor—200 ohms—Porcelain type—20 watts (R22)	.80
3553	Resistor—8,000 ohms—Porcelain type—20 watts (R24)	.80
3554	Resistor — 1,200 ohms — Carbon type — ½ watt (R27)—Package of 5	1.00
3556	Capacitor—0.05 mfd. capacitor (C1, C5, C17, C20)	.34
3557	Capacitor—0.002 mfd. capacitor (C33)	.30
3558	Capacitor—50 mmfd. capacitor (C13)	.36
3564	Bracket—Station selector dial lamp mounting bracket	.25
3565	Socket—Dial lamp socket	.50
3598	Capacitor—0.1 mmfd. (C4, C8, C18, C19, C38)	.36
3726	Arm—Range switch operating arm assembly —Comprising arm, link, studs and set screws	.45
3747	Capacitor—15 mmfd. (C42)	.36
3900	Resistor — 2,600 ohms — Carbon type — ½ watt (R26)—Package of 5	1.00
4022	Shaft—Shaft and bushing assembly for range switch operating arm—Comprising two washers, shaft, bushing and nut	.54
4023	Escutcheon—Station selector escutcheon	.42
4080	Knob—Range switch knob—Package of 5	.75
4081	Knob—Volume control or noise suppressor knob—Package of 5	1.08
4082	Knob—High or low frequency tone control knob—Package of 5	1.08
4160	Trimmer adjustment wrench and screw-driver	1.00
6114	Resistor — 20,000 ohms — Carbon type — 1 watt (R21, R25)—Package of 5	1.10
6142	Resistor — 6,000 ohms — Carbon type — ½ watt (R16)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R1)—Package of 5	1.00
6192	Spring—Three gang tuning condenser drive cord tension spring—Package of 10	.30
6242	Resistor—2 megohm—Carbon type—¼ watt (R9)—Package of 5	1.00
6279	Resistor—15,000 ohms—Carbon type—½ watt (R15)—Package of 5	1.00
6280	Resistor—400,000 ohms—Carbon type—½ watt (R11, R12, R13)—Package of 5	1.00
6282	Resistor—60,000 ohms—Carbon type—½ watt (R20)—Package of 5	1.00
6298	Cord—Three gang tuning condenser drive cord—Package of 5	.60
6300	Socket—Four contact Radiotron socket	.35
6314	Capacitor—160 mmfd. (C25)—Package of 5	2.00

Stock No.	DESCRIPTION	List Price
6323	Shaft—Three gang variable tuning condenser drive shaft—Comprising 1 shaft, 2 "C" washers and 2 flat washers—Package of 2	$0.20
6429	Capacitor pack—Comprising one 0.11 mfd. and one 0.7 mfd. capacitor in metal container (C30, C31)	.98
6430	Capacitor pack—Comprising two 4.0 mmfd., one 0.25, one 0.025, one 0.1, and one 0.5 mfd. capacitors in metal container (C23, C26, C27, C28, C29, C35)	3.78
6131	Reactor—Filter reactor (L21)	1.92
6132	Transformer—Interstage audio transformer (T2)	3.69
6134	Reactor—Second detector plate coupling reactor (L15)	1.96
6135	Transformer—First intermediate frequency transformer (L8, L9, C14, C15, C16, R9)	2.54
6436	Reactor—High frequency tone control compensating reactor (L17)	.70
6437	Coil—Oscillator coil assembly (L5, L6, L7)	1.24
6439	Reactor—High frequency tone control reactor (L16)	1.14
6440	Transformer—Second intermediate frequency transformer (L2, L3, C21, C22)	1.94
6441	Transformer—Third intermediate frequency transformer (L10, L11)	1.76
6442	Reactor—Volume control series reactor (L18)	.88
6443	Capacitor—10 mmfd. (C34)	1.50
6447	Volume control—Complete with mounting nut (R19)	1.92
6448	Tone control—Low frequency tone control complete with mounting nut (R17)	1.04
6449	Tone control—High frequency tone control complete with mounting nut (R23)	1.06
6450	Rheostat—Noise suppressor rheostat (R3)	1.24
6537	Switch—Range switch (S2, S3, S4, S5, S6, C41, C43, C44)	1.30
6538	Coil—Antenna coil (L1, L2, R1, C1)	1.80
6539	Coil—Detector coil (L3, L4)	1.44
6541	Scale—Dial and dial scale	.75
6785	Cable—Braid covered—Five conductor reproducer cable	.80
6786	Condenser—3-gang variable tuning condenser assembly (C2, C3, C6, C7, C11, C12)	7.12
7062	Capacitor—Adjustable trimming capacitor—15 to 70 mmfd. (C9)	.50
7139	Drum—Dial drum with set screws and three dial mounting nuts	.35
7484	Socket—Five contact Radiotron socket	.35
7485	Socket—Six contact Radiotron socket	.40
7487	Shield—Radiotron tube shield	.25
7488	Shield—Tube shield top	.20
8978	Transformer—Power transformer—105-120 volts—50-60 cycles (T1)	8.50
8979	Transformer—Power transformer—105-120 volts—25-40 cycles	12.88
8980	Transformer—Power transformer—210-240 volts—50-60 cycles	9.36
8982	Capacitor pack—Comprising two 1.0 mfd. capacitors in metal container	1.44
9050	Oscillator—Test oscillator—150-25,000 K. C.	29.50†
	REPRODUCER ASSEMBLIES	
6184	Board—Terminal board complete with three terminals—Package of 5	.50
6155	Transformer—Output transformer (T3)	1.95
8920	Ring—Cone retaining ring	.35
8969	Cone—Reproducer cone (L19)—Package of 5	6.35
9125	Coil assembly—Comprising field coil, magnet and cone support (L20)	4.94
9463	Reproducer complete	9.42

.0761 † Full discount not allowed. PL 88

RCA Victor Company, Inc.

CAMDEN, NEW JERSEY, U. S. A.

23733 Sig. 15 Printed in U. S. A.

RCA Victor Model 262

Ten-Tube, Five-Band A. C. Receiver

SERVICE NOTES

SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

A RADIO CORPORATION OF AMERICA SUBSIDIARY

REPRESENTATIVES IN PRINCIPAL CITIES

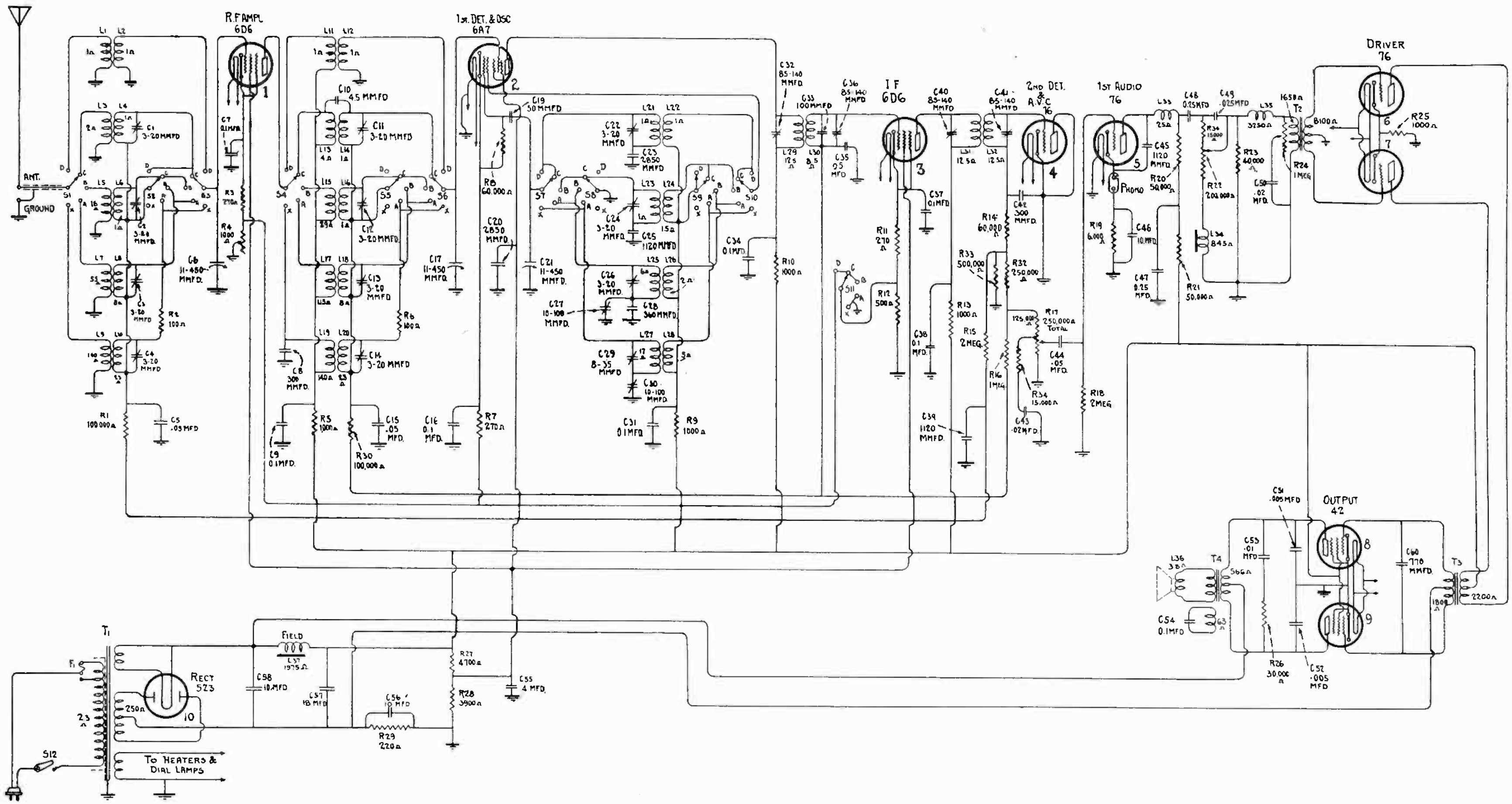


Figure 1—Schematic Circuit Diagram—Models with sensitivity control change for band position

RCA VICTOR MODEL 262

Ten-Tube, Five-Band A. C. Superheterodyne

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Voltage Rating	105–125 Volts
Frequency Rating	25–60 and 50–60 Cycles
Power Consumption	130 Watts (All Frequencies)
Type and Number of Radiotrons	2 RCA-6D6, 1 RCA-6A7, 4 RCA-76, 2 RCA-42, 1 RCA-5Z3—Total, 10
Tuning Frequency Range	Band X— 140 KC – 410 KC Band A— 540 KC – 1720 KC Band B— 1720 KC – 5400 KC Band C— 5400 KC – 18,000 KC Band D—18,000 KC – 36,000 KC
Line-up Frequencies	175 KC, 410 KC, 460 KC, 600 KC, 1720 KC, 5160 KC, 18,000 KC
Maximum Undistorted Output	7 Watts
Maximum Output	14 Watts

PHYSICAL SPECIFICATIONS

Height	42½ Inches
Width	26½ Inches
Depth	13½ Inches

This ten-tube, five-band all-wave superheterodyne radio receiver is an instrument in which most of the important modern radio developments have been incorporated. Wide tuning range, excellent sensitivity and selectivity and a large undistorted output contribute to the realization of outstanding performance in all major requirements. The extremely wide tuning range (140 KC to 36,000 KC except for a break between 410 KC and 540 KC) covers every broadcasting, police, aviation and amateur band used throughout the world.

Important new operating features include an "airplane" type dial with band indicator, a "second" hand for vernier tuning and "band spread," a double-ratio vernier drive and the usual sensitivity and volume control. A circuit feature is the automatic sensitivity control change that occurs when switching from the long-wave to the short-wave bands. This enables the sensitivity control to maintain its same smooth action in all bands.

A high degree of tonal fidelity is obtained through the use of a high gain, high output, low distortion audio amplifier and a large 10-inch electro-dynamic loudspeaker. The high and low frequency tone controls provide a method whereby the frequency characteristic may be altered for adverse operating conditions such as static, station hum, etc.

DESCRIPTION OF ELECTRICAL CIRCUIT

The general circuit arrangement consists of an R. F. stage, a combined oscillator and first detector, and I. F. stage, a combined second detector and automatic volume control, an audio stage, a push-pull driver stage and a push-pull Pentode output stage. Plate and grid voltages are supplied by the RCA-5Z3 heavy duty rectifier combined with a suitable filtering stage, of which the loudspeaker field is a part. Figures 1 and 2 show the schematic circuit diagrams.

The signal enters the receiver through a shielded antenna lead and is applied to the grid of the R. F. tube through the antenna coupling transformer. The secondary of this transformer is tuned to the signal frequency by means of one unit of the gang-capacitor The output of this stage is transformer coupled to the grid circuit of the first detector, which is also tuned to the signal frequency by a unit of the gang-capacitor.

Combined with the signal in the first detector is the local oscillator signal, which is always at a 460 KC frequency difference (higher) from the signal frequency. A separate coil system and the third unit of the gang-capacitor are used in the oscillator circuit.

In conjunction with these three tuned circuits it is well to point out that five different groups of tuned circuits are used, one group for each tuning band. A

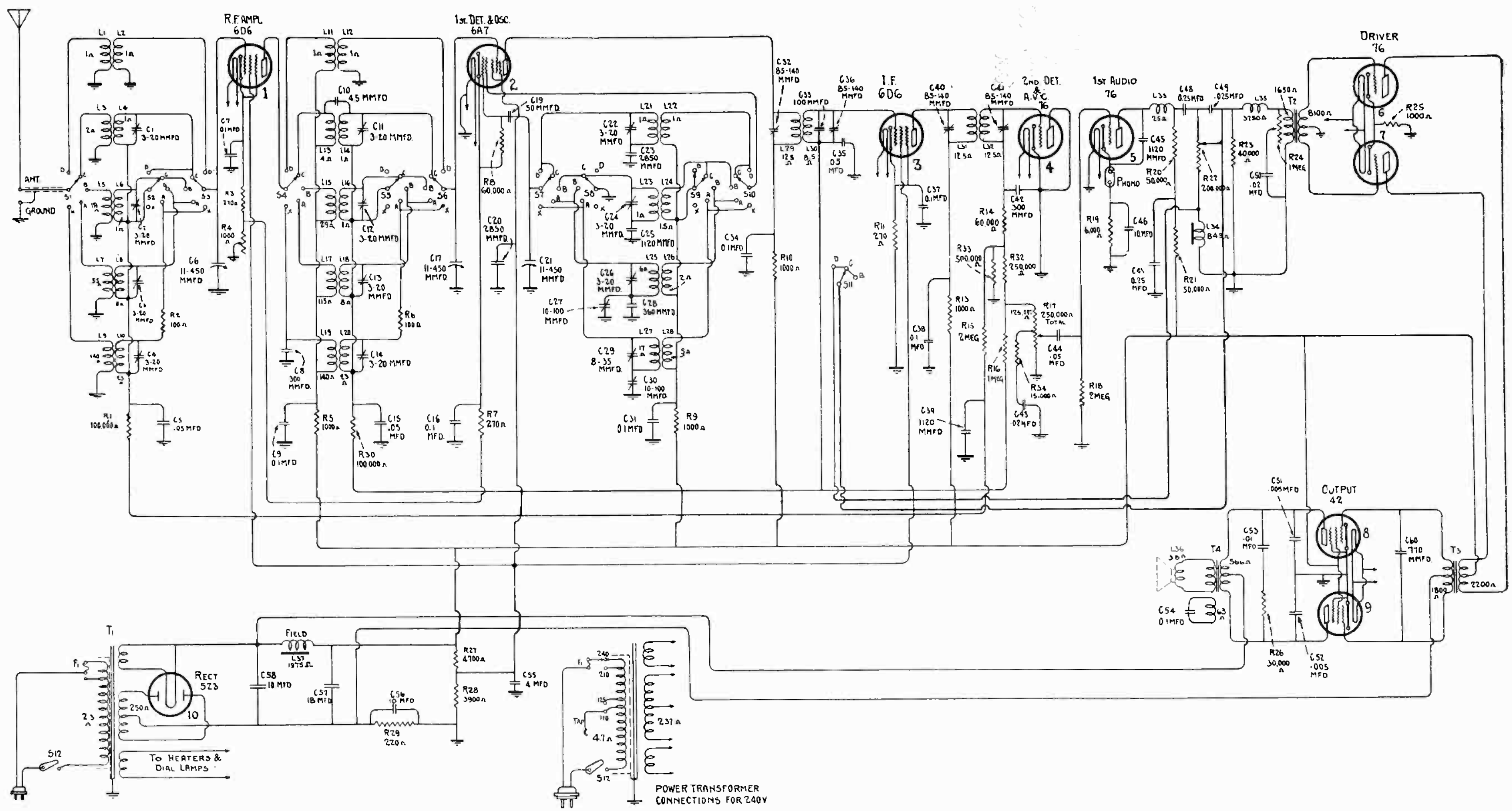


Figure 2—Schematic Circuit Diagram—Models with fidelity change for band position

five-position selector switch is provided for selecting the band in which the desired signal is located. In addition to selecting the desired coil system, additional groups of contacts are provided for short-circuiting the preceding lower frequency R. F. and detector coils and the two preceding oscillator coils. This is to prevent "dead" spots due to absorption effects caused by the coils, the natural period of which without the gang-capacitor connected falls in the next higher frequency band. This gang-switch also has additional contacts for changing the sensitivity in the various bands.

The sensitivity control in bands X and A controls the R. F. and first detector while in bands B, C and D it controls the R. F., first detector and I. F. stage. This is caused by the action of the selector switch. It should also be noted that the sensitivity control is paralleled with a 500-ohm resistor (R-12, Figure 1) in bands B, C and D.

The output of the first detector, which is the I. F. signal (460 KC), is fed directly through two tuned circuits to the grid of the I. F. amplifier stage. The I. F. stage, which utilizes Radiotron RCA-6D6, uses two transformers, which consist of four tuned circuits, all of which are tuned to 460 KC.

The output of the I. F. amplifier is then applied to the grid of the RCA-76 second detector. The plate of this tube is connected to its cathode and the tube operated as a diode detector and automatic volume control. The direct current component of the rectified signal produces a voltage drop across resistors R-32 and R-17. The voltage drop across both resistors constitutes the automatic bias voltage for the R. F. stage, while the drop across R-17 alone constitutes the bias voltage for the first detector and I. F. stage. These automatic bias voltages for the R. F., first detector and I. F. stages give the automatic volume control action of the receiver. It should be noted that resistor R-33 is connected in parallel across resistors R-32 and R-17. This reduces the total amount of resistance in the circuit to a proper value. Resistor R-34 and capacitor C-43, which are connected in series and from a tap on the volume control to ground, provide low frequency, low volume compensation.

The volume control selects the amount of audio voltage that is applied to the grid of the RCA-76 A. F. stage and thereby regulates the volume of the entire receiver. The first audio stage is coupled through a high and low frequency tone control system and transformer to the grid circuit of the push-pull drive stage. It should be noted that a link has been provided in series with the cathode of this stage, so that phonograph connections may be easily made if required.

The driver stage is transformer coupled to the output stage, which consists of two Radiotrons, RCA-42, connected in push-pull. A feature of the output stage is the use of fixed bias, which reduces distortion and increases the available output. This is accomplished by the use of the drop across R-29, which carries the entire DC output from the rectifier. Naturally the output stage uses but a portion of the total rectified current and current variations in it have but little effect on the drop across the resistor.

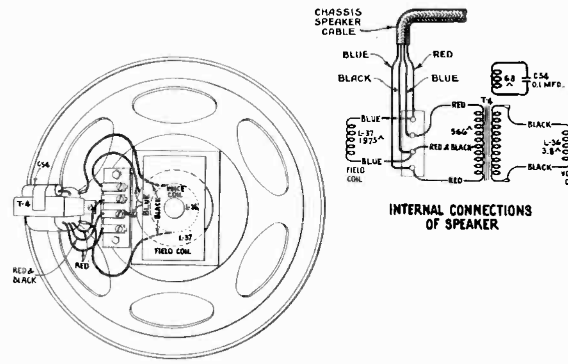


Figure 3—Loudspeaker Wiring

The output of the power stage is coupled through a step-down transformer to the voice coil of the loudspeaker. A separate winding, which is shunted by a capacitor, has been provided in this transformer which gives a very sharp, high-frequency cut-off for the entire audio system. This greatly reduces the reproduction of any high-frequency interchannel interference or other disturbance of a high-frequency character which is outside of the useful musical range.

The loudspeaker used is of the ten-inch type. It is fully capable of handling the high-power, high-quality output of the receiver and converting it into faithful sound reproduction.

Figure 3 shows the loudspeaker wiring, Figures 4 and 6 the chassis wiring and Figures 8 and 10 the R. F. unit wiring.

VARIATIONS IN MODELS

The preceding description of the electrical circuit applies to numerous models of this receiver. However, there are other models in which a change from the foregoing has been made. This change consists of using the section of the band selector switch that formerly changed the sensitivity control, for changing the fidelity in various bands, the sensitivity remaining the same in all bands. This permits the receiver to maintain the utmost fidelity in bands X and A while reducing the low frequency output in bands B, C and D. Such a change results in improved performance.

The sensitivity control in these models operates as formerly in bands X and A. That is, the sensitivity control adjusts the residual bias for the R. F. and first detector stages.

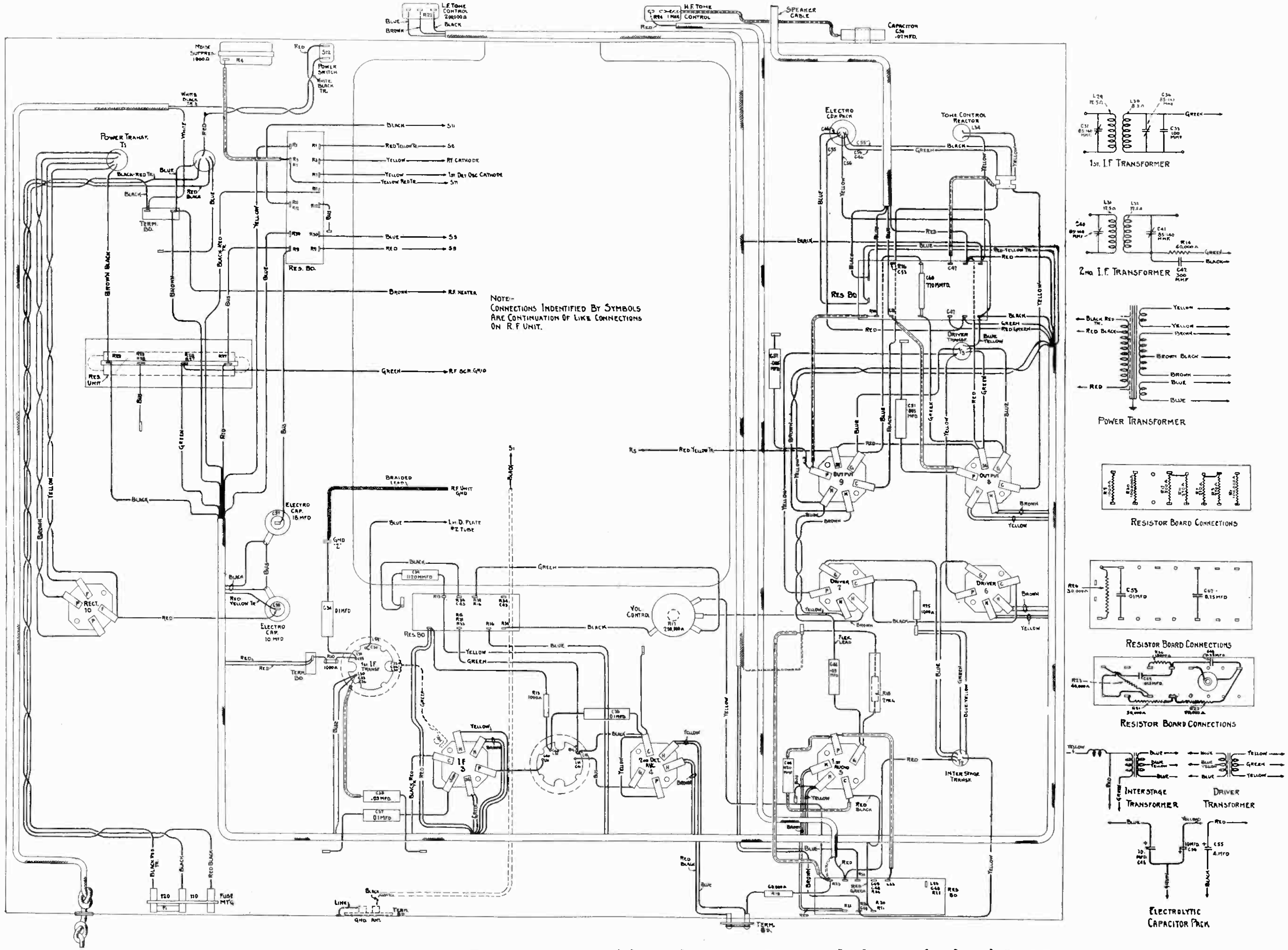


Figure 4—Chassis Wiring Diagram—Models with sensitivity control change for band position

SERVICE DATA

(1) LINE-UP PROCEDURE

The line-up procedure of this receiver is somewhat involved and it is important that these instructions be carefully followed when making adjustments. Properly aligned, this receiver has outstanding performance; improperly aligned, it may be impossible to receive signals on all bands.

Equipment

To align this receiver, proper test equipment must be used. This consists of a modulated R. F. oscillator having proper frequency range, an output indicator, an alignment tool and a tuning wand. These parts, have been developed by the manufacturer of this receiver for use by service men to duplicate the original factory adjustments.

Checking with Tuning Wand

Before making any R. F., oscillator or first detector adjustments, the accuracy of the present adjustments may be checked by means of the tuning wand (Stock No. 6679). The tuning wand consists of a bakelite rod having a brass cyclinder at one end and a special finely divided iron insert at the other end. Inserting the cylinder into the center of a coil lowers its inductance, while inserting the iron end increases its inductance. From this, it is seen that unless the trimmer adjustment for a particular coil is perfect at alignment frequencies, inserting one end of the wand may increase the output of a particular signal. A perfect adjustment is evidenced by a lowering of output when either end of the wand is inserted into a coil.

The shields over the R. F. coil assembly have a hole at their top for entrance of the tuning wand. The location of the various coils inside of the shield is shown in Figure 5. An example of the proper manner of using the tuning wand would be to assume the external oscillator were set at 1720 KC and the signal tuned in. The output indicator should be connected across the voice coil of the loudspeaker. Then insert the tuning wand, first one end and then the other end, into the top of the three transformers at the left of the R. F. assembly, facing the front of the chassis. A perfect adjustment of the trimmer would be evidenced by a reduction in output when each end of the wand is inserted in each of the three transformers. If one end—for example, the iron end—when inserted in one coil caused an increase in output, then that circuit is low. An increase in the trimmer capacitance would be the proper remedy.

(2) I. F. TUNING CAPACITOR ADJUSTMENTS

This receiver has one I. F. stage, and two transformers having four adjustable capacitors which may require adjustment. The transformers are all peaked at 460 KC.

A detailed procedure for making this adjustment follows:

(a) Connect the output of an external oscillator tuned to 460 KC between the first detector grid and ground. Connect the output indicator across the voice coil of the loudspeaker.

(b) Place the oscillator in operation at 460 KC. Place the receiver in operation and adjust the station selector until a point is reached (Band A) where no signals are heard and turn the volume control to its maximum position. Reduce the oscillator input until a slight indication is obtained in the output indicator.

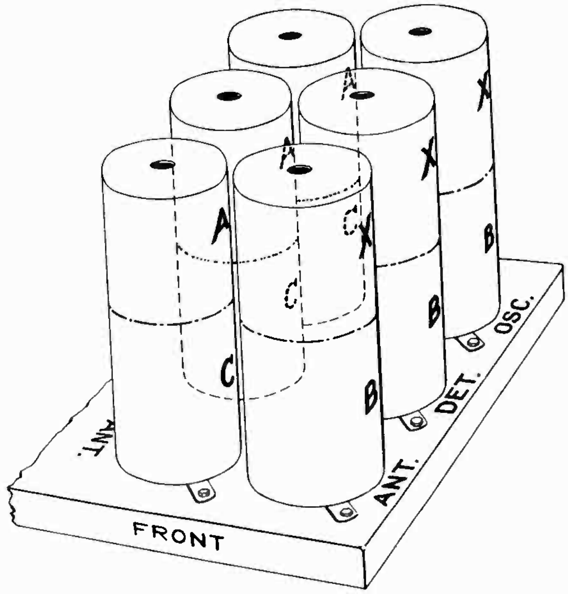


Figure 5—Location of Coils in Shields

(c) Refer to Figure 7. Adjust each trimmer of the I. F. transformers until a maximum output is obtained. Go over the adjustments a second time.

This completes the I. F. adjustments. However, it is good practice to follow the I. F. adjustments with the R. F. and oscillator adjustments due to interlocking which always occurs.

(3) R. F. OSCILLATOR AND FIRST DETECTOR ADJUSTMENTS

Four R. F., oscillator and first detector adjustments are required in bands "A" and "X." Three are required in bands "B" and "C." None are required in band "D."

To properly align the various bands, each band must be aligned individually. The preliminary set-up

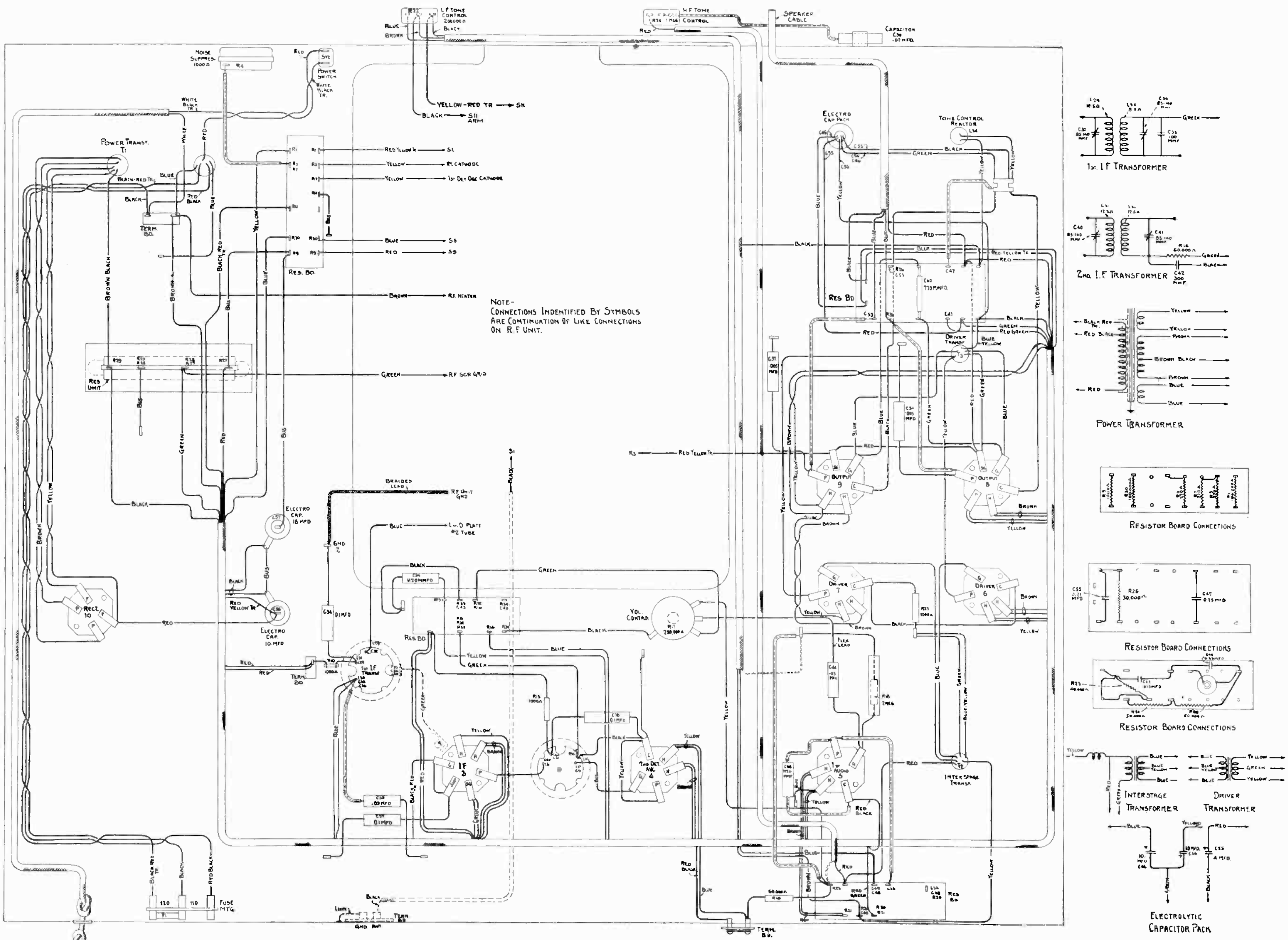


Figure 6—Chassis Wiring Diagram—Models with fidelity change for band position

requires the external oscillator to be connected between the antenna and ground terminals of the receiver and the output indicator must be connected across the voice coil of the loudspeakers. The volume control must be at its maximum position and the input from the oscillator must be at the minimum value possible to get an output indication under these conditions. In the high-frequency bands, it may be necessary to disconnect the oscillator from the receiver and place it at a distance in order to get a sufficiently low input to the receiver.

The dial pointer must be properly set before starting any actual adjustments. This is done by turning the variable capacitor until it is at its maximum capacity position. One end of the pointer should point exactly at the horizontal line at the lowest frequency end of band "A," while the other end should point to within 1/64 inch of the horizontal line at the highest frequency end of band "A."

Figure 7 shows the location of the trimmers for each band. Care must be exercised to only adjust the trimmers in the band under test.

Band "X"

(a) Tune the external oscillator to 410 KC, set the pointer at 410 KC and adjust the oscillator, detector and R. F. trimmers for maximum output.

(b) Shift the external oscillator to 175 KC. Tune in the 175 KC signal irrespective of scale calibration and adjust the series trimmer marked 175 KC on Figure 7, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 410 KC as described in (a).

Band "A"

(a) Tune the external oscillator to 1720 KC, set the pointer at 1720 KC and adjust the oscillator, detector and R. F. trimmers for maximum output.

(b) Shift the external oscillator to 600 KC. Tune in the 600 KC signal irrespective of scale calibration and adjust the series trimmer, marked 600 KC on Figure 7, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 1720 KC as described in (a).

Band "B"

(a) Tune the external oscillator to 5160 KC, and set the pointer at 5160 KC. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(b) Check for the image signal, which should be received at approximately 4240 on the dial. It will be necessary to increase the external oscillator output for this check.

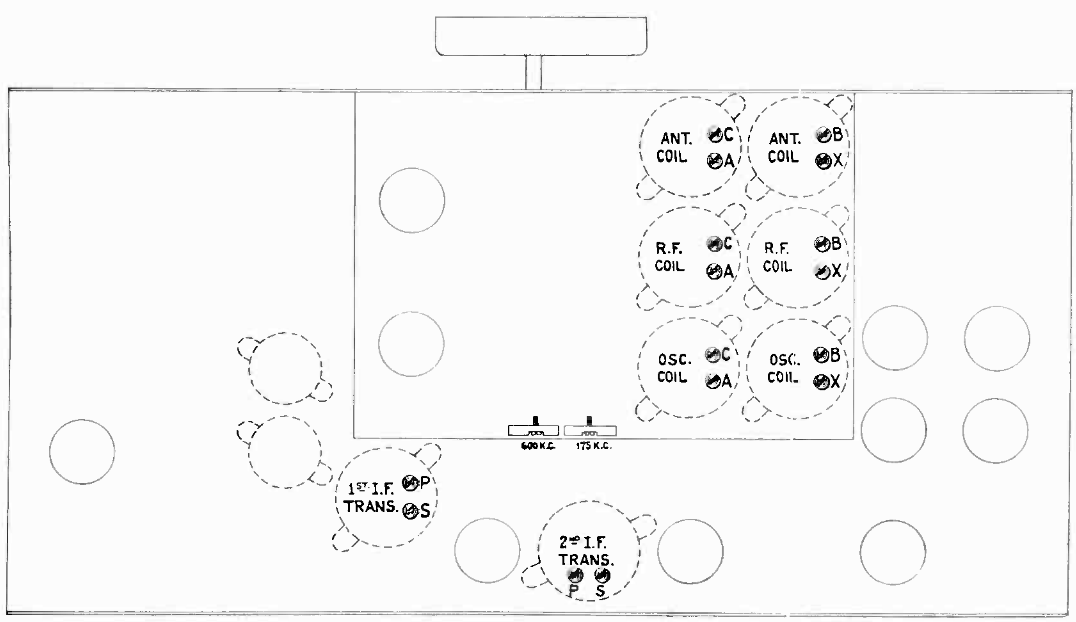


Figure 7—Location of Trimmer Capacitors

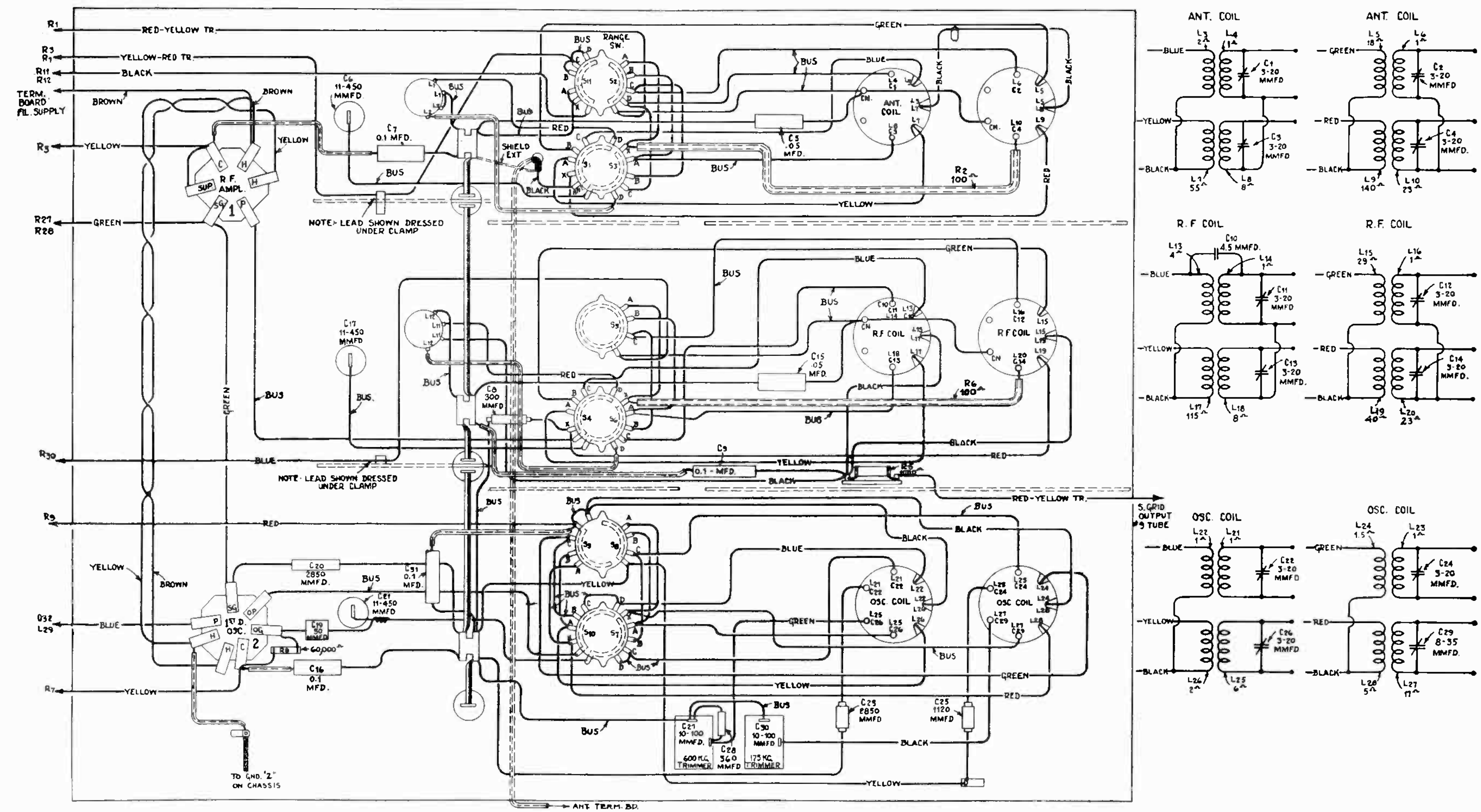


Figure 8—R. F. Unit Wiring Diagram—Models with sensitivity control change for band position

(c) The antenna and detector trimmers should now be peaked for maximum output.

Band "C"

(a) Tune the external oscillator to 18,000 KC, and set the pointer at 18 M. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacity from minimum to maximum.

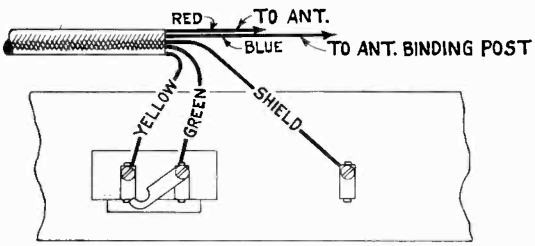


Figure 9—Junior "Duo" Connections

(b) Check for the image signal, which should be received at approximately 17,080 on the dial. It may be necessary to increase the external oscillator output for this check.

(c) Reduce the capacity of the detector trimmer. while rocking the tuning capacitor, until the signal disappears. The first detector circuit is then aligned with the oscillator circuit and the RCA-6A7 tube is blocked. Then increase the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal is peaked for maximum output.

(d) The antenna trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

Band "D"

No adjustments are required for band "D."

(4) MAGNETIC PICKUP CONNECTIONS

A terminal board (link in series with first audio stage cathode) is provided at the rear of the chassis for adding phonograph facilities to this instrument. Figure 9 shows the connections that will be required for the Junior "Duo" turntable assembly.

(5) VOLTAGE READINGS

The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if low-resistance meters are used, such allowances must be made. Figure 11 shows a chart in which the various voltages of the tube contacts are shown.

RADIOTRON SOCKET VOLTAGES

120-Volt A. C. Input—Volume and Sensitivity Controls Maximum—Band Switch at "A"—No Signal

Radiotron No.		Cathode to Ground Volts, D. C.	Screen Grid to Ground Volts, D. C.	Plate to Ground Volts, D. C.	Cathode Current, M. A.	Heater Volts, A. C.
RCA-6D6—R. F.		2.5	101	242	9.2	6.3
RCA-6A7	Detector	2.8	101	244	10.9	6.3
	Oscillator	—	—	244		
RCA-6D6—I. F.		2.5	101	242	9.2	6.3
RCA-76—2nd Det. AVC		0	—	—	0	6.3
RCA-76—A. F.		6.2	—	196*	1.2	6.3
RCA-76—Driver		11.4	—	247	5.6	6.3
RCA-76—Driver		11.4	—	247	5.6	6.3
RCA-42—Power		0	247	376	21.0	6.3
RCA-42—Power		0	247	376	21.0	6.3
RCA-5Z3—Rectifier		—	—	768/384 R. M. S.	112	5.0

*Cannot be measured with ordinary voltmeter.

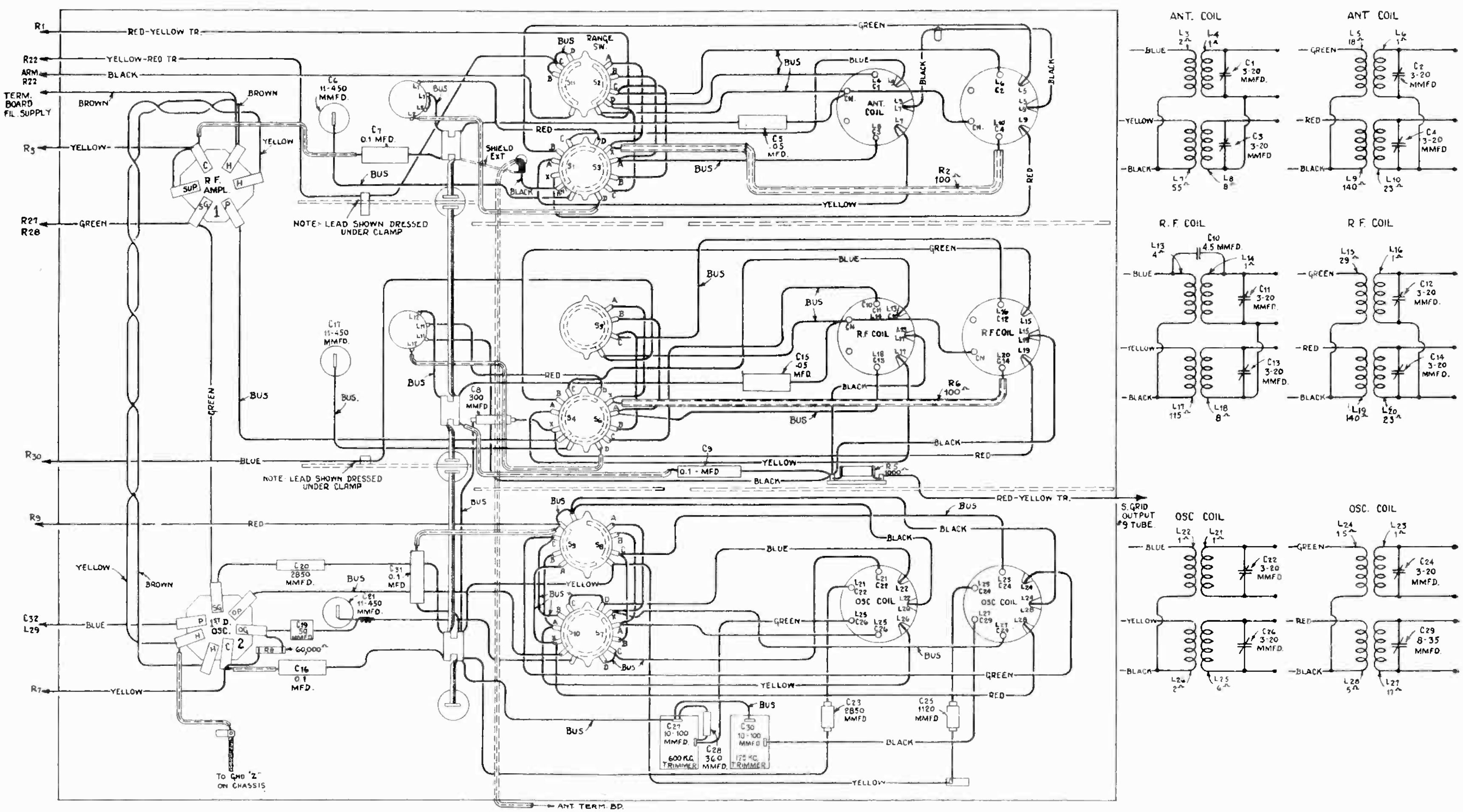


Figure 10—R. F. Unit Wiring Diagram—Models with fidelity change for band position

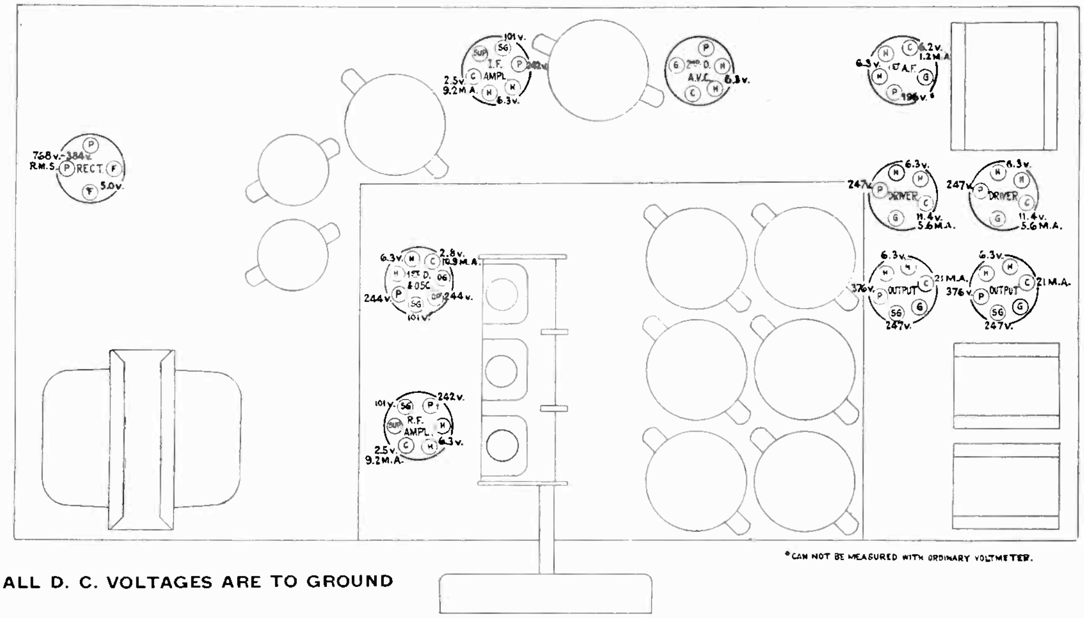


Figure 11—Radiotron Socket Voltages

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4372	Bracket—Bass tone control mounting bracket	$0.20
4683	Bracket — Treble tone control mounting bracket	.25
4406	Bracket—Volume control mounting bracket	.25
3794	Capacitor—100 mmfd.—Located on first I. F. transformer (C33)	.30
3981	Capacitor—300 mmfd.—Located on second I. F. transformer (C42)	.30
4668	Capacitor—770 mmfd. (C60)	.30
4409	Capacitor—1120 mmfd. (C39, C45)	.35
3643	Capacitor—0.005 mfd. (C51, C52)	.25
3787	Capacitor—0.01 mfd. (C53)	.30
3639	Capacitor—0.02 mfd. (C43)	.25
4652	Capacitor—0.02 mfd. (C50)	.60
3888	Capacitor—0.05 mfd. (C35)	.25
4694	Capacitor—0.05 mfd. (C44)	.30
3765	Capacitor—0.025 mfd. (C49)	.34
3877	Capacitor—0.1 mfd. (C37)	.32
4645	Capacitor—0.1 mfd. (C34, C38)	.25
3597	Capacitor—0.25 mfd. (C47)	.40
3702	Capacitor—0.25 mfd. (C48)	.42
7790	Capacitor—10. mfd. (C58)	1.05
7788	Capacitor—18. mfd. (C57)	1.10
7833	Capacitor pack—Comprising two 10. mfd. and one 4. mfd. capacitor (C46, C55, C56)	2.00
4420	Clamp—Antenna lead clamp and screw—Package of 10	.40
4358	Clamp—Mounting clamp for capacitor—Stock No. 7788 or No. 7790	.15
7806	Coil—First audio plate choke (L33)	.30
4371	Cover—Fuse mount cover	.15
10907	Fuse—3 amperes—Package of 5	.40
3376	Mount—Fuse mount—105–125 volt operation	.40
4604	Mount—Fuse mount for 200–250 volt operation	$0.35
7784	Reactor—Tone control reactor (L34)	1.30
6135	Resistor—270 ohms—Carbon type—¼ watt—Package of 5 (R3, R7, R11)	1.00
4622	Resistor—500 ohms—Carbon type—¼ watt—Package of 10 (R12)*	2.00
4370	Resistor—1,000 ohms—Carbon type—¼ watt—Package of 10 (R9, R10, R13, R25)	2.00
6243	Resistor—6,000 ohms—Carbon type—¼ watt—Package of 5 (R19)	1.00
3998	Resistor—15,000 ohms—Carbon type—¼ watt—Package of 5 (R34)	1.00
6143	Resistor—40,000 ohms—Carbon type—¼ watt—Package of 5 (R23)	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt—Package of 5 (R14)	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt—Package of 5 (R1, R30)	1.00
3744	Resistor—250,000 ohms—Carbon type—¼ watt—Package of 5 (R32)	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt—Package of 5 (R33)	1.00
3033	Resistor—1 megohm—Carbon type—¼ watt—Package of 5 (R16)	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt—Package of 5 (R15, R18)	1.00
3594	Resistor—50,000 ohms—Carbon type—½ watt—Package of 5 (R20, R21)	1.00
2240	Resistor — 30,000 ohms — Carbon type — 1 watt (R26)	.22
4649	Resistor—Flat type—Total resistance 8820 ohms—Divided as follows: one 220 ohms, one 3,900 ohms and one 4,700 ohms section (R27, R28, R29)	1.05
7804	Rheostat—Sensitivity control rheostat (R4)	1.30

* R12 Resistor—500 ohms—Some Models

REPLACEMENT PARTS (Continued)

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
4656	Screw—Volume control mounting assembly—Comprising one bushing, one washer, one shakeproof washer and one nut	$0.18
4452	Shield—First audio, second detector A.V.C. or driver Radiotron shield	.35
3683	Shield—Second detector—A.V.C. Radiotron shield top	.20
4453	Shield—I. F. Radiotron shield	.32
7800	Shield—Intermediate frequency transformer shield	.45
3859	Socket—4-contact rectifier Radiotron socket	.30
7484	Socket—5-contact first audio, second detector A.V.C. or driver Radiotron socket	.35
7485	Socket—6-contact I. F. Radiotron socket	.40
6676	Socket—6-contact output Radiotron socket	.40
4686	Strip—"ANT–GND" terminal strip—Two terminals and link	.20
7796	Switch—Operating switch (S12)	.62
7795	Tone control—Bass tone control (R22)	1.30
4648	Tone control—Treble tone control (R24)	1.25
7841	Transformer—Audio transformer pack comprising interstage transformer and reactor (T2, L35)	4.05
4431	Transformer—First intermediate frequency transformer (L29, L30, C32, C33, C36)	2.28
4433	Transformer—Second intermediate frequency transformer (L31, L32, C40, C41, C42)	2.15
7832	Transformer—Driver transformer (T3)	2.85
9505	Transformer—Power transformer—105–125 volts—50–60 cycles (T1)	6.35
9506	Transformer—Power transformer—105–125 volts—25–40 cycles	8.90
9507	Transformer—Power transformer—105–250 volts—40–60 cycles	6.40
4650	Volume control (R17)	1.38

R. F. UNIT ASSEMBLIES

Stock No.	Description	List Price
2747	Cap—Contact cap—Package of 5	.50
4646	Capacitor—4.5 mmfd. (C10)	.20
4633	Capacitor—50 mmfd. (C19)	.25
3981	Capacitor—300 mmfd. (C8)	.30
4413	Capacitor—360 mmfd. (C28)	.22
4412	Capacitor—1,120 mmfd. (C25)	.25
4524	Capacitor—2,850 mmfd. (C23)	.35
4615	Capacitor—2,850 mmfd. (C20)	.34
4417	Capacitor—0.05 mfd. (C5, C15)	.25
4415	Capacitor—0.1 mfd. (C7, C16)	.30
4645	Capacitor—0.1 mfd. (C9, C31)	.25
3861	Capacitor—Adjustable capacitor (C27, C30)	.78
4420	Clamp—Antenna lead clamp and screw—Package of 10	.40
4410	Coil—Antenna coil—Band "D" (L1, L2)	.70
7803	Coil—Antenna coil—B.-S.W. (L3, L4, L7, L8, C1, C3)	1.82
7810	Coil—Antenna coil—P.B.-L.W. (L5, L6, L9, L10, C2, C4)	2.10
7805	Coil—Detector coil—B.-S.W. (L13, L14, L17, L18, C11, C13)	2.15
7808	Coil—Detector coil—P.B.-L.W. (L15, L16, L19, L20, C12, C14)	2.05
4421	Coil—Detector coil—Band "D" (L11, L12)	.70
7807	Coil—Oscillator coil—B.-S.W. (L21, L22, L25, L26, C22, C26)	1.62
7809	Coil—Oscillator coil—P.B.-L.W. (L23, L24, L27, L28, C24, C29)	1.70
7801	Condenser—3-gang variable tuning condenser (C6, C17, C21)	4.42
4340	Lamp—Dial lamp—Package of 5	.60
4370	Resistor—1,000 ohms—Carbon type—¼ watt—Package of 10 (R5)	2.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt—Package of 5 (R8)	1.00
4418	Resistor—100 ohms—Flexible type—Package of 10 (R2, R6)	1.50

Stock No.	Description	List Price
4656	Screw—Chassis mounting screw assembly—Comprising one bushing, one washer, one shakeproof washer, and one nut (four sets required to mount chassis)	$0.18
7800	Shield—Antenna, detector or oscillator coil shield	.45
4452	Shield—First detector-oscillator Radiotron shield	.35
3683	Shield—Radiotron shield top	.20
4454	Shield—R. F. amplifier Radiotron shield	.44
3529	Socket—Dial lamp socket	.32
7485	Socket—6-contact R. F. amplifier Radiotron socket	.40
3572	Socket — 7-contact first detector-oscillator Radiotron socket	.38
7836	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11)	3.05

DRIVE ASSEMBLIES

Stock No.	Description	List Price
4362	Arm—Band indicator operating arm	.28
10194	Ball—Steel ball for variable condenser drive assembly—Package of 20	.25
4422	Clutch—Tuning condenser drive clutch assembly—Comprising drive shafts, balls, ring, spring and washers—Assembled	.88
4455	Dial—Station selector dial	.60
7799	Drive—Variable tuning condenser drive assembly complete	2.45
4364	Gear—Spring gear assembly complete with hub, pinion, gear cover and spring	.96
4361	Indicator—Band indicator—Celluloid lettered—D. C. B. A. X.	.12
4363	Pointer—Station selector main (large) pointer	.18
4367	Pointer—Station selector vernier (small) pointer	.15
3943	Screen—Celluloid screen for dial light—Package of 2	.18
3993	Screw—No. 6-32-5/32" square head set screw for band indicator operating arm or variable condenser drive—Package of 10	.25
4377	Spring—Band indicator and arm tension spring—Package of 5	.25
4378	Stud—Band indicator operating arm stud—Package of 5	.25

CABLE ASSEMBLIES

Stock No.	Description	List Price
4653	Cable—Main cable	1.90
4654	Cable—4-conductor—Reproducer cable	.58
4655	Cable—Shielded cable—From low-frequency tone control to resistor boards	.58

REPRODUCER ASSEMBLY

Stock No.	Description	List Price
4645	Capacitor—0.1 mfd.—Located on output transformer (C54)	.25
7835	Coil—Field coil, magnet and cone support (L37)	4.55
8969	Cone—Reproducer cone (L36)—Package of 5	6.35
9543	Reproducer—Reproducer complete	10.36
6999	Screen—Dust (cloth) screen—Package of 6	.12
7834	Transformer—Output transformer and capacitor (T4, C54)	3.75

MISCELLANEOUS PARTS

Stock No.	Description	List Price
4677	Bezel—Metal bezel (escutcheon) for station selector dial glass	.56
6614	Glass—Station dial glass	.30
3829	Knob—Bass or treble tone control, volume or sensitivity control range switch or operating switch knob—Package of 5	1.10
4657	Knob—Knob station selector knob—Package of 5	.65
4678	Ring—Retaining ring for dial glass—Pkg. of 5	.34
4119	Screw—8-32-¼" headless set screw for knob—Stock No. 4657—Package of 20	.38
4393	Screw—8-32-5/16" headless set screw for knob—Stock No. 3829—Package of 10	.25

RCA Victor
Model 281

Twelve-Tube, Five-Band A. C. Receiver

SERVICE NOTES

SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

A RADIO CORPORATION OF AMERICA SUBSIDIARY

REPRESENTATIVES IN PRINCIPAL CITIES

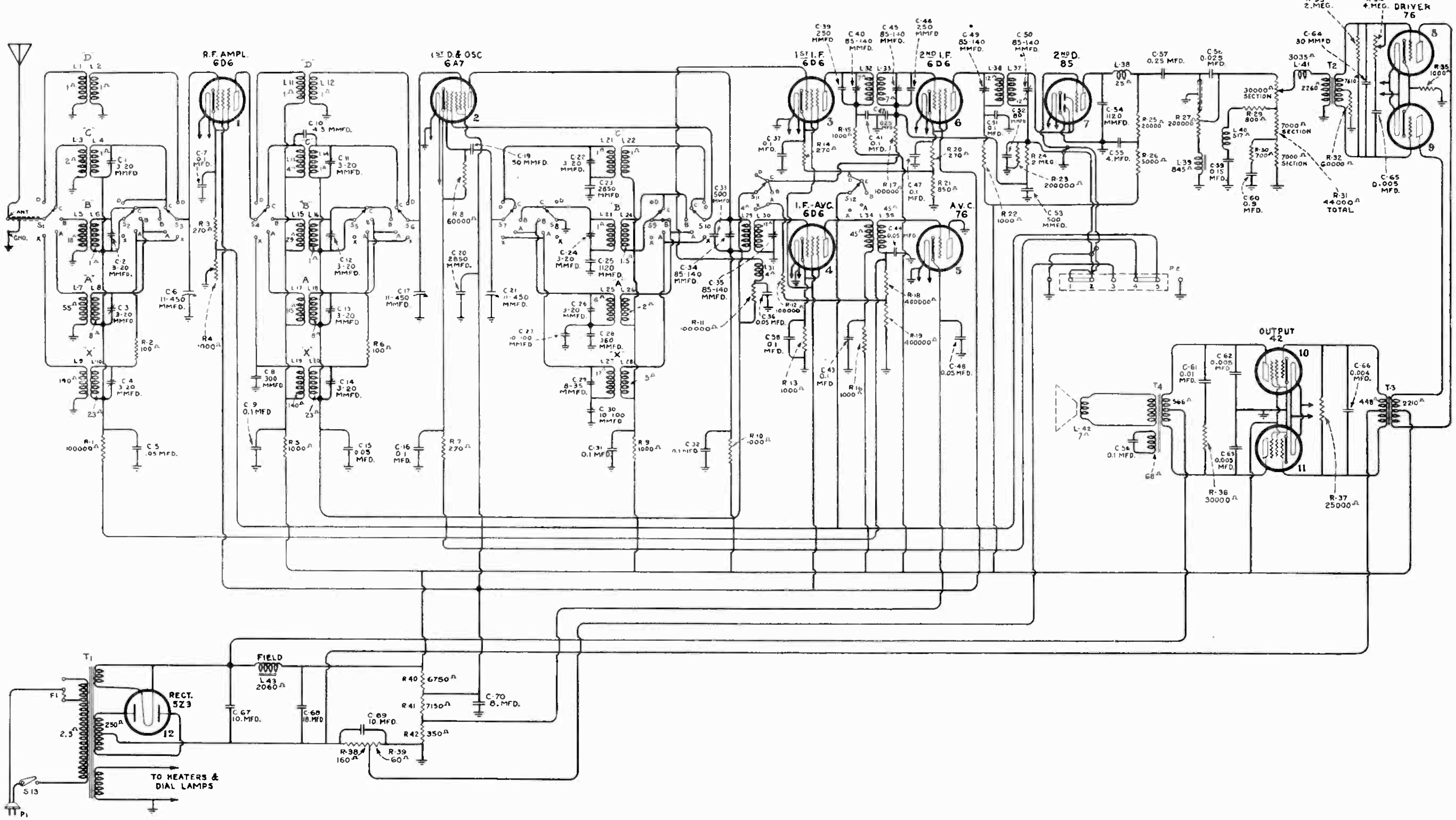


Figure 1—Schematic Circuit Diagram

RCA VICTOR MODEL 281

Twelve-Tube, Five-Band A. C. Superheterodyne

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Voltage Rating .... 105–125 Volts
Frequency Rating .... 25–60 and 50–60 Cycles
Power Consumption .... 130 Watts (all frequencies)
Type and Number of Radiotrons ...... 4 RCA-6D6, 1 RCA-6A7, 3 RCA-76, 1 RCA-85, 2 RCA-42, 1 RCA-5Z3—Total 12

Tuning Frequency Range ....
- Band X .... 140 K. C.–410 K. C.
- Band A .... 540 K. C.–1720 K. C.
- Band B .... 1720 K. C.–5400 K. C.
- Band C .... 5400 K. C.–18,000 K. C.
- Band D .... 18,000 K. C.–36,000 K. C.

Line-up Frequencies .... 175 K. C., 410 K. C., 460 K. C., 600 K. C., 1720 K. C., 5160 K. C., 18,000 K. C.
Maximum Undistorted Output .... 8 Watts
Maximum Output .... 16 Watts

PHYSICAL SPECIFICATIONS

Height .... 43 Inches
Width .... 27½ Inches
Depth .... 17¾ Inches

This twelve-tube, five-band all-wave superheterodyne radio receiver is an instrument in which all of the important modern developments known to the radio art have been combined. Its extreme range permits the listener to receive stations from all over the world in a manner not approached by other instruments. A full vision "Airplane" type dial with band indicator and direct calibration in both kilocycles and megacycles provides an easy means of locating stations. A two-speed tuning ratio permits the user to tune either rapidly or slowly through stations. A tuning range from 140 K. C. to 36,000 K. C. (with break from 410 K. C. to 540 K. C.) covers every broadcasting band used throughout the world today.

A high degree of tonal fidelity is obtained through the use of a high-power, high-gain, low-distortion audio amplifier and a large-field, 10-inch electro-dynamic loudspeaker. A diode second detector further improves this characteristic. An aurally compensated volume control ensures to the listener the maintenance of this tone quality at all degrees of volume. High and low frequency tone controls provide a means whereby either the high or low frequency response may be reduced as required by adverse operating conditions (station hum, static, etc.).

Other features include a sensitivity control, two distinct automatic volume control systems, a special R. F. unit of high efficiency which greatly improves the noise to signal ratio of short-wave reception, and an automatic sensitivity change for the short-wave bands. The cabinet is of unusual construction, having a sloping operating panel and tone chambers for eliminating cabinet resonance. It is designed along "moderne" lines of classic simplicity.

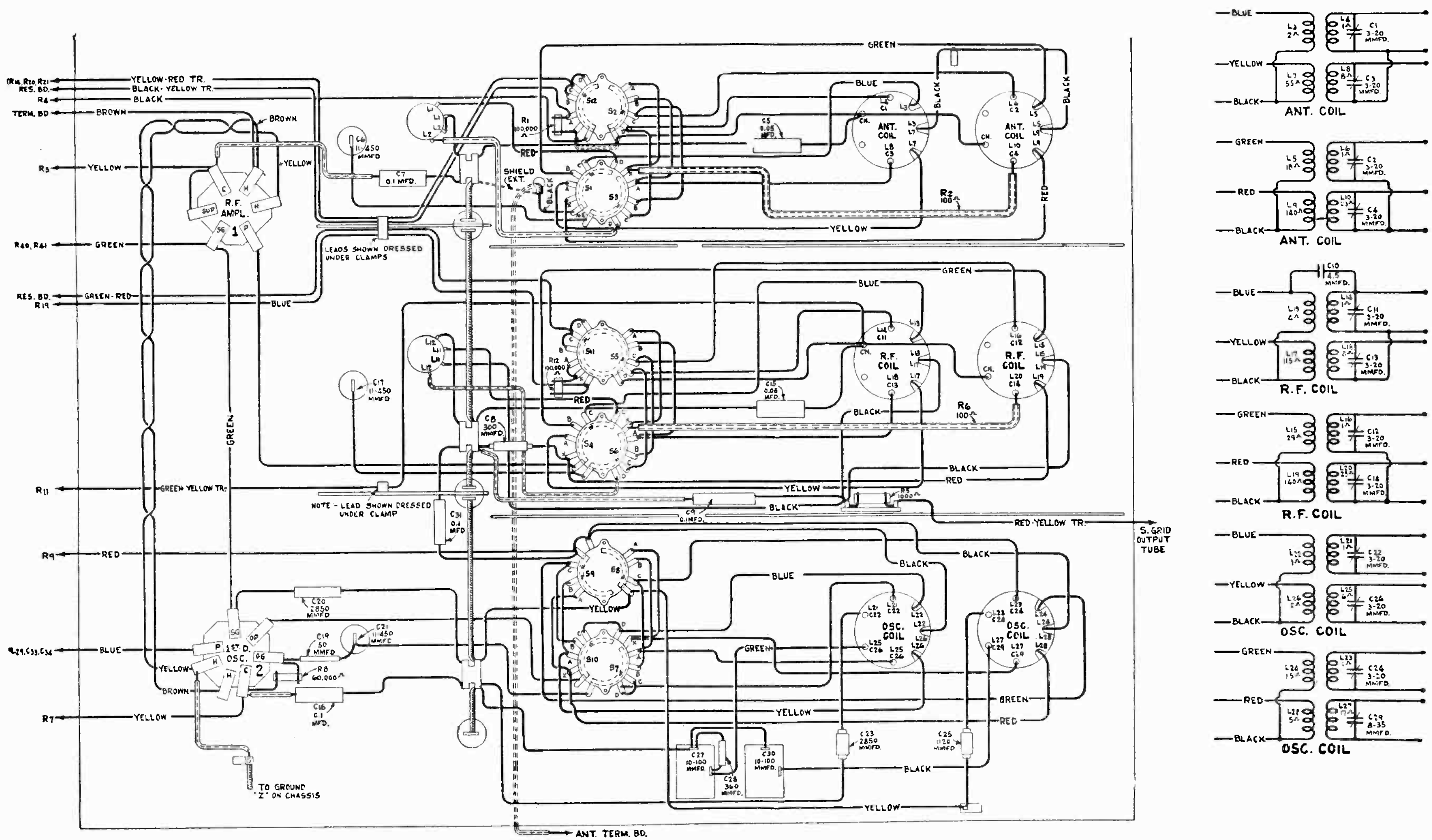


Figure 2—R. F. Assembly Wiring Diagram

DESCRIPTION OF ELECTRICAL CIRCUIT

The general circuit arrangement consists of an R. F. stage, a combined oscillator and first detector stage, two I. F. stages, a combined second detector and automatic volume control, a push-pull audio driver stage and a push-pull Class A output stage. Plate and grid voltages are supplied by the RCA-5Z3 heavy duty rectifier combined with a suitable filtering system. In addition, a double channel A. V. C. stage is provided which uses two additional tubes. Figure 1 shows the over-all schematic circuit diagram while Figure 2 shows the R. F. assembly wiring.

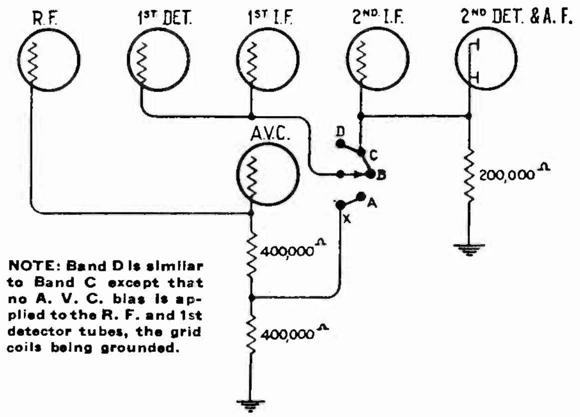


Figure 3—Switching Arrangement of Automatic Volume Control Systems

The signal enters the receiver through a shielded antenna lead and is applied to the grid of the R. F. tube through the antenna coupling transformer. The secondary of this transformer is tuned to the signal frequency by means of one unit of the gang-capacitor. The output of this stage is transformer coupled to the grid circuit of the first detector, which is also tuned to the signal frequency by a unit of the gang-capacitor.

Combined with the signal in the first detector is the local oscillator signal, which is always at a 460 K. C. frequency difference (higher) from the signal frequency. A separate coil system and the third unit of the gang-capacitor are used in the oscillator circuit.

In conjunction with these three tuned circuits it is well to point out that five different groups of tuned circuits are used, one group for each tuning band. A five-position selector switch is provided for selecting the band in which the desired signal is located. In addition to selecting the desired coil system, additional groups of contacts are provided for short-circuiting the preceding lower frequency R. F. and detector coils and the two preceding oscillator coils. This is to prevent "dead" spots due to absorption effects caused by the coils, the natural period of which without the gang capacitor connected falls in the next higher frequency band. This gang switch also has additional contacts for performing other functions which will be discussed.

The output of the first detector which is the I. F. signal (460 K. C.) is fed directly through two tuned circuits to the grid of the automatic volume control I. F. amplifier stage. A coupling coil adjacent to the secondary of this transformer is connected directly to the signal I. F. stage, which is in effect parallel to the A. V. C., I. F. stage. Examining the signal amplifier further we find that the output of the first signal I. F. stage is applied through a transformer to the second I. F. stage and thence through a second transformer to the second detector. Both circuits of each transformer are accurately tuned to the I. F. signal, which is 460 K. C.

Further examining the A. V. C., I. F. stage it will be seen that the output of this stage is applied to the A. V. C. tube through an untuned I. F. transformer. The A. V. C. stage, which is an RCA-76, is operated as a straight rectifier, its plate being grounded and only the grid being used. This tube is shielded in the usual manner. A small grid voltage, approximately 5.0 volts, is maintained so that rectification does not occur until the signal level exceeds this grid voltage. When this occurs, a portion of the rectified signal produces a voltage drop across resistors R-18 and R-19. The drop across both of these resistors constitutes the automatic bias voltage for the R. F. stage. The drop across R-19 alone gives the automatic bias voltage for the first detector and first I. F. stage on bands X and A.

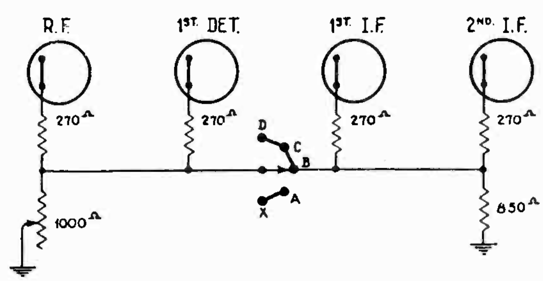


Figure 4—Sensitivity Control Switching Arrangement

Examining the second detector, the diode electrodes provide the detector action while the grid and plate give audio amplification. A portion of the rectified signal also gives a voltage drop across R-23 which is

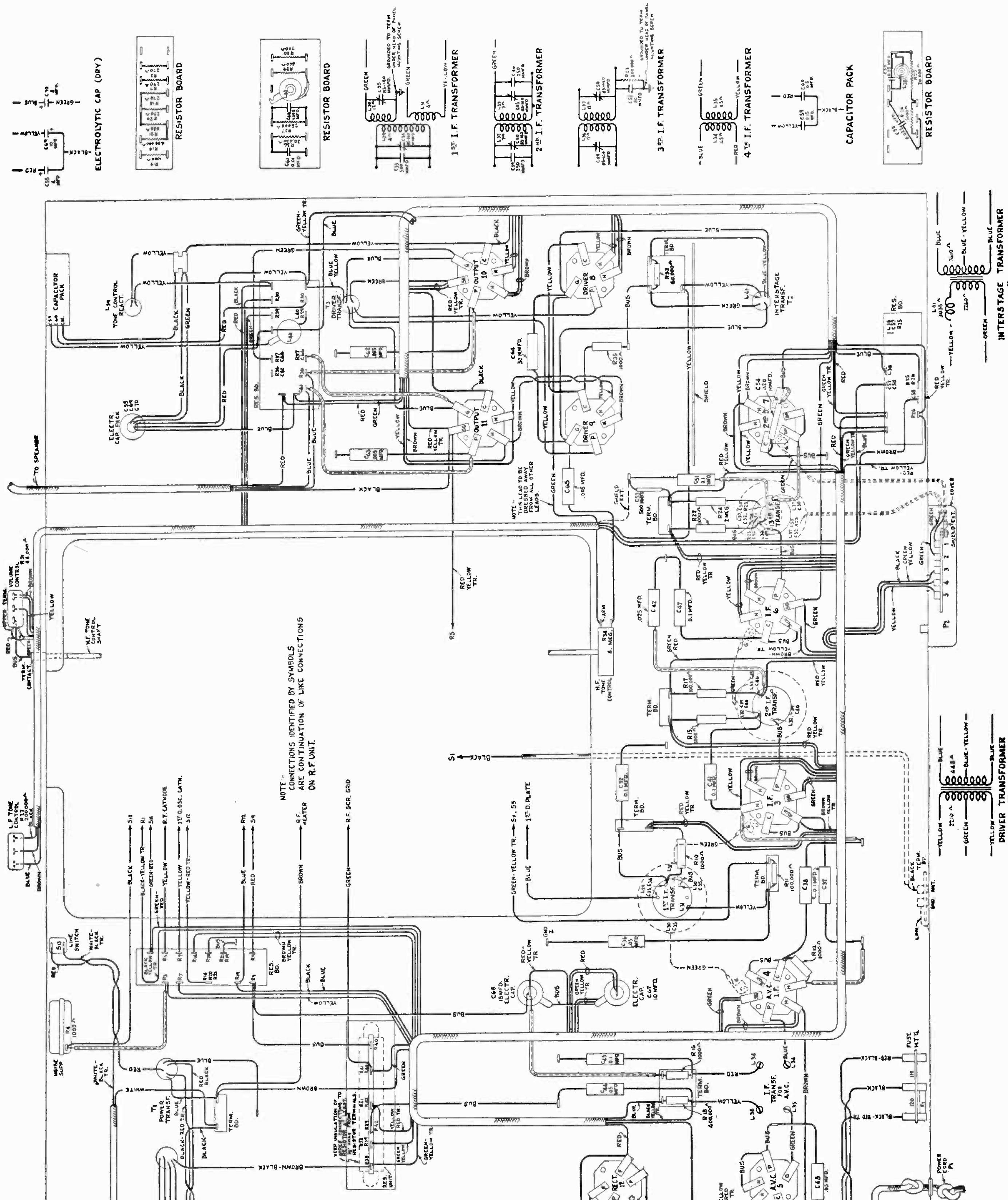


Figure 5—Chassis Assembly Wiring Diagram

a second automatic volume control system for the receiver. The voltage drop is applied to the second I. F. stage in all bands and to the first detector and first I. F. stage in bands B and C. The change in automatic volume control systems is made by an additional group of contacts on the band selector switch. Figure 3 shows the switching arrangements for changing the A. V. C. system in the various bands.

At this point, an explanation as to why two automatic volume control systems are used and why the sensitivity control is changed in different bands may be in order.

Two automatic volume control systems are used because of the different receiving conditions in different bands. For example, in the broadcast and long-wave band (X and A) signal levels are very high. Also due to the use of an aurally compensated volume control, a constant input to the second detector must be maintained. From this, it is evident that the double channel I. F. automatic volume control is ideal. It maintains a constant input to the second detector and yet does not function on an extremely weak signal. In the short-wave bands, however, conditions are different. Signal strengths are always very low and fluctuate widely. For this reason it is important to have some automatic volume control action below the level at which the double channel system works. This is provided by the diode A. V. C. of the second detector, which functions on the first detector and two I. F. stages on the short-wave bands. It should be noted that this action is present on the second I. F. stage on all bands. This further flattens the action of the double-channel system in bands X and A.

At this point it is well to examine the sensitivity control which also changes on different bands. The sensitivity control adjusts the residual bias on the R. F. and first detector stages in bands X and A while it controls the R. F., 1st detector and both I. F. stages on bands B, C, and D. Figure 4 shows the switching arrangement used.

The sensitivity control is changed so that in bands X and A it controls the R. F. and 1st detector while in bands B, C, and D it controls the R. F., 1st detector, 1st I. F. and 2nd I. F. stages. The reason for this is that for a given degree of sensitivity in bands X and A the residual bias will be considerably higher in the R. F. and 1st detector stages than in the bands B, C, and D used. This is to prevent possible overloading of these stages due to the high-signal strengths encountered in bands X and A. Also, in bands B, C, and D, for a given degree of sensitivity the R. F. stage operates at a higher gain, which gives an improved signal to noise ratio. This is caused by the paralleling of the sensitivity control with an 850-ohm resistor in these bands.

Returning to the second detector, we find its output circuit is coupled to the grid circuit of the driver stage through a compensated volume control system, tone control system and transformer. The volume control uses two stages of compensation, which serves to increase the high and low frequencies as the volume is reduced. This compensates for the natural loss in sensitivity of the human ear to the high and low frequencies at low sound levels. A low and a high frequency tone control enables the listener to alter the fidelity of the receiver to his individual taste.

The driver stage, which is a pair of RCA-76 Radiotrons connected in push-pull, is transformer coupled to a pair of RCA-42's which are the output stage. A feature of the output stage is the use of fixed bias, which reduces distortion and increases the available

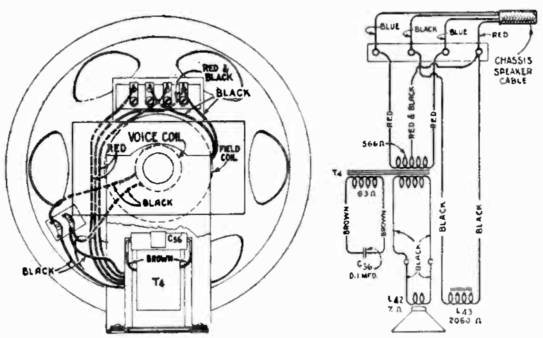


Figure 6—Loudspeaker Wiring

output. This is accomplished by the use of the drop across R-38 and R-39, which carries the entire D. C. output from the rectifier. Naturally the output stage uses but a portion of the total rectified current and current variations in it will have but little effect on the drop across the resistor.

The output of the power stage is coupled through a step-down transformer to the voice coil of the loudspeaker. A separate winding, which is shunted by a capacitor, has been provided in this transformer which gives a very sharp, high-frequency cut-off for the entire audio system. This greatly reduces the reproduction of any high-frequency interchannel interference or other disturbance of a high-frequency character which is outside of the useful musical range.

The loudspeaker used is of the large field ten-inch type. It is fully capable of handling the high-power, high-quality output of the receiver and converting it into faithful sound reproduction.

Figure 5 shows the chassis wiring while Figure 6 shows the loudspeaker wiring.

(1) LINE-UP PROCEDURE

The line-up procedure of this receiver is somewhat involved and it is important that these instructions be carefully followed when making adjustments. Properly aligned, this receiver has outstanding performance; improperly aligned, it may be impossible to receive signals on all bands.

Equipment

To properly align this receiver, the following equipment must be used. This is a modulated R. F. oscillator having proper frequency range, an output indicator, an alignment tool, a tuning wand, and a "dummy" Radiotron RCA-76. These parts, which are shown in Figure 8, have been developed by the manufacturer of this receiver for use by service men to duplicate the original factory adjustments. The "dummy" Radiotron, RCA-76, is obtained by removing one heater prong from an otherwise perfect tube.

Checking with Tuning Wand

Before making any R. F., oscillator or first detector adjustments, the accuracy of the present adjustments may be checked by means of the tuning wand (Stock No. 6679). The tuning wand consists of a bakelite rod having a brass cylinder at one end and a special finely divided iron insert at the other end. Inserting the cylinder into the center of a coil lowers its inductance, while inserting the iron end increases its inductance. From this it is seen that unless the trimmer adjustment for a particular coil is perfect at alignment frequencies, inserting one end of the wand may increase the output of a particular signal. A perfect adjustment is evidenced by a lowering of output when either end of the wand is inserted into a coil.

The shields over the R. F. coil assembly have a hole at their top for entrance of the tuning wand. The location of the various coils inside of the shield is shown in Figure 7. An example of the proper manner of using the tuning wand would be to assume the external oscillator were set at 1720 and the signal tuned in. The A. V. C. tube would be replaced by the

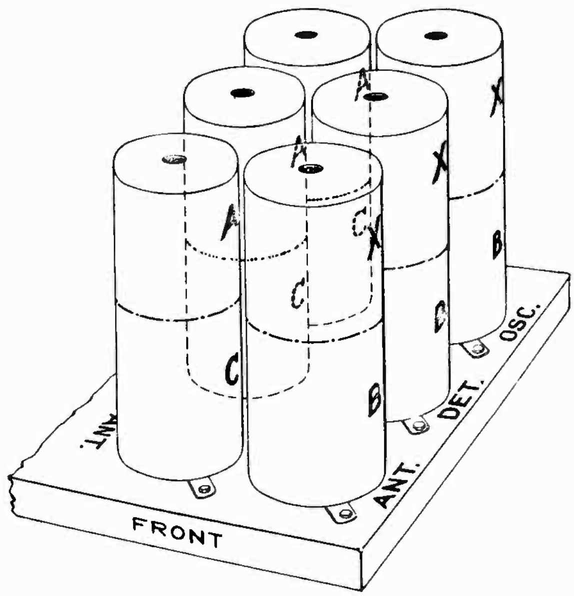
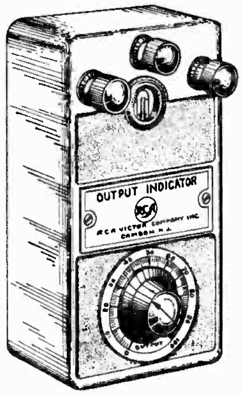


Figure 7—Location of Various Coils in Shields

"dummy" RCA-76 and the output indicator could be connected across the voice coil of the loudspeaker. Then the tuning wand would be inserted, first one end and then the other end, into the top of the three transformers at the left of the R. F. assembly, facing the front of the chassis. A perfect adjustment of the trimmer would be evidenced by a reduction in output

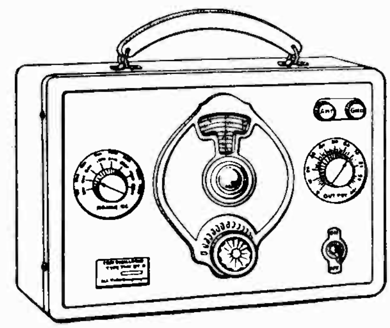


TMV-121-A

Stock No. 4317—Output Indicator

Stock No. 4160—Alignment Tool

Stock No. 6679—Tuning Wand



TMV-97-B

Stock No. 9050—Full Range Test Oscillator

Figure 8—Equipment Required for Aligning Receiver

when each end of the wand is inserted in each of the three transformers. If one end—for example, the iron end—when inserted in one coil caused an increase in output, then that circuit is low. An increase in the trimmer capacitance would be the proper remedy.

(2) I. F. TUNING CAPACITOR ADJUSTMENTS

Although this receiver has three I. F. stages, two for the signal and one for the A. V. C., only three transformers having six adjustable capacitors require adjustment. The fourth transformer is in the A. V. C. circuit and is broadly tuned, not requiring adjustments. The transformers are all peaked, being tuned to 460 K. C.

A detailed procedure for making this adjustment follows:

(a) Connect the output of an external oscillator tuned to 460 K. C. between the first detector grid and ground. Connect the output indicator across the voice coil of the loudspeaker. Replace the A. V. C. tube in the receiver with the "dummy" RCA-76.

(b) Place the oscillator in operation at 460 K. C.; place the receiver in operation and adjust the station selector until a point is reached (Band A) where no signals are heard and turn both the volume and sensitivity controls to their maximum position. Reduce the oscillator input until a slight indication is obtained in the output indicator.

(c) Refer to Figure 9. Adjust each trimmer of the I. F. transformers until maximum output is obtained. Go over the adjustments a second time.

This completes the I. F. adjustments. However, it is good practice to follow the I. F. adjustments with the R. F. and Oscillator adjustments due to interlocking which always occurs.

(3) R. F. OSCILLATOR AND FIRST DETECTOR ADJUSTMENTS

Four R. F., oscillator and first detector adjustments are required in bands "X" and "A." Three are required in bands "B" and "C" while none are required in band "D." Band "D" uses the second harmonic of the oscillator while the detector and R. F. coils do not have trimmers.

To properly align the various bands, each band must be aligned individually. The preliminary set-up requires the external oscillator to be connected between the antenna and ground terminals of the receiver. The output indicator must be connected across the voice coil of the loudspeaker while the "dummy" RCA-76 must be placed in the A. V. C. socket. The sensitivity and volume controls must be at their maximum position and the input from the oscillator must be at the minimum value possible to get an output indication under these conditions. In the high-frequency bands, it may be necessary to dis-

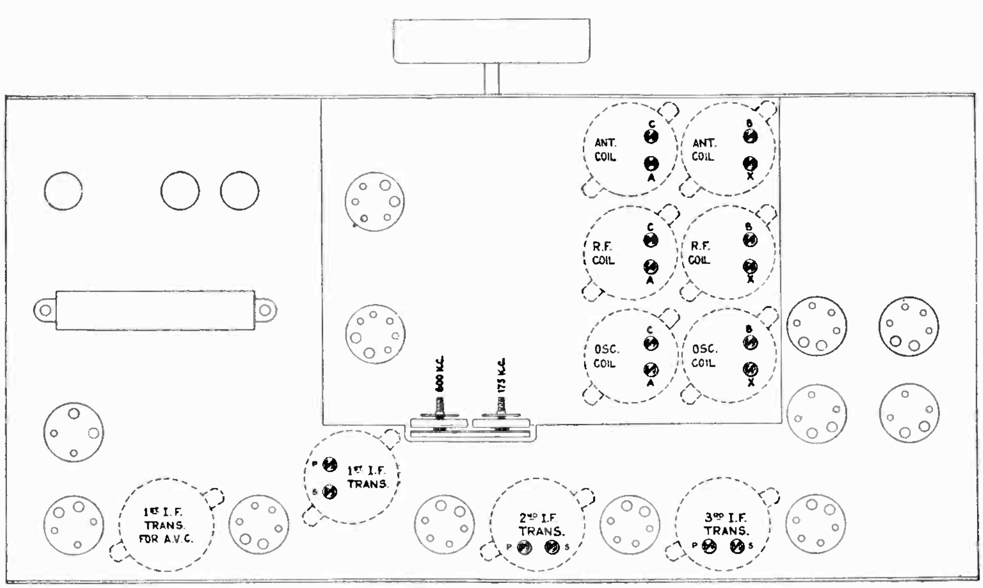


Figure 9—Location of Various Trimmer Capacitors

connect the oscillator from the receiver and place it at a distance in order to get a sufficiently low input to the receiver.

The Dial Pointer must be properly set before starting any actual adjustments. This is done by turning the variable capacitor until it is at its maximum capacity position. One end should point exactly at the horizontal line at the lowest frequency end of band "A," while the other end should point to within 1/64" of the horizontal line at the highest frequency end of band "A."

Figure 9 shows the location of the trimmers for each band. Care must be exercised to only adjust the trimmers in the band under test.

Band "X"

(a) Tune the external oscillator to 410 K. C., set the pointer at 410 K. C. and adjust the oscillator, detector and R. F. trimmers for maximum output.

(b) Shift the external oscillator to 175 K. C. Tune in the 175 K. C. signal irrespective of scale calibration and adjust the series trimmer marked 175 K. C. on Figure 9, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 410 K. C. as described in (a).

Band "A"

(a) Tune the external oscillator to 1720 K. C., set the pointer at 1720 K. C. and adjust the oscillator, detector and R. F. trimmers for maximum output.

(b) Shift the external oscillator to 600 K. C. Tune in the 600 K. C. signal irrespective of scale calibration and adjust the series trimmer, marked 600 K. C. on Figure 9, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 1720 K. C. as described in (a).

Band "B"

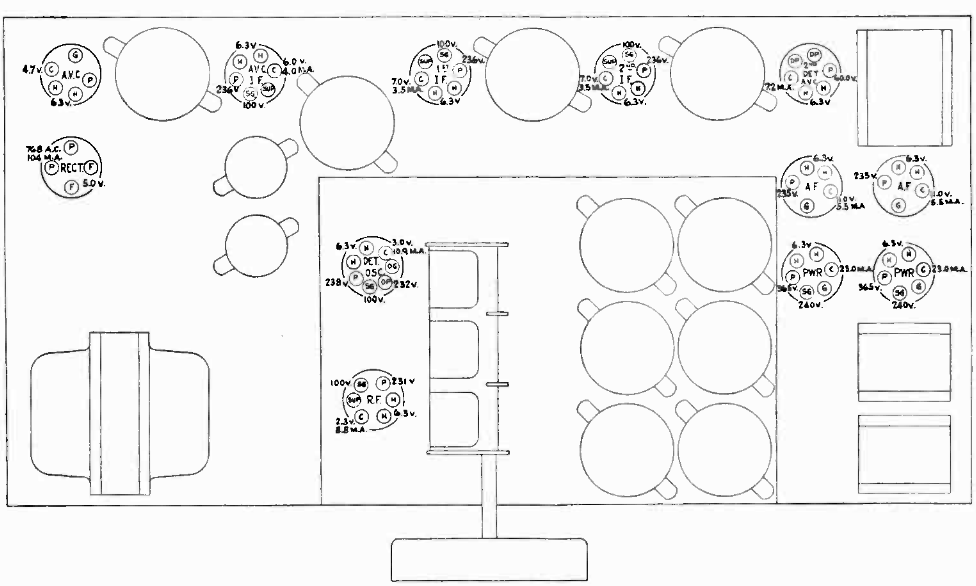
(a) Tune the external oscillator to 5160 K. C., and set the pointer at 5160 K. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(b) Check for the image signal, which should be received at approximately 4240 on the dial. It will be necessary to increase the external oscillator output for this check.

(c) The antenna and detector trimmers should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

Band "C"

(a) Tune the external oscillator to 18,000 K. C., and set the pointer at 18 M. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacity from minimum to maximum.



ALL D. C. VOLTAGES ARE TO GROUND

Figure 10—Radiotron Socket Voltages

(b) Check for the image signal, which should be received at approximately 17,080 on the dial. It may be necessary to increase the external oscillator output for this check.

(c) Reduce the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal disappears. The first detector circuit is then aligned with the oscillator circuit and the RCA-6A7 tube is blocked. Then increase the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal is peaked for maximum output.

(d) The antenna trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

Band "D"

No adjustments are required for Band D.

(4) MAGNETIC PICKUP CONNECTIONS

A Terminal Board is provided at the rear of the chassis for adding phonograph facilities to this instrument. In general, it is best to operate the phonograph with its volume control at its maximum output position and use the radio receiver volume control for adjusting volume. The radio volume control is compensated and will result in much better tone quality at low volume than will be obtained if it is operated open and the volume adjusted from the pickup volume control. Figure 11 shows the various types of connections that will be required for the different turntable assemblies.

(5) VOLTAGE READINGS

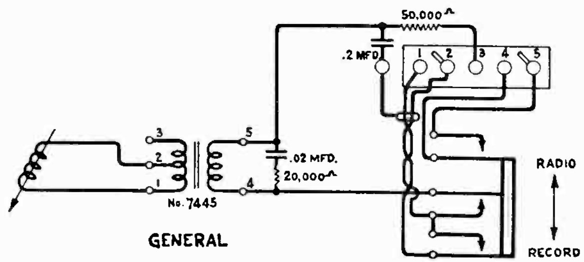
The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if low-resistance meters are used, such allowances must be made.

RADIOTRON SOCKET VOLTAGES

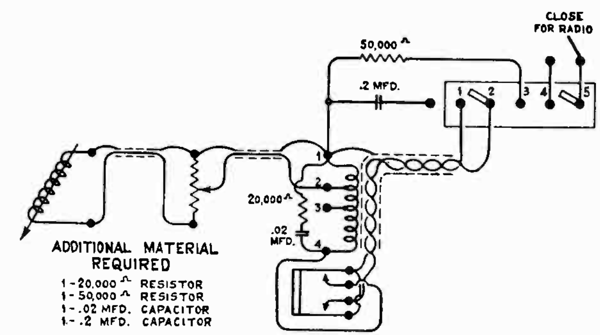
Maximum Sensitivity—No Signal—120-Volt A. C. Input

Radiotron No.		Cathode to Ground, Volts	Screen Grid to Ground, Volts	Plate to Ground, Volts	Cathode Current, M. A.	Heater Volts, A. C.
RCA-6D6—R. F.		2.3	100	231	8.8	6.3
RCA-6A7	Osc.	3.0	—	232	10.9	6.3
	Det.		100	238		
RCA-6D6—1st I. F.		7.0	100	236	3.5	6.3
RCA-6D6—2nd I. F.		7.0	100	236	3.5	6.3
RCA-6D6—A. V. C.-I. F.		6.0	100	236	4.0	6.3
RCA-76—A. V. C.		4.7	—	0	0	6.3
RCA-85—2nd Det.		0	—	60	7.2	6.3
RCA-76—A. F.		11.0	—	235	5.5	6.3
RCA-76—A. F.		11.0	—	235	5.5	6.3
RCA-42—Power		0	240	365	23.0	6.3
RCA-42—Power		0	240	365	23.0	6.3
RCA-5Z3—Rectifier		—	—	768/384 RMS	104.0	5.0

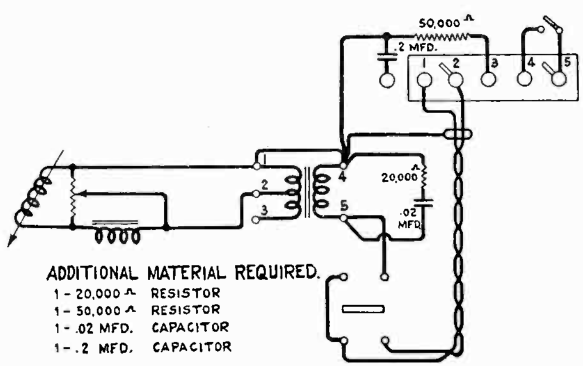
Power Transformer connected to 120-volt Tap.



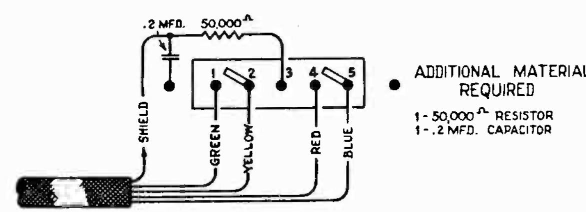
General Connections



End Table Connections



Portable Turntable Connections



Junior "Duo" Connections

Figure 11—Magnetic Pickup Connections

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4372	Bracket—Low frequency tone or volume control mounting bracket	$0.20
4406	Bracket—High frequency tone control mounting bracket	.25
2747	Cap—Contact cap—Package of 5	.50
4407	Capacitor—30 mmfd. (C64)	.25
4405	Capacitor—80 mmfd. (C52)—Package of 5	.85
4376	Capacitor—250 mmfd.—Located on second intermediate frequency transformer (C39, C46)—Package of 5	.80
4404	Capacitor—500 mmfd. (C33, C53)—Package of 5	.85
4409	Capacitor—1120 mmfd. (C54)	.35
4070	Capacitor—.004 mfd. (C66)	.42
3643	Capacitor—.005 mfd. (C62, C63)	.25
6512	Capacitor—.005 mfd. (C65)	.28
3787	Capacitor—.01 mfd. (C61)	.30
3888	Capacitor—.05 mfd. (C36, C44, C48)	.25
3765	Capacitor—.025 mfd. (C42, C58)	.34
4645	Capacitor—.1 mfd. (C32, C41, C43, C51)	.25
3877	Capacitor—.1 mfd. (C37, C38, C47)	.32
3702	Capacitor—.25 mfd. (C57)	.42
7790	Capacitor—10 mfd. (C67)	1.05
7788	Capacitor—18 mfd. (C68)	1.10
7787	Capacitor pack—Comprising one .15 mfd. and one .5 mfd. capacitors (C59, C60)	1.10
7789	Capacitor pack—Comprising one 4., one 8. and one 10. mfd. capacitors (C55, C69, C70	2.68
4358	Clamp—Electrolytic capacitor clamp	.15
7806	Coil—Second detector plate choke coil (L38)	.30
4371	Cover—Fuse mount cover	.15
4359	Cover—Terminal board cover	.15
10907	Fuse—3-ampere—Package of 5	.40
3376	Mount—Fuse mount 105–125-volt instrument	.40
7784	Reactor—Tone control reactor (L39)	1.30
7483	Reactor—Volume control compensating reactor (L40)	.68
6135	Resistor—270 ohms—Carbon type—¼ watt (R3, R7, R14, R20)—Package of 5	1.00
4240	Resistor—700 ohms—Carbon type—¼ watt (R30)—Package of 5	1.00
4375	Resistor—800 ohms—Carbon type—¼ watt (R29)—Package of 10	2.00
6247	Resistor—850 ohms—Carbon type—¼ watt (R21)—Package of 5	1.00

Stock No.	Description	List Price
4687	Resistor—1,000 ohms—Carbon type—¼ watt (R9, R10, R13, R15, R16, R22, R35)—Package of 10	$2.00
3110	Resistor—25,000 ohms—Carbon type—¼ watt (R37)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R32)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R11, R17)—Package of 5	1.00
3116	Resistor—200,000 ohms—Carbon type—¼ watt—Located on third I. F. transformer (R23)—Package of 5	1.00
4368	Resistor—400,000 ohms—Carbon type—¼ watt (R18, R19)—Package of 10	2.00
6242	Resistor—2 megohms—Carbon type—¼ watt (R24, R33)—Package of 5	1.00
3413	Resistor—5,000 ohms—Carbon type—½ watt (R26)—Package of 5	1.00
2240	Resistor—30,000 ohms—Carbon type—1 watt (R36)	.22
5817	Resistor—20,000 ohms—Carbon type—3 watt (R25)	.25
6997	Resistor—Total resistance 14,470 ohms with 160–60–350–7150 and 6750 ohm sections (R38, R39, R40, R41, R42)	.95
7804	Rheostat—Noise suppressor rheostat (R4)	1.30
4453	Shield—First I. F., AVC—I. F. or second I. F. Radiotron shield	.32
3683	Shield—Radiotron shield top	.20
4452	Shield—Second detector or AVC Radiotron shield	.35
7800	Shield—Shield for intermediate frequency coils	.45
3859	Socket—4-contact rectifier Radiotron socket	.30
7484	Socket—5-contact AVC Radiotron socket	.35
6676	Socket—6-contact output Radiotron socket	.40
7485	Socket—6-contact driver Radiotron socket	.40
7796	Switch—Operating switch (S13)	.62
7795	Tone control—Low frequency (R27)	1.30
7797	Tone control—High frequency (R34)	1.35
7794	Transformer—AVC intermediate frequency transformer (L34, L35)	.82
7785	Transformer—Driver transformer (T3)	2.40
7791	Transformer—First intermediate frequency transformer (L29, L30, L31, C33, C34, C35)	2.35
9505	Transformer—Power transformer 105–125-volt, 50–60 cycle (T1)	6.35
9506	Transformer—Power transformer 105–125 volts, 25–40 cycles	8.90
7792	Transformer—Second intermediate frequency transformer (L32, L33, C39, C40, C45, C46)	2.22

REPLACEMENT PARTS—(Continued)

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
7793	Transformer—Third intermediate frequency transformer (L36, L37, C49, C50, C52, R23)	$2.50
7786	Transformer pack—Comprising one reactor and interstage transformer (L41, T2)	4.25
7798	Volume control (R31)	2.05
	R. F. UNIT ASSEMBLIES	
4646	Capacitor—4.5 mmfd. (C10)	.20
4416	Capacitor—50 mmfd. (C19)—Package of 5	1.25
3981	Capacitor—300 mmfd. (C8)	.30
4413	Capacitor—360 mmfd. (C28)	.22
4412	Capacitor—1120 mmfd. (C25)	.25
4524	Capacitor—2850 mmfd. (C23)	.35
4615	Capacitor—2850 mmfd. (C20)	.34
4417	Capacitor—0.05 mfd. (C5, C15)	.25
4415	Capacitor—0.1 mfd. (C7, C16)	.30
4645	Capacitor—0.1 mfd. (C9, C31)	.25
3861	Capacitor—Adjustable capacitor (C27, C30)	.78
4420	Clamp—Antenna lead clamp and screw—Package of 10	.40
4410	Coil—Antenna coil—Band "D" (L1, L2)	.70
7803	Coil—Antenna coil—"B"—"SW" (L3, L4, L7, L8, C1, C3)	1.82
7810	Coil—Antenna coil—"PB"—"LW" (L5, L6, L9, L10, C2, C4)	2.10
7805	Coil—Detector coil—"B-SW" (L13, L14, L17, L18, C11, C13)	2.15
7808	Coil—Detector coil—"PB-LW" (L15, L16, L19, L20, C12, C14)	2.05
4421	Coil—Detector coil—Band "D" (L11, L12)	.70
7807	Coil—Oscillator coil—"B-SW" (L21, L22, L25, L26, C22, C26)	1.62
7809	Coil—Oscillator coil—"PB-LW" (L23, L24, L27, L28, C24, C29)	1.70
7801	Condenser—3-gang variable tuning condenser (C6, C17, C21)	4.42
4419	Lead—Shield single-conductor antenna lead	.45
4370	Resistor—1,000 ohms—Carbon type—¼ watt (R5)—Package of 10	2.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R8)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1, R12)—Package of 5	1.00
4418	Resistor—100 ohms—Flexible type (R2, R6)—Package of 10	1.50
7800	Shield—Antenna, detector or oscillator coil shield	.45
4452	Shield—First detector oscillator coil shield	.35
3683	Shield—Radiotron shield top	.20
4454	Shield—R. F. amplifier Radiotron shield	.44
3529	Socket—Dial lamp socket	.32
7485	Socket—6-contact Radiotron socket	.40
3572	Socket—7-contact Radiotron socket	.38
4686	Strip—Terminal strip engraved "ANT-GND"	.20
7802	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12)	4.05

Stock No.	Description	List Price
	CABLE ASSEMBLIES	
7815	Cable—Audio cable	$0.62
7813	Cable—From L. F. tone control, volume control to resistor boards	.72
7812	Cable—Main cable	1.30
7814	Cable—Reproducer cable—4-conductor	.45
	REPRODUCER ASSEMBLIES	
4193	Board—Terminal board	.32
9509	Coil—Field coil, magnet and cone support (L43)	11.46
7000	Cone—Reproducer cone (L42)—Package of 5	9.45
9508	Reproducer complete	17.40
6999	Screen—Dust screen—Package of 6	.12
4506	Transformer—Output transformer and capacitor (T4, C56)	2.85
	MISCELLANEOUS ASSEMBLIES	
4677	Bezel—Metal bezel (escutcheon) for station selector dial	.56
6614	Glass—Station selector dial glass	.30
4425	Knob—Station selector knob—Package of 5	.75
3829	Knob—Volume control, tone control, noise suppressor or range switch knob—Package of 5	1.10
4340	Lamp—Dial lamp—Package of 5	.60
4678	Ring—Station selector dial glass retaining ring—Package of 5	.34
4119	Screw—8-32-¼" headless set screw for knob—Stock Number 4425—Package of 20	.38
4393	Screw—8-32-5/16" headless set screw for knob—Stock Number 3829—Package of 10	.25
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	.28
10194	Ball—Steel ball for variable condenser drive assembly—Package of 20	.25
4422	Clutch—Tuning condenser drive clutch assembly—Comprising drive shaft, balls, ring, spring and washers assembled	.88
4455	Dial—Station selector dial	.60
7799	Drive—Variable tuning condenser drive assembly complete	2.45
4364	Gear—Spring gear assembly complete with hub pinion, gear cover and spring	.96
4361	Indicator—Band indicator—Celluloid-lettered D-C-B-A-X	.12
4363	Pointer—Station selector main pointer—Large	.18
4367	Pointer—Station selector vernier pointer—Small	.15
3993	Screw—No. 6-32-5/32" square head set screw for variable condenser drive assembly—Package of 10	.25
4377	Spring—Band indicator and arm tension spring—Package of 5	.25
4360	Stem—Pointer stem assembly	.35
4378	Stud—Band indicator operating arm stud—Package of 5	.25

Instructions for

RCA Victor Duo 301

Four-Tube Double-Range Superheterodyne Combination
(Table Model)

INSTALLATION

Setup—After unpacking the instrument, remove the rear panel of the cabinet (held in place by screws) and withdraw all material inserted to protect the tubes during shipment. Refer to the tube location diagram printed on the license label attached to the cabinet and ***make certain:***

(a) That all tubes are in the proper sockets and pressed down firmly.

(b) That all shields are rigidly in place over the tubes shown by double circles on the diagram.

(c) That the short flexible leads shown on the diagram are attached to the dome terminals of the proper tubes as indicated, and that the spring contact clips are pressed down firmly.

Replace the cabinet rear panel, feeding the antenna and ground wires (black and yellow, respectively) through the left-hand opening near the bottom of the panel and the power cord through the adjacent right-hand opening. Finally, raise the lid of the cabinet and remove all packing material from the phonograph playing compartment.

Location—The instrument should be placed upon a table or other level surface convenient to the antenna and ground connections and near an electrical outlet or lamp socket. Care should be taken to avoid restriction of natural ventilation through the cabinet as would occur with the set situated so that its back is flush with a wall of the room or with the instrument resting upon or close to a radiator or other heating device.

Antenna and Ground—A well-insulated outdoor antenna having a length of from 50 to 100 feet, including the lead-in wire, is recommended. It should be erected as high as conveniently possible and sufficiently remote from power lines and street railways to prevent excessive local interference. If the instrument is installed in a building of non-metallic construction, an indoor antenna ordinarily will afford satisfactory reception and may be considered the most practical. Buildings in which the roof or framework is of metal, however, form an effective shield which greatly impedes the passage of radio waves; to insure best results in such installations, therefore, an outdoor antenna is essential.

A *good* ground connection is essential for best performance. The ground lead should be as short as possible and attached preferably to a cold-water pipe. An approved ground clamp should be used to insure a tight and permanent connection.

The two flexible insulated wires extending from the cabinet at the rear are provided to facilitate connections to the antenna and ground. Connect the *black* wire to the antenna lead-in and the *yellow* wire to the ground lead. Both joints should be soldered and wrapped with insulating tape.

Power Supply—Connect the power cord to an electrical outlet supplying alternating current at the proper voltage and frequency (cycles), as specified on the license label.

OPERATION

Controls

The instrument has five operating controls, four located on the front panel of the cabinet, as follows:

(1) **Power Switch and Radio Volume Control** (Left-hand Knob)—In the extreme *counter-clockwise* position, the power switch is "off." Rotating the knob slightly *clockwise* turns the power "on"—further rotation increases the volume on radio reception.

(2) **Station Selector** (Upper Middle Knob)—This control is equipped with an illuminated dial, calibrated to facilitate location and identification of stations (add one cipher to scale numerals to obtain frequency in kilocycles.

(3) **Tone Range Switch** (Lower Middle Knob)—This switch has two positions, the *clockwise* setting providing *full-range* reproduction. When the knob is turned *counter-clockwise*, treble response and static interference (when latter is present) will be reduced.

(4) **Frequency Range Switch** (Right-hand Knob)—With this knob in its *counter-clockwise* position, stations transmitting in the 540–1500 kilocycle or broadcast range will be received (frequencies in this range are indicated by the large numerals adjacent to the scale graduations). When the knob is turned *clockwise*, the circuits are transferred to permit reception from stations operating in the 1600–3500 kilocycle range (frequencies in this range are indicated approximately by the small outer numerals), as follows:

(a) **Police Calls**—At dial settings near "170" for stations transmitting at 1712 kilocycles and between "240" and "260" for stations operating in the 2450 kilocycle band.

(b) **Amateur Radio "Phone"**—At dial settings between "180" and "200" (assigned band 1800–2000 kilocycles).

(c) **Aviation Communications "Phone"** — At dial settings above "240" (2500–3500 kilocycles).

The fifth control knob is located on the right-hand side of the cabinet and serves the following purpose:

(5) **Record Volume Control**—The volume produced by a phonograph record will be increased upon rotation of this knob in a *clockwise* direction. When not operating the phonograph, this control should be turned fully *counter-clockwise* in order to insure proper radio performance.

Radio Procedure

To operate the radio receiver, refer to the foregoing description of the controls and proceed as follows:

1. Set the Frequency Range Switch for the desired frequency band.

2. Apply power by turning the left-hand knob on the front panel slightly clockwise from the "off" position of the power switch, thus illuminating the dial—indicative of normal operation. Several seconds, however, will be required for the tubes to heat before reproduction is possible. Set the Radio Volume Control fully clockwise for maximum volume—reduce the setting if too noisy.

3. Rotate the Station Selector slowly over the range of the dial until a desirable station program is heard.

NOTE—The majority of stations in the 1600–3500 kilocycle band do not offer continuous programs. Police calls are usually intermittent at regular or irregular intervals. Local or strong stations in the 540–1500 kilocycle broadcast band may be audible (sometimes at more than one point on the dial) when the Frequency Range Switch is set for 1600–3500 kilocycles.

4. After receiving a signal, turn the Radio Volume Control counter-clockwise until the volume is reduced to a low level. Now readjust the Station Selector accurately to the position mid-way between the points where the quality becomes poor or the signal disappears. *This setting minimizes the proportion of background noise and provides best quality of reproduction.*

5. Adjust the Radio Volume Control to the desired volume level and set the Tone Range Switch for the preferred tone quality.

6. When through operating, switch the power "off" by turning the left-hand knob on the front panel to its extreme counter-clockwise position.

Phonograph Procedure

Facilities for electrical reproduction of standard-speed (78 revolutions per minute) phonograph records are contained in this instrument. To play records of this type, swing back the hinged lid of the cabinet (remove the lid, if desired, by sliding from its hinges) and proceed as follows:

1. Turn the power "on," as for radio reception, by a slight clockwise rotation of the left-hand knob on the front panel. To prevent radio interference, this knob should not be turned beyond that point at which the "click" of the power switch is heard. If the receiver is tuned to a local or strong station, it may be found necessary to rotate the station selector a slight amount to eliminate such interference.

2. Place the record upon the turntable and insert a *new* needle—*Chromium* (orange or green shank), *Tungstone* (full volume) or *steel* (full volume)—in the electric pickup. To insert the needle, first loosen the knurled screw on the front of the pickup, push the needle to the full depth of the opening and tighten the screw.

NOTE—For best reproduction when using steel needles, a new needle should be substituted after each selection. With care, the *orange* Chromium needles may be used to play 25, and the *green* Chromium needles from 75 to 100 recordings. Chromium needles should never be replaced in the pickup (if removed for any reason before completely worn), as undue record wear would result. Tungstone needles are capable of playing from 100 to 200 recordings, provided care is taken not to injure the point. Do not use *Tungstone* needles on thin, flexible records or on transparent-faced (illustrated) records.

3. Start the turntable rotating in a *clockwise* direction by twirling with the hand. When normal speed is attained, lower the pickup carefully onto the record, starting the needle at the outside groove.

4. Adjust the Record Volume Control to obtain the desired volume.

5. After the selection has been played, lift the pickup and swing it to the right so as to clear the turntable. While changing records, the turntable either may be left rotating or may be stopped by pressure of the hand, as found most convenient.

6. When through operating, return the Record Volume Control to its counter-clockwise extremity and switch the power "off." The pickup should be placed upon the felt-covered wooden support at the right-hand side of the turntable when not operating the phonograph—do not leave the pickup resting on the record or turntable. Replace and close the cabinet lid.

Lubrication—Lift off the turntable at least once each year and apply a few drops of high-grade light machine oil around the *outside* of the shaft bushing to provide lubrication for the metal washer upon which the motor field member floats. The shaft bushing is self-lubricating; however, no harm will result if excess oil runs inside the bushing.

SERVICE DATA

Voltage Rating..105–125 Volts
Frequency Rating...............................25, 50 and 60 Cycles
Power Consumption.......................................45 Watts
Number and Types of Radiotrons—
1 RCA-6A7, 1 RCA-6F7, 1 RCA-41, 1 RCA-1-V
Undistorted Output..1.9 Watts
Frequency Range.................540–1500 K. C. and 1600–3500 K. C.

This table type combination instrument consists of a four tube super-heterodyne chassis and a new compactly constructed motor board assembly. The receiver incorporates features such as wide tuning range, electro-dynamic loudspeaker, two-point tone control, illuminated dial and the inherent sensitivity, selectivity and tone quality of the super-heterodyne.

The following description of the circuit describes several new design features which are incorporated in this receiver.

The first tube is a combined first detector and oscillator using Radiotron RCA-6A7. Separate tuned circuits are provided for each function. The detector coil is tapped so that the tuning range may be extended merely by shorting out a portion of the coil. The oscillator circuit is not tapped, the high frequency range being obtained by use of its second harmonic instead of the fundamental for obtaining the I. F. frequency.

The next tube is a combined I. F. stage and second detector using Radiotron RCA-6F7. It has two sets of elements, one being used as a screen grid I. F. amplifier and one as a triode detector. The I. F. frequency in this receiver is 460 K. C. The output stage is a single Pentode RCA-41.

The rectifier is an RCA-1-V used in a half-wave rectifying circuit. A feature of this circuit is that only one transformer secondary is used. This is accomplished by having a cathode type rectifier, a series arrangement of filaments and a tapped secondary winding.

Figure A shows the pickup details, Figure B the assembly wiring, Figure C the schematic circuit and Figure D the wiring diagram and Figure E the loudspeaker wiring.

RADIOTRON SOCKET VOLTAGES

120 Volt, 60 Cycle Line—Maximum Volume Control Setting—No Signal

Radiotron No.		Cathode to Control Grid, Volts D. C.	Cathode to Screen Grid, Volts D. C.	Cathode to Plate, Volts D.C.	Plate Current, M.A.	Heater or Filament, Volts
RCA-6A7	First Detector	1.25	70	235	2.5	6.3
	Oscillator	—	—	180	3.5	
RCA-6F7	I. F.	1.25	70	235	5.5	6.3
	Second Det.	19	—	145*	0.4	
RCA-41	Output	17	240	230	26.5	6.3
RCA-1-V	Rectifier	—	—	335 RMS	50	6.3

* Actual voltage cannot be measured with ordinary voltmeter.

Line-Up Adjustments

The detector and oscillator line-up trimmer capacitors are adjusted by setting both the dial and an external oscillator first at 1400 K. C. and adjusting the tuning capacitor trimmer capacitors for maximum output, then changing the oscillator frequency and dial setting to 600 K. C. and adjusting the submounted trimmer capacitor for maximum output. The I. F. adjustments are made by adjusting the two trimmer capacitors located on the first I. F. transformer for maximum output when a 460 K. C. signal is connected between the control grid of the first detector and ground. Be sure and set the station selector at a point where no signal is being received when making I. F. adjustments.

Pickup Service Data

The magnetic pickup and tone-arm assembly of this instrument is of new design and unique construction. Service work will consist of centering the armature, replacing the rubber pivots and replacing the magnet coil.

Disassembling the Pickup

The pickup may be disassembled in the following manner:

(a) Unsolder the two cable connections to the terminal strip.

(b) Remove the needle screw and screws "A" and "B."

(c) Remove the pickup assembly from the arm and housing.

(d) Unsolder the two magnet coil leads attached to the terminals and then remove screw E. This will allow the removal of the fibre terminal board.

(e) If centering the pickup armature is the only adjustment required, such centering can be done without removing the fibre terminal board indicated in (d). The armature is centered by loosening screw F, accessible through the hole shown, and holding the armature with the finger in proper position while screw F is tightened. "Feeling" the armature while deflecting it between its two extremes is the best manner of ascertaining proper centering. When centering, after work has been done or the magnet removed, it is important that the magnet be remagnetized while in place.

(f) If the coil or pivot rubbers are to be replaced, the pickup must be further disassembled. This is done by removing the magnet and then removing screws C and D. The pole piece may now be removed and the old coil and sleeve disassembled. Acetone will be found helpful for dissolving the old cement that holds the coil in place. The new coil, with its sleeve, may now be replaced and cemented in a similar position to that occupied by the old coil. Duco household or Ambroid cement may be used to hold the coil in place. Be careful to center the coil with its paper sleeve before cementing.

(g) The pivot rubbers are replaced by loosening the armature adjusting screw F and removing the armature from its bracket. The rubbers can then be removed by slipping them from each end of the pivot shaft.

It is important to remember that in all operations after reassembling but before placing in the tone arm, the pickup should be magnetized and the armature centered after remagnetizing. Magnetizing should be done by placing the pickup magnet on the magnetizer and sliding it onto the pole pieces, after magnetizing being careful not to break the magnetic circuit.

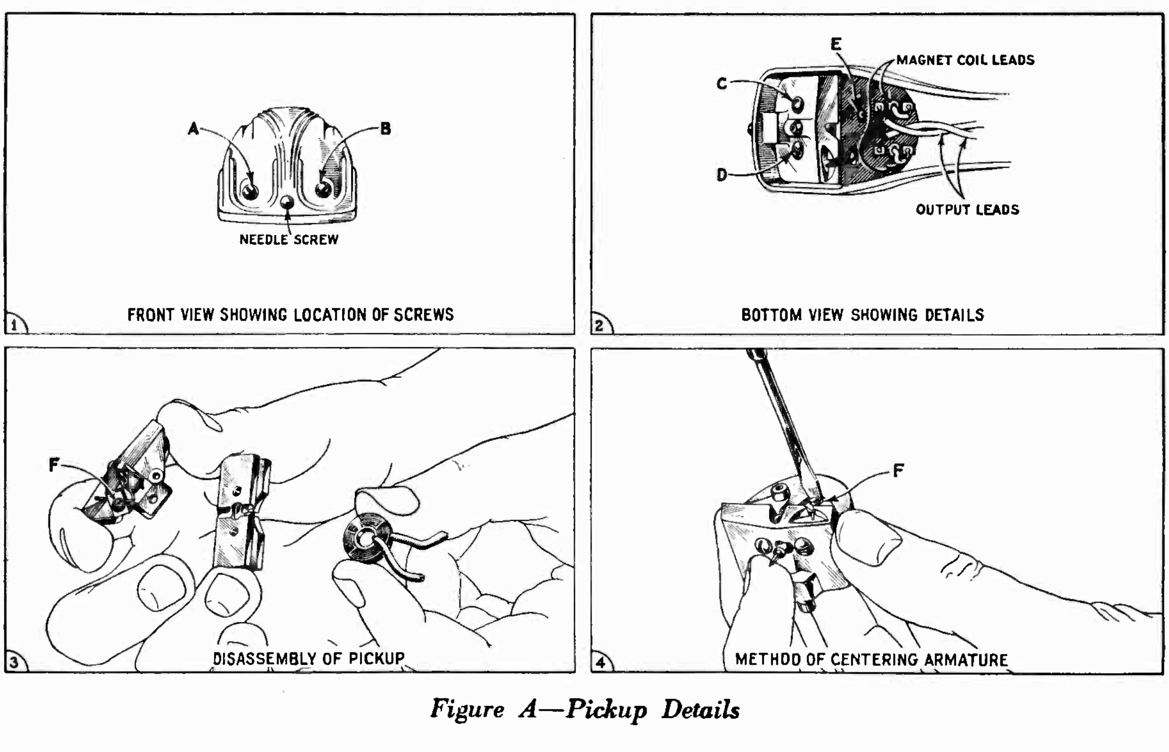


Figure A—Pickup Details

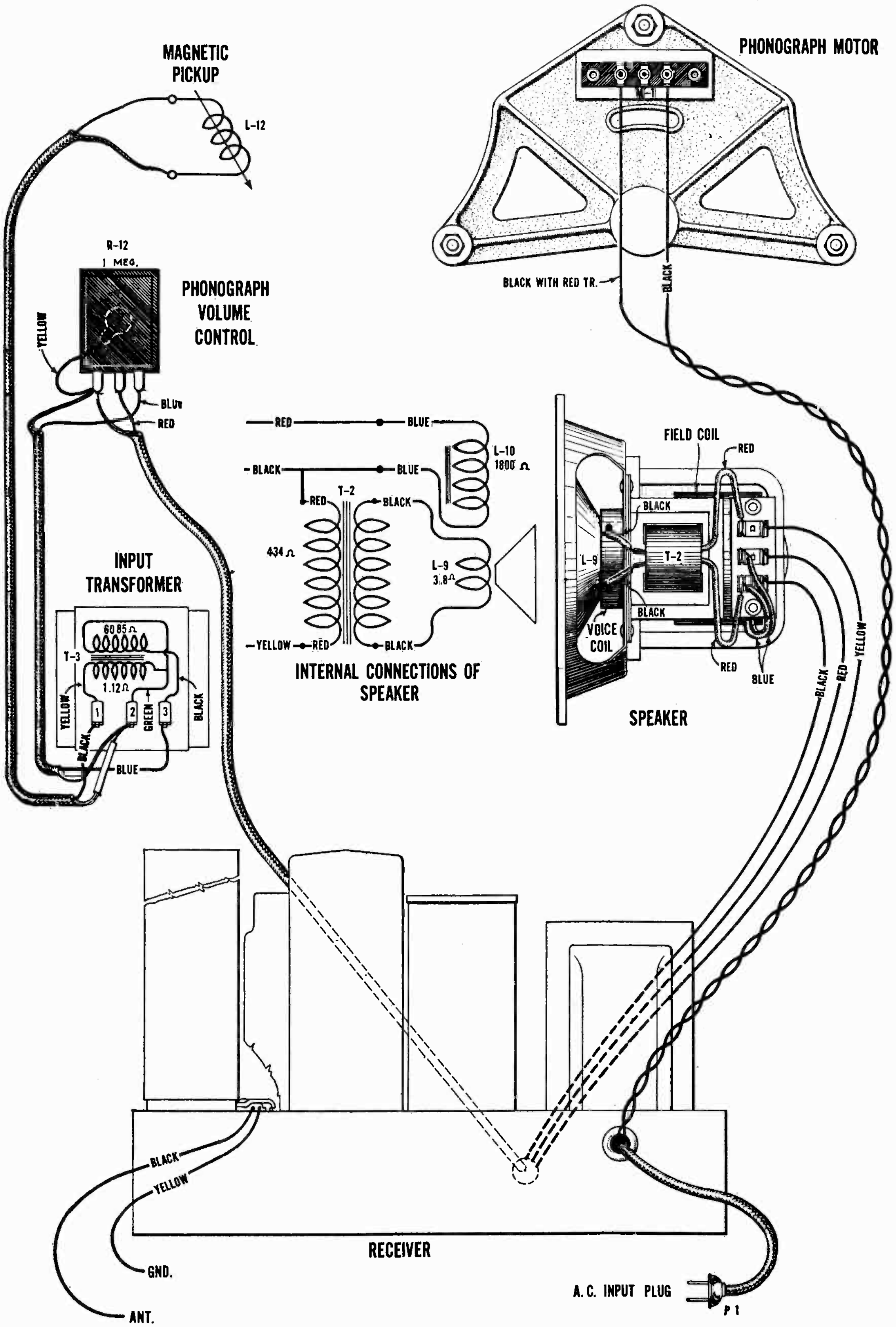


Figure B—Assembly Wiring

.0811

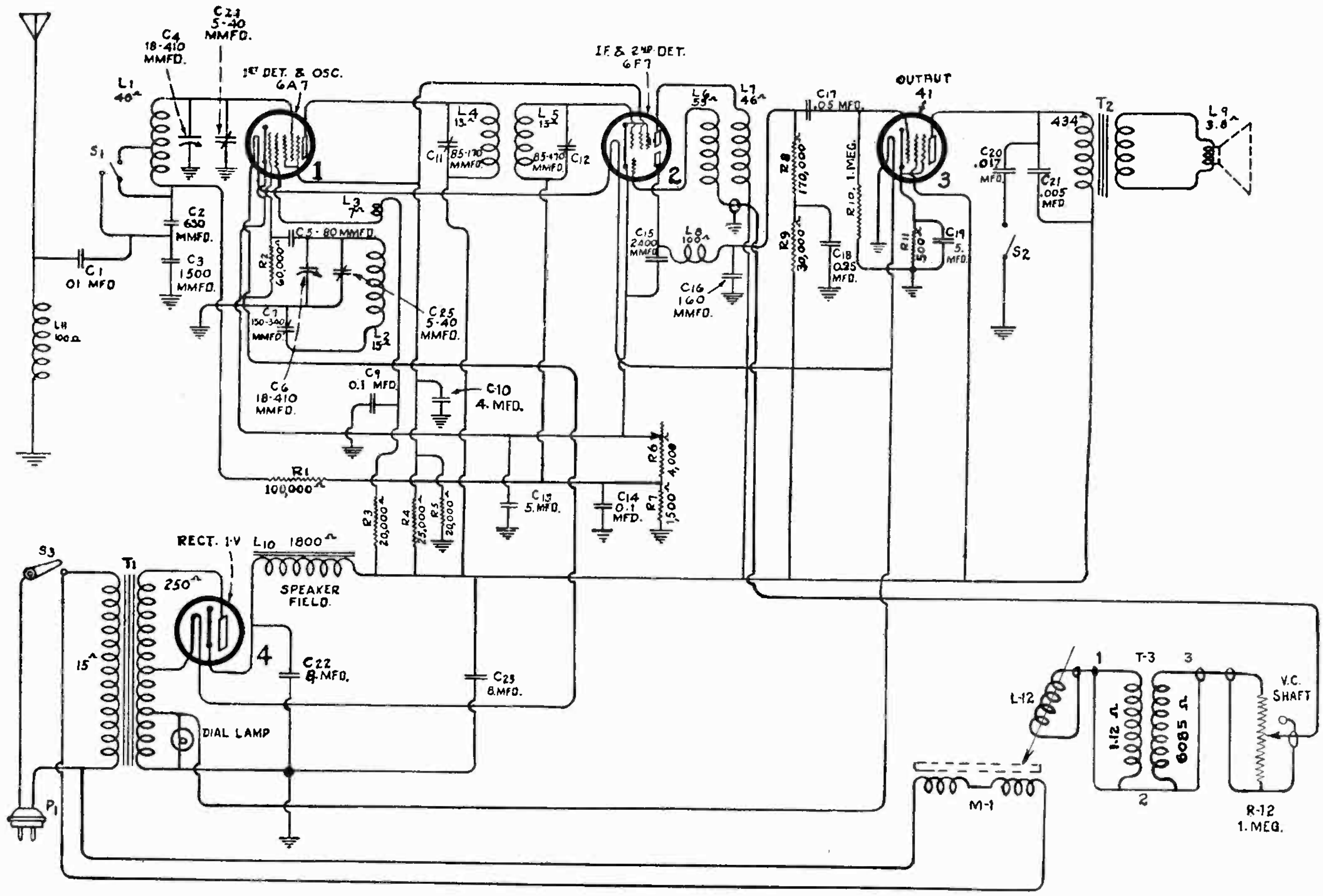


Figure C—Schematic Circuit Diagram

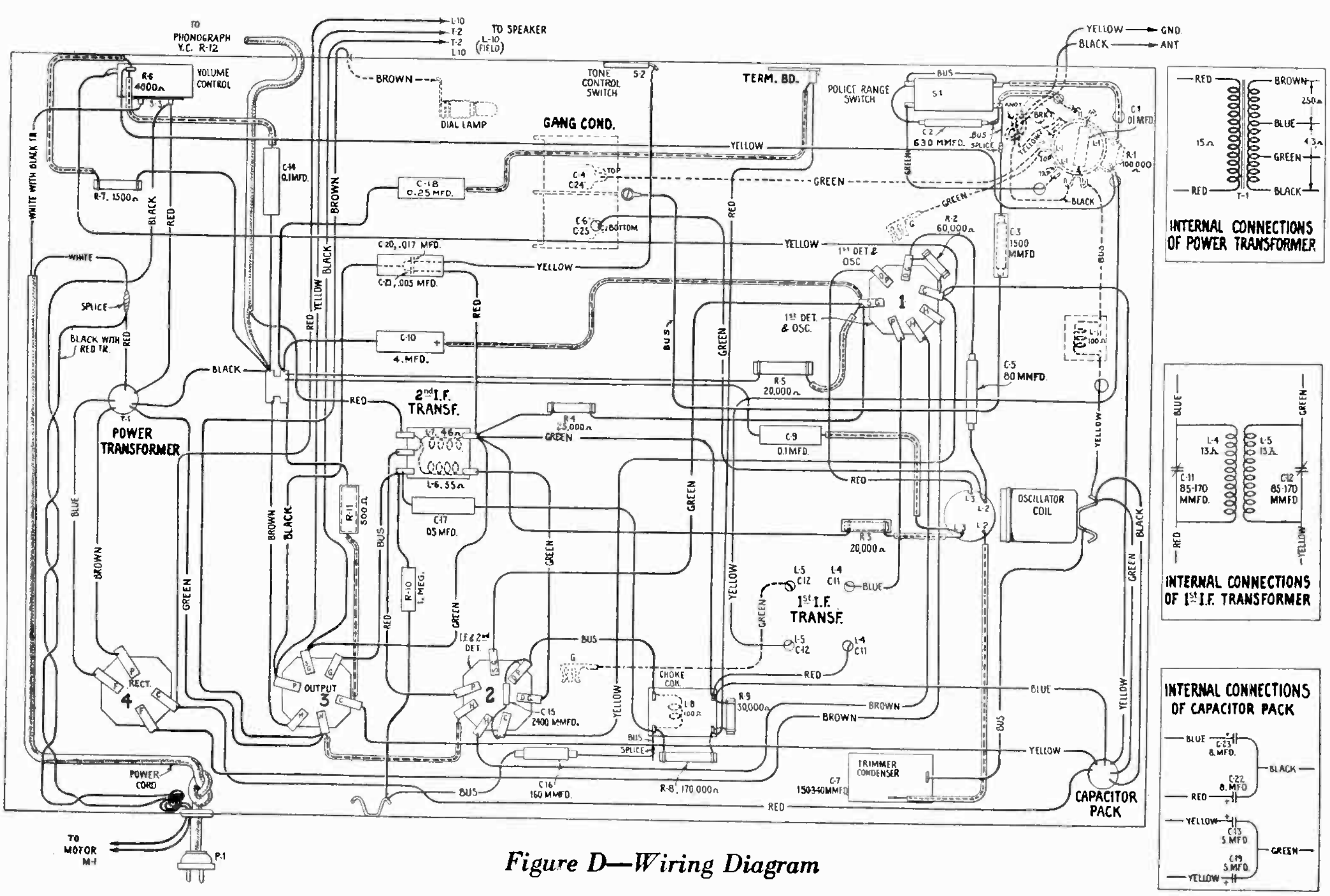


Figure D—Wiring Diagram

PHONOGRAPH MOTOR SERVICE DATA

The synchronous motor used in this instrument is of simple design and foolproof construction. Among its many features are low power consumption, single moving part, ease of starting, oilless main bearing, resilient bumper, and long life with freedom from service repairs.

Figure E shows the main parts of the motor and the points that may require attention.

Operation—The two stator coils are connected in series and the motor is started by giving it a clockwise spin with the hand. If it is found to be difficult of starting, or if it runs at a sub-synchronous speed such as at 70 R. P. M., such action may result from one of the following causes:

Difficult to Start—This may be due to the stator failing to rotate on the outer bearing. This can be caused by the spaghetti sleeve being jammed in the slot, or sticking to the resilient bumper. The outer bearing not being properly lubricated may also cause this condition. It is important that the ball bearing be at the bottom of the main bearing assembly.

Slow Speed—If the turntable is jarred or slowed down, the motor may run at a sub-synchronous speed, such as 70 R. P. M. This is remedied by merely lifting the tone arm from the turntable, thereby removing the load. The turntable speed will then immediately increase to normal.

Excessive Vibration and Hum—A small amount of hum when starting decreasing to a negligible amount while running is normal. If excessive vibration occurs either at starting or running, it may be due to one of the following:

(1) Insufficient lubricant in outer bearing or any other failure that will cause the stator to bind.

(2) The metal washer should be above the leather washer at the bottom of the main bearing.

(3) Motor not properly supported from motor board. Unless the motor is properly supported from the motor board, normal vibration will be excessive.

Removing Rotor from Stator—The rotor which includes the turntable may be removed by loosening the screw shown in Figure E until it clears the rotor and then lifting the turntable. Be careful not to lose the ball end-bearing when this is removed. After replacing the rotor, tighten the restraining screw securely to eliminate the possibility of rattle in operation.

Power Consumption—The motor consumes 4 watts. It should never be turned on when the rotor is removed, as in this condition excessive current will be drawn with consequent increase in temperature.

NOTE: The above values of power consumption are average for a 60 cycle motor at 125 volts. At lower voltages the power consumption will be less.

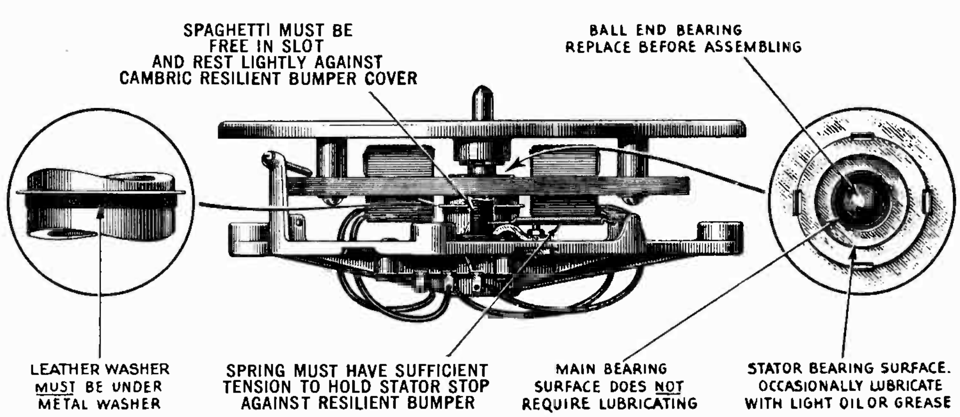


Figure E—Details of Motor

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
2747	Contact cap—Package of 5	$0.50
3047	Resistor—1500 ohms—Carbon type—½ watt (R7)—Package of 5	1.00
3076	Resistor—1 megohm—Carbon type—½ watt (R10)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1)—Package of 5	1.00
3077	Resistor—30,000 ohms—Carbon type—½ watt (R9)—Package of 5	1.00
3459	Capacitor—80 mmfd. (C5)	.44
3597	Capacitor—0.25 mfd. (C18)	.40
3572	Socket—7-contact Radiotron socket	.38
3584	Ring—Oscillator coil retaining ring—Package of 5	.40
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R2)—Package of 5	1.00
3603	Resistor—500 ohms—Carbon type—1 watt (R11)—Package of 5	1.10
3641	Capacitor—0.1 mfd. (C9)	.35
3682	Shield—Radiotron shield	.22
3701	Capacitor—0.01 mfd. (C1)	.30
3713	Capacitor—0.05 mfd. (C17)	.32
3857	Coil—Detector choke coil (L8)	.90
3858	Socket—Dial lamp socket and bracket	.26
3859	Socket—4-contact Radiotron socket	.30
3862	Screw—Chassis mounting screw and washer—Package of 4.	.24
3865	Capacitor—160 mmfd. (C16)	.30
3869	Resistor—170,000 ohms—Carbon type—½ watt (R8)—Package of 5	1.00
3873	Capacitor—1500 mmfd. (C3)	.30
3877	Capacitor—0.1 mfd. (C14)	.32
3886	Reflector—Dial light reflector	.30
3887	Scale—Dial scale—Package of 5	.60
3889	Resistor—25,000 ohms—Carbon type—3 watt (R4)	.25
3917	Capacitor—0.25 mfd. (C18)	.40
3932	Capacitor—2400 mmfd. (C15)	.30
3933	Capacitor—630 mmfd. (C2)	.32
4000	Capacitor—Adjustable capacitor (C7)	.78
4018	Coil—Choke coil (L11)	.90
6676	Socket—6-contact socket	.40
6787	Capacitor—Comprising one .005 mfd. and one .017 mfd. capacitors (C20, C21)	.30
6114	Resistor—20,000 ohms—Carbon type—1 watt (R3, R5)—Package of 5	1.10
6660	Condenser—2-gang variable condenser (C4, C6, C24, C25)	2.78
6661	Capacitor pack—Comprising two 5.0 mfd. and two 8.0 mfd. capacitors (C13, C19, C22, C23)	2.70
6662	Transformer—First intermediate frequency transformer (L4, L5, C11, C12)	2.34
6663	Transformer—Second intermediate frequency transformer (L6, L7)	1.06
6664	Coil—Oscillator coil (L2, L3)	.94
6665	Shield—Oscillator coil shield and mounting bracket	.34
6666	Coil—Antenna coil (L1, C1, R1)	1.08
6667	Volume control (R6, S3)	1.58
6668	Switch—Range switch (S1)	.58
6669	Switch—Tone control switch (S2)	$0.50
6832	Capacitor—4.0 mfd. (C10)	.85
9464	Transformer—Power transformer—105-125 volts—50-60 cycles (T1)	3.20
9465	Transformer—Power transformer—105-125 volts—25-40 cycles	4.38
	REPRODUCER ASSEMBLIES	
6788	Transformer—Output transformer (T2)	1.60
8987	Cone—Reproducer cone complete (L9)—Package of 5	5.00
9437	Coil assembly—Comprising field coil, magnet and cone support (L10)	2.72
9467	Reproducer complete	5.15
	TURNTABLE AND MOTOR ASSEMBLIES	
3808	Board—Motor terminal board	.20
4052	Spring—Package of 5	.40
3813	Motor suspension assembly—Comprising one screw, one metal bushing, two rubber bushings, one flat washer, one lockwasher and one nut—3 sets	.56
4083	Washer—Leather washer—Package of 10	.20
4084	Washer—Metal washer—Package of 10	.26
7651	Coil—Stator coil—60 cycle operation	.48
7652	Coil—Stator coil—50 cycle operation	.48
7653	Lamination—Stator laminations—Assembled—60 cycle operation—110 or 220 volts	.66
7654	Lamination—Stator laminations—Assembled—50 cycle operation	.66
7655	Lamination—Rotor lamination assembly—60 cycle operation	1.00
7656	Lamination—Rotor lamination assembly—50 cycle operation	1.00
7657	Base—Motor base and bearing assembly	1.20
7714	Lamination—Rotor laminations—Assembled—60 cycles—220 volts	1.76
7715	Coil—Stator coil—60 cycles—220 volts	.68
9038	Motor complete—105-125 volts—60 cycles	8.00
9039	Motor complete—105-125 volts—50 cycles	8.00
9040	Turntable complete—With spindle for 50 or 60 cycle operation	1.16
10194	Ball—Steel ball bearing—Package of 20	.25
	PICKUP AND ARM ASSEMBLIES	
3811	Screw—Needle holding screw—Package of 10	.46
3812	Armature	.32
6825	Pickup and arm assembly complete	4.82
6826	Coil—Pickup coil (L12)	.64
	MISCELLANEOUS PARTS	
3961	Knob—Phonograph volume control knob—Package of 5	.60
4087	Screw and washer—Chassis mounting screw and washer assembly—Package of 4	.22
4199	Knob—Station selector knob—Package of 5	.80
4200	Knob—Range switch, volume or tone control knob—Package of 5	1.05
6827	Volume control—Phonograph volume control (R12)	1.46
6828	Transformer—Phonograph input transformer (T3)	2.60

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Printed in U. S. A.

Instructions for

RCA Victor Duo 320

Six-Tube Superheterodyne "Selective Short-Wave" Combination

INTRODUCTION

This radio-phonograph combination contains a receiver operable throughout two tuning ranges, one covering the usual band of from 540 to 1500 kilocycles and the other covering a band of from 5400 to 15,350 kilocycles. Between the limits of the latter range are included four of the internationally-assigned short-wave broadcast bands, located at 49, 31, 25 and 19 meters, respectively. Thus, in addition to providing entertainment from the accustomed broadcasting stations, this instrument permits direct reception of programs from the principal short-wave broadcast transmitters located in all parts of the world.

Provisions for short-wave reception are built into the radio chassis—not simply connected to an existing chassis as a short-wave adaptor—resulting in distinctly superior performance. The tuning ranges are quickly interchangeable by means of a push-pull switch on the front of the cabinet. Other features contributing to tuning ease and accuracy are: (1) the "vernier" dual-ratio station selector drive, permitting either rapid or fine adjustments independently; and (2) the clock-type "full-vision" illuminated dial, calibrated directly in frequency for both ranges.

Facilities for the electrical reproduction of either standard speed (78 revolutions per minute) or long-playing (33⅓ R. P. M.) records of 12 inches diameter or less are accessible beneath the hinged lid of the cabinet. To insure uniform high-quality reproduction and satisfactory operation, Victor records should be used with this instrument.

INSTALLATION

Location—The instrument should be placed convenient to the antenna and ground connections and to an electrical outlet.

Phonograph—Raise the cabinet lid and withdraw all packing material from the playing compartment. Insert the used-needle cup (packed in outfit package) in the hole provided. With the speed-shifter (lever projecting toward front left-hand corner of motorboard) set in its 78 R. P. M. (outward) position, mount the turntable (also in outfit package) on the motor spindle. Make certain that the spindle drive key engages the slot in the turntable hub.

Chassis—Proper operation of the instrument can be assured only when the radio chassis rests lightly as intended upon its rubber support cushions. To prevent damage in shipment, the chassis is clamped rigidly to the cabinet; the support cushions are thus placed under compression and rendered ineffective. At installation, therefore, loosen the four clamping screws (accessible beneath the interior shelf) just sufficiently to permit free cushioning of the chassis.

Tubes—The instrument is equipped and tested at the factory with RCA Radiotrons and is shipped with these tubes installed. Before making the required external connections, however, it will be advisable to examine the tube installation as one or more of the tubes, shields or dome terminal clips may have been jarred loose in shipment. Refer to the tube location diagram printed on the rating label inside the cabinet and *make certain:*

(1) That all tubes are in the proper sockets and pressed down firmly.

(2) That all shields are rigidly in place over the tubes represented by double circles on the diagram.

(3) That the spring connectors of the short flexible (grid) leads, shown on the diagram, are securely attached to the dome terminals of the proper tubes.

NOTE—The grid lead for the RCA-2B7 must be enclosed by the cylindrical tube shield. A slot is provided at the bottom of this shield for entrance of the lead.

Antenna and Ground—The efficiency of any antenna varies greatly with the frequency of incoming radio waves, a given length being excellent at certain frequencies and comparatively poor at others. For uniform results throughout a wide tuning range such as found in this instrument, therefore, an antenna of adjustable length would be desirable theoretically. From a practical standpoint, however, very good results will be obtained using two antennas of different length, one 24–29 feet for short-wave reception and the other 50–100 feet for reception in the standard broadcast band (540–1500 kc), the lead-in considered as part of the total length in each case.

The shorter antenna may be used alone if preferred but probably will not be satisfactory for receiving distant or low-powered stations in the standard broadcast band. Further, no advantage will be gained by its use on the shorter wave lengths unless it can be installed so that the majority of its length is unshielded (not contained in a building of metallic construction) and sufficiently remote from sources of man-made interference (such as house-wiring, power lines, street-railways and passing automobiles) to prevent excessive noise. If these conditions cannot be fulfilled, it will be preferable to erect a single antenna of compromise length (100–105 feet overall) which, in addition to providing excellent results in the standard broadcast band, will also favor reception in the short-wave broadcast bands located at 49, 31, 25 and 19 meters.

Good reception in many installations will be obtained without connecting the instrument to an external ground since the power line characteristics often render a separate radio ground unnecessary. In any case, however, best results will be insured by grounding the set in the conventional manner to a water-pipe or radiator or to a metallic pipe or stake driven from five to eight feet into the soil. The ground lead when used should be short, preferably not more than 15 feet in length, and connected to a clean portion of the pipe or stake surface by means of an approved ground clamp.

A terminal board is provided at the rear of the receiver chassis for connecting to the antenna and ground. Connect the antenna lead to the left-hand terminal (marked "ANT") and the ground lead to the right-hand terminal (marked "GND"). Tighten the terminals with a screw driver to insure permanent electrical connections.

Power Supply—Connect the power cord of the instrument to an electrical outlet supplying alternating current at the voltage and frequency (cycles) specified on the rating label. While any voltage within the specified limits may be employed, a change in the internal connections will be required if the local voltage is less than 110 (for 105–125 volt models) or 220 (for 200–250 volt models). The alternative connections are shown in the Service Data section of this booklet and the changeover, when necessary, preferably should be made by the dealer. Consult your power company if you are in doubt as to the specific voltage or frequency of the supply.

OPERATION

Controls

The four control knobs on the front of the cabinet, in sequence from left to right, are:

(1) *Power Switch and Tone Control*—The power switch operates at the counter-clockwise end of the control range. A slight clockwise rotation actuates the switch, causing illumination of the dial—indicative of normal operation. Continued clockwise rotation increases the treble response gradually.

(2) *Volume Control*—Sound level (volume) increases upon rotation of this control in a clockwise direction.

(3) *Station Selector* (Dual Knob)—The large knob (adjacent to panel) should be used for rapid approximate settings of the dial pointer and the small outer knob for accurate or "vernier" adjustments. The lower end of the pointer traverses a calibrated scale which is applicable to either tuning range (*to obtain kilocycles from scale markings, add one cipher for standard broadcast band and two ciphers for short-wave range*). Selection of any available short-wave broadcast band is facilitated by alignment of the opposite end of the pointer with the proper bracketed segment on the upper half of the dial. These segments indicate the approximate extremities of each band and are identified with respect to nominal wavelength: 49, 31, 25 and 19 (meters).

(4) *Range Switch*—This switch is of push-pull construction and adapts the receiver for operation within either tuning range as follows:

(a) *Inward Position*—For standard broadcast band (540 to 1500 kilocycles).

(b) *Outward Position*—For short-wave range (5400 to 15,350 kilocycles).

A fifth knob is located in the phonograph playing compartment at the front right-hand corner of the motorboard. This control serves two functions as follows:

(5) *Transfer Switch and Record Volume Control*—The transfer switch operates at the counter-clockwise end of the control range. With the knob turned fully counter-clockwise, the switch is set for Radio operation. Clockwise rotation first transfers the circuits for Phonograph operation and then increases the sound level (volume) obtained from records.

Radio Procedure

The actual operation is simple and not unlike that of more conventional instruments designed for the reception of standard broadcast programs alone. However, the full possibilities of any short-wave receiver cannot be attained until the user has a practical knowledge of short-wave transmission behavior and operating schedules. It is therefore recommended that the appended Notes on Short-Wave Reception be studied carefully.

A brief outline of the recommended operating procedure should suffice. See the foregoing description of the controls and proceed as follows:

1. Set the Transfer Switch counter-clockwise for Radio operation and the Range Switch for the frequency range within which the desired station is included.

2. Turn the Power Switch "on" and adjust the Tone Control to its extreme clockwise position—*for full-range reproduction.* Wait a few seconds in order that the tubes may attain the proper temperature before attempting further operation.

3. Advance the Radio Volume Control to a position near the middle of its range and rotate the Station Selector until the dial indicator assumes a position coincident with the listed frequency of the desired station. Then with the vernier control (small knob), turn the selector *very slowly* over a narrow range on each side of that setting, advancing the volume control further in a clockwise direction and repeating the tuning process, if necessary, until the signal is heard.

NOTE—This procedure is important—especially so for short-wave reception. Because of the wide band of frequencies covered by the short-wave range, tuning is critical (sharp). A station of suitable strength often will be imperceptible if passed through rapidly or in a haphazard manner.

4. After receiving the signal, turn the Radio Volume Control counter-clockwise until the volume is reduced to a low level. Then readjust the Station Selector accurately to the position mid-way between the points where the quality becomes poor or the signal disappears. *This setting minimizes the proportion of background noise and provides the fine quality of reproduction possible with this instrument.*

5. Adjust the Radio Volume Control to the desired volume level.

NOTE—*The automatic volume control* built into this instrument maintains the volume level substantially constant irrespective of normal fluctuations of signal strength (fading). Also, other stations with good signal strength will be received at approximately the same level without manual readjustment of the volume.

6. Turn the Tone Control counter-clockwise if decreased treble response is preferred or to reduce noise interference if excessive.

7. When through operating, return the Tone Control to its counter-clockwise extremity, thus switching "off" the power.

Phonograph Procedure

To operate the electrical phonograph, refer to the section on "Controls" and proceed as follows:

1. Turn the Transfer Switch and Record Volume Control knob clockwise, for phonograph operation.

2. Apply power by turning the Tone Control clockwise from the "off" position. Set this control in the extreme clockwise position for *full-range* reproduction. A few seconds are required for the tubes to heat before operation is possible.

3. Place the desired record on the turntable. Insert a *new* needle in the pickup as far as it will go and tighten the needle screw. For long-playing (33⅓ R. P. M.) records, use *only* the *orange Chromium* needle. For standard (78 R. P. M.) records, use the latter needle or, if preferred, either the *green Chromium* or the full volume *Tungstone* needle. Ordinary steel needles (full volume) can be used with standard (78 R. P. M.) records, provided a new needle is inserted for each selection.

NOTE—With care, the *orange* Chromium needle should play 25, the *green* Chromium 75 to 100, and the Tungstone 100 to 200 records. *Never re-insert in the pickup a Chromium needle which has been used (however slightly), as damage to the record grooves would result.* Do not use *Tungstone* needles with thin, flexible records or with transparent-faced (illustrated) records.

4. Pull the starting lever (right-hand side of turntable) forward to start the motor. Set the speed shifter (left-hand side of turntable) for the speed—78 or 33⅓ R. P. M.—corresponding to the record on the turntable. Then place the needle on the smooth outer surface of the record and slide it into the first groove.

NOTE—The speed shifter should not be moved inward (from the 78 to the 33⅓ R. P. M. position) while the turntable is at rest.

5. Adjust the Record Volume Control to obtain the desired volume.

6. For most faithful reproduction, the Tone Control should be left in the fully clockwise position while using the phonograph. Turning this control counter-clockwise decreases the treble response and reduces the needle scratch noise (particularly noticeable with old records) reproduced by the loudspeaker.

7. At the completion of the record, lift the pickup arm and move it toward the right to stop the motor (motor stops automatically at the end of a record having the *eccentric* final groove). Lower the pickup outside the turntable—never allow it to rest on the record (or turntable) when not operating the phonograph.

8. When through operating, close the lid and turn the power switch "off."

Lubrication—The motor should be lubricated with light oil once every six months. Two oil holes on top of the motor are accessible through openings in the motorboard when the turntable is removed. The ball-bearing mechanism under the turntable should be lubricated once a year by prying off the cover and packing with vaseline or light motor grease, being careful to prevent any dirt particles from entering with the grease. Make sure that the speed shifter is in the outward (78 R. P. M.) position before replacing the turntable on the spindle.

NOTES ON SHORT-WAVE RECEPTION

While the design of this instrument is such that no previous experience or special skill is required for proper operation, its full possibilities can be realized only by those familiar with the general characteristics of transmission on the shorter wave-lengths. The following notes are a summary of extensive data compiled mainly by experimentation and should be found both interesting and helpful, especially to beginners in the field of short-wave reception.

Broadcast transmission at 49 meters is most reliable when received from a distance of 300 miles (500 kilometers) or more, although good reception at distances greater than 1500 miles (2400 kilometers) can be expected only when a large portion of the signal path lies in darkness.

Thirty-one (31) meter stations afford greatest reliability of service to receivers situated at a distance exceeding 800 miles (1300 kilometers). Good reception from distant stations in this band is possible both day and night.

Reception from stations operating in the 25 meter band is most common when a span of 1000 miles (1600 kilometers) or more separates the receiver and transmitter. Such transmission over distances of less than 2000 miles (3200 kilometers), will be received best during daylight hours. The more distant stations, however, can still be heard well after nightfall under favorable conditions.

In the 19 meter band, stations situated at a distance of 1500 miles (2400 kilometers) or greater will be found most satisfactory. Signals in this band will generally be heard during daylight hours—rarely after nightfall or when any appreciable portion of the transmission path is in darkness. Wave-lengths below 19 meters are useful only when transmitted entirely through daylight and over long distances (2000 miles or more); ordinarily they cannot be received after sunset.

Transmitted signals of any wave-length are known to divide into two components—the "ground" wave and the "sky" wave. The former remains close to the earth's surface, providing reliable service only over short distances from the broadcasting station. The sky wave, however, travels into the higher layers of the atmosphere and is reflected back to the earth's surface at an appreciable distance from the station. With short-wave signals, the sky wave usually does not return within the radius covered by the ground wave, resulting in a so-called dead-spot region within which reception is impossible or extremely unsatisfactory. The length of the region wherein such conditions are effective is known as the skip distance, varying greatly from day to night and from summer to winter approximately as shown in Table I.

When attempting to receive distant or foreign stations, the time standards observed at various longitudes throughout the world must be considered. At 8:00 P. M. in New York or 7:00 P. M. in Chicago, it is of the next day—1:00 A. M. in London, 2:00 A. M. in most of Europe and 11:00 A. M. in Australia. On the American continents, therefore, regular evening broadcasts from Europe will be received in the late afternoon and from Australia in the early morning. Special programs, however, are frequently transmitted from European stations at times chosen for evening reception in America.

Although reception on the short wave-lengths is less affected by atmospherics or static and good results may be had in midsummer even during a thunder storm, the reverse is true of man-made interference. Electrical machinery such as trolleys, dial telephones, motors, electric fans, automobiles, airplanes, electrical appliances, flashing signs and oil burners create far more interference to the shorter waves than to frequencies in the standard broadcast band (200 to 555 meters).

While the foregoing statements are valid, many other factors may so influence the transmission of short waves that exceptions are probable in certain locations. Experience in the operation of short-wave receivers in a given location is the best guide as to what to expect in reception at various times.

Table I—Effect of Time of Day and Season of Year on Short-Wave Transmission*

Wave-length (Meters)	Ground Wave Range		Sky Wave (Mid-Summer) Approximate Range				Sky Wave (Mid-Winter) Approximate Range			
			Noon		Midnight		Noon		Midnight	
	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.
100	90	145	—90	—145	90—600	145—960	90—100	145—160	90—2500	145—4000
49	75	120	100—200	160—320	250—5000	400—8000	200—600	320—960	400—∞	640—∞
31	60	97	200—700	320—1125	1000—∞	1600—∞	500—2000	800—3200	1500—∞	2400—∞
25	50	80	300—1000	480—1600	1500—∞	2400—∞	600—3000	960—4800	2000—∞	3200—∞
19	35	56	400—2000	640—3200	2500—∞	4000—∞	900—4000	1450—6400	X	X
15	15	24	700—4000	1125—6400	X	X	1500—∞	2400—∞	X	X

∞—Unlimited distance.

X—Ordinarily cannot be heard.

* Time and season apply to transmitting station. Distances specified are based on relatively high-power transmission and favorable conditions of reception.

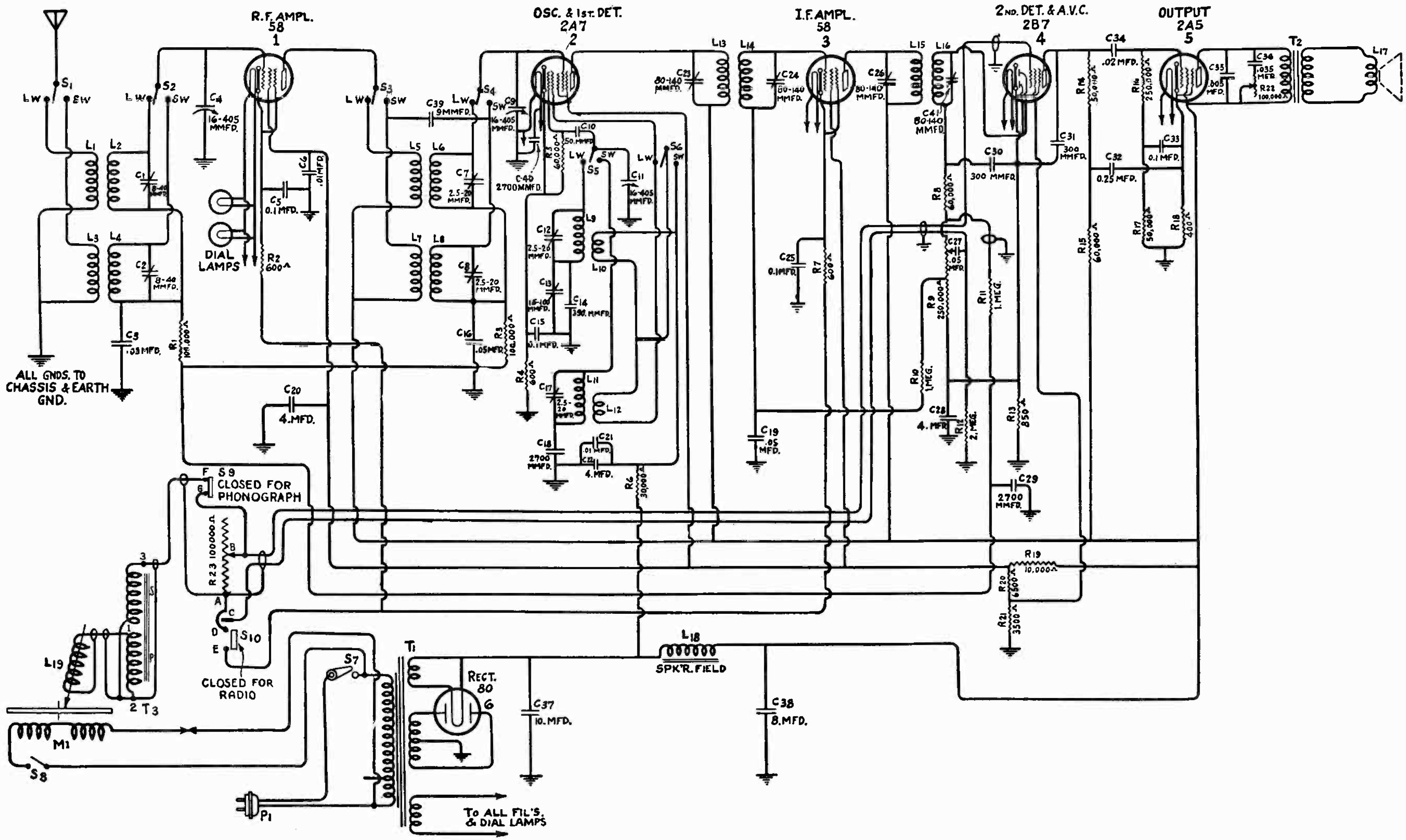

Figure A—Schematic Circuit Diagram

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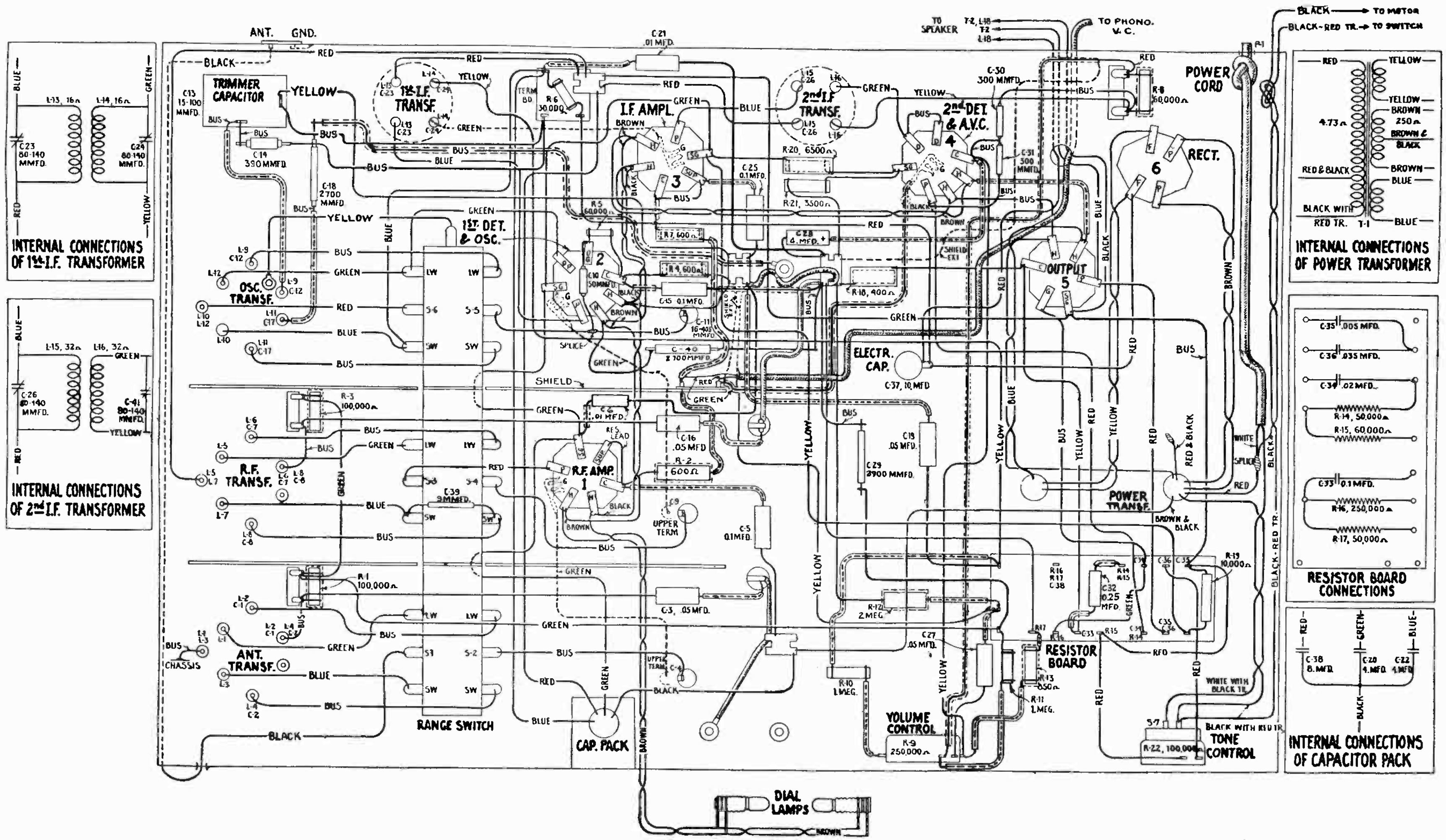

Figure B—Wiring Diagram

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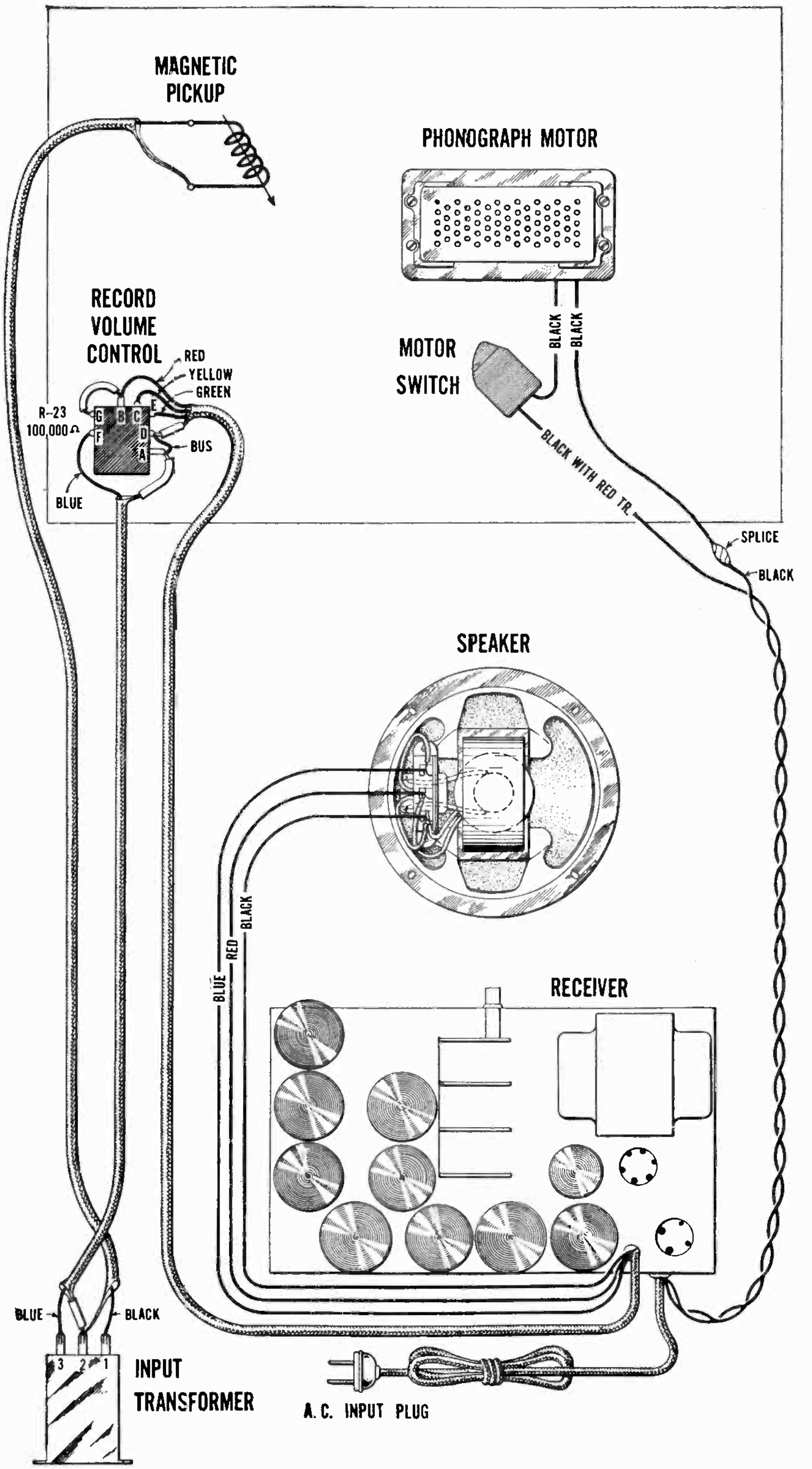
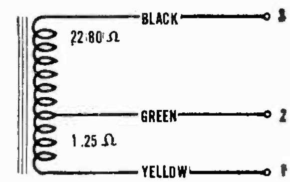
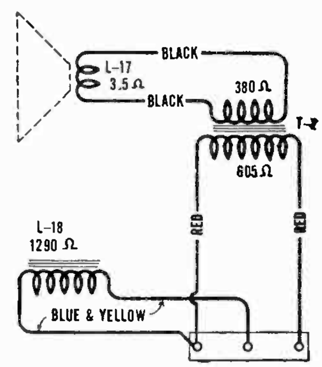




INTERNAL CONNECTIONS OF INPUT TRANSFORMER



INTERNAL CONNECTIONS OF SPEAKER

Figure C—Assembly Wiring Diagram

SERVICE DATA

Electrical Specifications

Voltage Rating..105–125 Volts
Frequency Rating................................25, 50 and 60 Cycles
Power Consumption....50 and 60 Cycle, 100 Watts; 25 Cycle 105 Watts
Number and Type of Radiotrons............................2 RCA-58
1 RCA-2A7 1 RCA-2B7 1 RCA-2A5 1 RCA-80—Total 6.
Tuning Ranges.........540 K. C.–1500 K. C.—5400 K. C.–15,350 K. C.
Undistorted Output......................................1.75 Watts

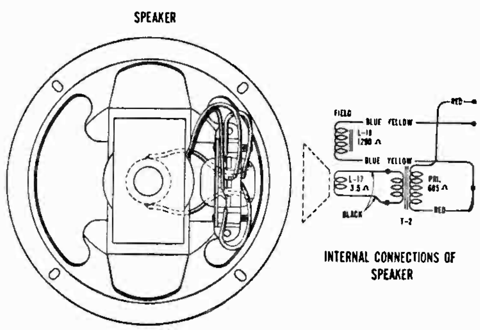


Figure D—Loudspeaker Wiring

This "Selective Short-Wave" combination instrument utilizes the new six tube double band superheterodyne together with the standard two-speed motor board assembly. Excellent quality of record reproduction together with unusual radio performance characterize this instrument.

The receiver is a six-tube two-band A. C. operated Superheterodyne receiver combining the standard and short-wave broadcasting bands. The frequency ranges are selected by means of a two position switch. Other features include a double reduction vernier tuning drive using two concentric knobs giving a 10–1 and a 55–1 ratio of speed reduction, a continuously variable tone control, six-inch electrodynamic loudspeaker, automatic volume control, single Pentode output tube and the inherent sensitivity, selectivity and tone quality of the Superheterodyne.

The chassis is of compact construction, affording unusual accessibility to all parts and adjustments. An "Airplane" type dial calibrated in frequency and showing the location of the short-wave bands is a special feature of this instrument. Figure A shows the schematic circuit, Figure B the wiring diagram, Figure C the assembly wiring and Figure D the loudspeaker wiring. Service data on the magnetic pickup is given on one of the following pages.

Line-Up Capacitor Adjustments

In order to properly align this receiver it is essential that Stock No. 9050 Test Oscillator be used. This oscillator covers the frequencies of 150 K. C. to 25,000 K. C. continuously, has good stability and includes an attenuator. In addition to the oscillator, a non-metallic screwdriver such as Stock No. 7065 and an output meter are required. The output meter should be preferably a thermo-couple galvanometer connected across or in place of the cone coil of the loudspeaker.

I. F. Tuning Adjustments—Two transformers comprising four tuned circuits are used in the intermediate amplifier. These are tuned to 370 K. C. and the adjustment screws are accessible as shown in Figure D. Proceed as follows:

(a) Short-circuit the antenna and ground terminals and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the chassis.

(b) Connect the test oscillator output between the first detector control grid, and chassis ground. Connect the output meter across the voice coil of the loudspeaker and adjust the oscillator output so that, with the receiver volume control at maximum, a slight deflection is obtained in the output meter.

(c) Adjust the secondary and primary of the first and then the second I. F. transformers until a maximum deflection is obtained. Keep the oscillator output at a low value so that only a slight deflection is obtained on the output meter at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. adjustments.

R. F. and Oscillator Adjustments—The R. F. line-up capacitors are located at the bottom of the coil assemblies instead of their usual position on the gang capacitor. They are all accessible from the bottom of the chassis except the 600 K. C. series capacitor, which is accessible from the rear of the chassis. Proceed as follows:

(a) Connect the output of the oscillator to the antenna and ground terminals of the receiver. Check the position of the indicator pointer when the tuning capacitor plates are fully meshed. It should be coincident with the radial line adjacent to the dial reading of 54. Then set the Test Oscillator at 1400 K. C., the dial indicator at 140 and the oscillator output so that a slight deflection will be obtained in the output meter when the volume control is at its maximum position.

(b) With the Range Switch at the "in" position, adjust the three trimmers under the three R. F. coils designated as L. W. in Figure D, until a maximum deflection is obtained in the output meter. Then shift the Test Oscillator frequency to 600 K. C. The trimmer capacitor accessible from the rear of the chassis should now be adjusted for maximum output while rocking the main tuning capacitor back and forth through the signal. Then repeat the 1400 K. C. adjustment.

(c) Now place the Range Switch at the "out" position, shift the Test Oscillator to 15,000 K. C. and set the dial at 150. Adjust the three trimmer capacitors designated as SW in Figure D for a peak, beginning with the oscillator trimmer. It will be noted that the oscillator and first detector trimmers will have two peaks. The position which uses the lower trimmer capacitance, obtained by turning the screw counter-clockwise, is the proper adjustment for the oscillator while the position that uses a higher capacitance is correct for the detector. *Both of these adjustments must be made as indicated irrespective of output.* The R. F. is merely peaked. In conjunction with the detector adjustment, it is necessary to rock the main tuning capacitor back and forth while making the adjustment. This completes the line-up adjustments.

The important points to remember are the need for using the minimum oscillator output to obtain a deflection in the output meter with the volume control at its maximum position and the manner of obtaining the proper high frequency oscillator and detector adjustments.

Power Transformer Connections

The power transformer used in this model has a tapped primary winding. The transformer is normally connected for lines ranging in voltage from 110 to 125 volts. If for any reason the line is normally below 110 volts, the connections should be changed so the tap will be used. This is done by unsoldering the black with red tracer transformer lead connected to the power switch (on tone control) and substituting the red and black lead normally taped up. The black with red tracer lead should then be carefully taped to prevent short-circuit.

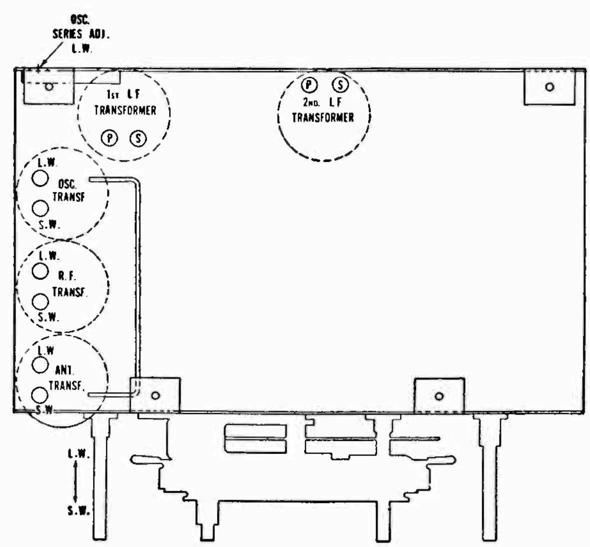


Figure E—Location of Line-Up Capacitors

TUBE SOCKET VOLTAGES (RADIO OPERATION)

115 VOLTS, A. C. Line—No Signal

Radiotron No.	Cathode to Control Grid, Volts	Cathode to Screen Grid, Volts	Cathode to Plate, Volts	Plate Current M. A.	Heater Volts
1. RCA-58 R. F.	3.0	100	265	6.0	2.32
2. RCA-2A7 1st Det. Osc.	3.0	100*	265*	2.0*	2.32
3. RCA-58 I. F.	3.0	100	265	6.0	2.32
4. RCA-2B7 2nd Det. A. V. C.	1.5	35	100	1.5	2.32
5. RCA-2A5 Power	16.0	255	240	35.0	2.32
6. RCA-80 Rectifier	725 Volts R. M. S.—75 M. A. Total Current				4.80

* The voltages and current refer to the detector part of the tube.

SERVICE DATA FOR MAGNETIC PICKUP

The Magnetic Pickup used in this combination instrument is of a new design with an improved frequency range. While in physical appearance it is similar to that of the older type, details of construction are considerably different. It consists essentially of a chromium steel magnet, two thin pole pieces, a mechanism support and bracket, a coil, and an armature that is damped by means of an anchored damping block.

The use of the anchored damping block eliminates any bad peaks in the frequency range. The frequency-response characteristic is substantially flat from 50 to 5,000 cycles.

Replacing Magnet Coil, Pivot Rubbers, Armature or Damping Block

In order to replace a defective coil or the hardened pivot rubbers (see Figure G), it is necessary to proceed as follows:

(a) Remove the pickup cover by removing the center holding screw and needle screw.

(b) Remove the pickup magnet and the magnet clamp by pulling them forward.

(c) Unsolder the coil leads and remove the mechanism assembly from the back plate by releasing the two mounting screws and the damping block clamping screw.

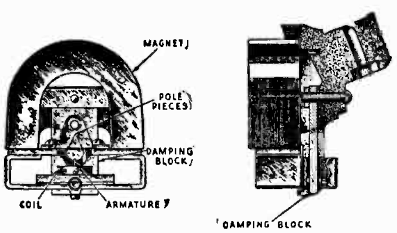


Figure F

(d) Remove screws A and B, Figure G, and then remove the mechanism assembly from the pole pieces.

(e) The coil or the front pivot rubber may now be removed and replaced. If it is desired to replace the rear pivot rubber, then the end of the armature soldered to the mechanism support must be unsoldered and the damping block removed. The rear pivot rubber now may be replaced. After putting the pivot rubbers in place a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block.

(f) The mechanism should now be reassembled, except for the magnet, which must be magnetized. After being magnetized, the mechanism—with the pole pieces upward—should be placed so that the magnet may be slid from the magnetizer onto the pole pieces without breaking physical contact. After placing the pole pieces on the magnet, the entire assembly should be remagnetized thoroughly, being careful not to change the polarity obtained by the initial magnetization.

(g) After assembling to the mechanism, the entire assembly should be fastened to the back plate by means of the screws provided, making sure the damping block is securely clamped. At the same time, the metal dust cover must be placed in position.

(h) After remagnetizing, it is necessary to correctly center the armature. This may be done quite accurately by feeling its play after the needle is inserted. A little practice will quickly show which way an adjustment is necessary to have the armature centered properly. The adjustment is made by loosening screws A and B (Figure G), and sliding the mechanism slightly in relation to the pole pieces.

(i) The cover may be now replaced over the entire assembly, and the pickup returned to the tone arm.

In assembling, it may be desirable to check the armature air gap by means of a small Feeler Gauge. This air gap should be nine mils on each side of the armature. However, a little practice with the needle in place will quickly disclose whether or not the armature is centered.

Replacing the Damping Block

If it is desired to replace the damping block, it may be done in the following manner:

(a) Disassemble the pickup as described under the preceding section.

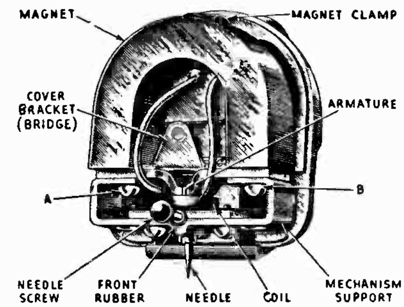


Figure G

(b) Remove the armature entirely by unsoldering it at its joint with the mechanism support.

(c) Remove the damping block from the armature and clean the bushing for holding the damping block with emery paper.

(d) Insert the armature through the new block so that it occupies the same position as that of the old. Also ascertain that the block is in correct vertical alignment with the armature. It will be noted that the hole in the damping block is somewhat smaller than the diameter of the armature. This is done so that a snug fit will be obtained.

(e) After properly locating the damping block, a soldering iron should be applied to the armature so that the block will melt slightly at its point of contact with the armature. A special tip, constructed as shown in Figure H, will prove desirable for fusing the block in place. The iron should be applied long enough to slightly melt the block and cause a small bulge on both sides, but should not be applied long enough to cause any bubbling. The pickup should then be reassembled as described in the preceding section.

Only rosin core solder should be used for soldering the coil leads in the pickup. Also rosin core solder should be satisfactory for resoldering the end of the spring in the hole in the mechanism, since both these parts have been previously tinned. In case the parts are not well tinned, it will be necessary to scrape the end of the spring and the hole in the mechanism until bright. These parts may now be tinned by using as a flux a water solution of zinc chloride (commonly called

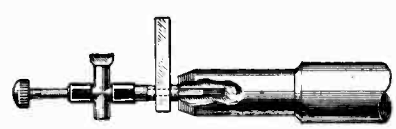


Figure H

acid flux). After tinning, dip the parts in water to wash off the acid flux and thereby prevent serious subsequent corrosion. After making sure that the pivot rubbers and damping block are properly in place, as described under (e) above, the armature may now be soldered in place in the mechanism by using rosin core solder, since the parts are now tinned. Care must be exercised to get the needle hole perfectly square with respect to the mechanism, or otherwise it will be difficult if not impossible to center the armature in the airgap as explained under (h).

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
2240	Resistor—30,000 ohms—Carbon type—1 watt (R6)	$0.22
2747	Cap—Contact cap—Package of 5	.50
3056	Shield—Second detector Radiotron shield—Package of 2	.40
3076	Resistor—1 megohm—Carbon type—½ watt (R10, R11)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1, R3)—Package of 5	1.00
3470	Resistor—6,500 ohms—Carbon type—1 watt (R20)—Package of 5	1.10
3514	Resistor—250,000 ohms—Carbon type—½ watt (R16)—Package of 5	1.00
3529	Socket—Dial lamp socket	.32
3572	Socket—7-contact Radiotron socket	.38
3594	Resistor—50,000 ohms—Carbon type—½ watt (R14, R17)—Package of 5	1.00
3631	Resistor—850 ohms—Carbon type—½ watt (R13)—Package of 5	1.00
3639	Capacitor—0.02 mfd. (C34)	.25
3683	Shield—Radiotron shield top	.20
3701	Capacitor—0.01 mfd. (C6, C21)	.30
3702	Capacitor—0.25 mfd. (C32)	.42
3768	Screw—Square head No. 6–32–¼″ set screw for condenser drive—Package of 10	.35
3796	Capacitor—4.0 mmfd. (C28)	.60
3849	Capacitor—50 mmfd. (C10)	.30
3859	Socket—4-contact Radiotron socket	.30
3861	Capacitor—Adjustable capacitor (C13)	.78
3877	Capacitor—0.1 mfd. (C5, C15, C25, C33)	.32
3878	Screw—No. 4–40–3/16″ screw for fastening station selector pointer—Package of 20	.25
3881	Escutcheon—Volume control escutcheon	.42
3888	Capacitor—0.05 mfd. (C19, C27)	.25
3892	Resistor—600 ohms—Carbon type—½ watt (R2, R4, R7)—Package of 5	1.00
3897	Resistor—400 ohms—Carbon type—1 watt (R18)—Package of 5	1.10
3899	Escutcheon—Station selector escutcheon	.42
3901	Capacitor—0.05 mfd. (C3, C16)	.36
3902	Knob—Station selector knob complete	.44
3903	Screw—No. 8–32–3/16″ headless cup point set screw for station selector knob—Package of 20	.36
3904	Knob—Volume control knob—Package of 5	.88
3905	Screw—Chassis mounting screw assembly—Comprising 4 screws, 4 washers and 4 cushions	.46
3906	Mounting assembly—Variable condenser mounting assembly—Comprising 3 bushings, 3 lockwashers, 3 nuts and 3 washers	.28
3935	Capacitor—340 mmfd. (C14)	.34
3936	Capacitor—3,900 mmfd. (C18, C29, C40)	.68
3937	Capacitor—300 mmfd. (C30, C31)	.34
3938	Capacitor—9 mmfd. (C39)	.25
3939	Resistor—3,500 ohms—Carbon type—½ watt (R21)—Package of 5	1.00
3940	Pointer—Station selector pointer—Package of 5	.50
3941	Dial—Station selector dial—Package of 5	1.75
3942	Shield—First detector Radiotron shield	.18
3943	Screen—Translucent screen for dial light—Package of 2	.18
3944	Shield—Antenna, R. F. or oscillator coil shield	.28
3991	Resistor—10,000 ohms—Porcelain type (R19)	.60
4160	Trimmer adjustment wrench and screwdriver	1.00
6188	Resistor—2 megohm—Carbon type—½ watt (R12)—Package of 5	1.00
6282	Resistor—60,000 ohms—Carbon type—½ watt (R5, R8, R15)—Package of 5	1.00
6571	Capacitor—10 mmfd. (C37)	1.20
6620	Capacitor—Comprising one .005 mfd. and one .035 mfd. (C35, C36)	.50
6676	Socket—6-contact Radiotron socket—Output	.40
6694	Condenser—3-gang variable tuning condenser (C4, C9, C11)	3.75
6695	Volume control (R9)	1.20
6696	Switch—Range switch (S1, S2, S3, S4)	2.24
6697	Transformer—First intermediate frequency transformer (L13, L14, C23, C24)	1.80
6698	Transformer—Second intermediate frequency transformer (L15, L16, C26)	1.78
6699	Coil—R. F. coil (L5, L6, L7, L8, C7, C8)	2.44
6700	Coil—Oscillator coil (L9, L10, L11, L12, C12, C17)	2.30
6701	Coil—Antenna coil (L1, L2, L3, L4, C1, C2)	2.64
6702	Drive—Variable tuning condenser drive assembly complete	1.86
6703	Capacitor pack—Comprising one 8.0 mmfd. and two 4.0 mmfd. capacitors (C20, C22, C38)	2.46
6704	Shaft—Tuning condenser drive assembly shaft	.64
6705	Tone control complete (R22)	1.20
6707	Glass—Station selector dial glass	.20
6708	Ring—Retaining ring for dial glass—Package of 5	.44
6755	Bezel—Metal bezel for station selector dial	.50

Stock No.	DESCRIPTION	List Price
7485	Socket—6-contact Radiotron socket	$0.40
7487	Shield—I. F. and R. F. amplifier Radiotron shield	.25
9446	Transformer—Power transformer—105–125 volts—50–60 cycles (T1)	5.40
9451	Transformer—Power transformer—105–125 volts—25–40 cycles	5.40
10194	Ball—Steel ball for condenser drive assembly—Pkg. of 20	.25
	PICKUP, PICKUP ARM ASSEMBLIES	
3385	Coil—Pickup coil	.50
3386	Cover—Pickup cover	.56
3387	Screw assembly—Pickup mounting screw assembly—Comprising one screw, one nut and one washer—10 sets	.40
3388	Screw—Pickup needle holding screw—Pkg. of 10	.60
3389	Rod—Automatic brake trip rod with lock nut—Package of 5	.40
3390	Escutcheon—Pickup arm escutcheon complete with mounting rivets	.46
3417	Armature—Pickup armature	.72
3418	Cushions—Pickup rubber cushions—Comprising one damper and two spacer cushions and one damper bushing—Package of 5 sets	1.10
3419	Screw—Pickup cover mounting screw—Package of 10	.40
6335	Pickup—Pickup unit complete	4.00
6346	Back—Pickup housing back	.45
7693	Arm—Pickup arm complete less escutcheon, pickup, pickup mounting screw, nut and washer	6.00
	TURNTABLE ASSEMBLIES	
3261	Bushing—Rubber bushing—Used on turntable spindle for long-playing records—Package of 5	.40
3338	Ring—Clamp ring assembly—Comprising spring, latch lever and stud	.50
3340	Washer—Thrust washer—Package of 2	.56
3341	Pin—Groov-Pin—Package of 2	.56
3342	Spring—Latch spring—Located on clamping ring—Package of 2	.56
3343	Sleeve—Sleeve complete with ball race	2.86
3344	Cover—Grease retainer cover—Package of 2	.70
3346	Bushing—Speed shifter lever bushing—Package of 4	.66
3347	Spring—Speed shifter lever spring—Package of 2	.30
3399	Lever—Speed shifter lever with mounting screws	.50
7084	Cover—Suede cover for turntable	.40
8948	Turntable—Complete	5.50
	MOTOR ASSEMBLIES	
3599	Motor mounting washer assembly—Comprising one screw, one washer and one lockwasher—Package of 3 sets	.30
8989	Motor—Motor complete—105–125 volts—60 cycles	18.52
8990	Motor—Motor complete—105–125 volts—50 cycles	18.52
8991	Motor—Motor complete—105–125 volts—40 cycles	23.36
8992	Motor—Motor complete—105–125 volts—25 cycles	23.36
8993	Rotor and shaft for 105–125 volts, 60 cycles motor	7.00
8994	Spindle—Turntable spindle with fibre gear for 60 cycles motor	4.75
8995	Rotor and shaft for 105–125 volts, 50 cycles motor	7.00
8996	Spindle—Turntable spindle with fibre gear for 50 cycles motor	4.75
8997	Rotor and shaft for 105–125 volts, 40 cycles motor	8.00
8998	Spindle—Turntable spindle with fibre gear for 40 cycles motor	5.50
8999	Rotor and shaft for 105–125 volts, 25 cycles motor	8.00
9001	Spindle—Turntable spindle with fibre gear for 25 cycles motor	5.50
	MISCELLANEOUS PARTS	
2947	Leather—Friction leather—Package of 20	.50
3322	Switch—Automatic brake switch with mounting screws (S8)	.75
3430	Box—Needle box with lid—Package of 2	.90
3615	Knob—Tone control, range switch, or phonograph volume control knob—Package of 5	.60
3994	Cover—Motor starting switch cover	.26
6757	Volume control—Phonograph volume control (R23, S9, S10)	2.70
6758	Transformer—Phonograph input transformer (T3)	2.70
6888	Cable—3-conductor reproducer cable	3.20
9050	Oscillator—Test oscillator—150 to 25,000 K. C.	29.50†
10174	Springs—Automatic brake springs—One set of 4 springs	.50
10184	Plate—Automatic brake latch trip plate with mounting screws—Package of 5	.40
	REPRODUCER ASSEMBLIES	
6476	Transformer—Output transformer (T2)	1.44
9428	Cone—Reproducer cone complete (L17)—Package of 5	5.00
9449	Reproducer complete	5.20
9450	Coil—Field coil magnet and cone support (L18)	2.80

.0725 † Full discount not allowed. PL 67

RCA Victor Company, Inc.
Camden, N. J., U. S. A.

23702 Printed in U. S. A.

Instructions for

RCA Victor Duo 321

Six-Tube Superheterodyne "Selective Short-Wave" Combination

INTRODUCTION

This radio-phonograph combination contains a receiver operable throughout two tuning ranges, one covering the usual band of from 540 to 1500 kilocycles and the other covering a band of from 5400 to 15,350 kilocycles. Between the limits of the latter range are included four of the internationally-assigned short-wave broadcast bands, located at 49, 31, 25 and 19 meters, respectively. Thus, in addition to providing entertainment from the accustomed broadcasting stations, this instrument permits direct reception of programs from the principal short-wave broadcast transmitters located in all parts of the world.

Provisions for short-wave reception are built into the radio chassis—not simply connected to an existing chassis as a short-wave adaptor—resulting in distinctly superior performance. The tuning ranges are quickly interchangeable by means of a push-pull switch on the front of the cabinet. Other features contributing to tuning ease and accuracy are: (1) the "vernier" dual-ratio station selector drive, permitting either rapid or fine adjustments independently; and (2) the clock-type "full-vision" illuminated dial, calibrated directly in frequency for both ranges.

Facilities for the electrical reproduction of either standard speed (78 revolutions per minute) or long-playing (33⅓ R. P. M.) records of 12 inches diameter or less are accessible beneath the hinged lid of the cabinet. To insure uniform high-quality reproduction and satisfactory operation, Victor records should be used with this instrument.

INSTALLATION

Preliminary—After withdrawing the instrument from its shipping container and removing the packing framework bolted to the underside of the cabinet, extract the interior wooden brace fastened by screws to the radio chassis shelf. Also remove the two red hex-head bolts which pass through the mounting rails and withdraw the two wooden blocks from between those rails and the motorboard, which should then float freely on its spring suspension.

Tubes—The instrument is equipped and tested at the factory with RCA Radiotrons and is shipped with these tubes installed. Remove the strip of tape which protects the rectifier (RCA-80) tube against damage in transit, then refer to the tube location diagram printed on the rating label attached to the rear of the receiver chassis and *make certain:*

(a) That all tubes are in the proper sockets and pressed down firmly. *Never apply power to the instrument unless all tubes are in place.*

(b) That the shields are rigidly in place over those tubes represented by double circles on the diagram.

(c) That the spring connectors of the short flexible (grid) leads shown on the diagram are securely attached to the dome terminals of the proper tubes.

NOTE—The grid lead for the RCA-2B7 must be enclosed by the cylindrical tube shield. A slot is provided at the bottom of this shield for entrance of the lead.

(d) That the lid is securely in place on the shield of that tube designated by a heavy outer circle on the diagram.

Phonograph—Raise the cabinet lid and remove all packing material from the playing compartment. Withdraw the turntable and used-needle cup from the Outfit Package and insert the latter in the opening provided in the motorboard. With the speed-shifter (lever projecting toward front left-hand corner of motor-board) set in its 78 R. P. M. (outward) position, mount the turntable on the motor spindle. Make certain that the spindle drive key engages the slot in the turntable hub.

Location—The instrument should be placed convenient to the antenna and ground connections and near an electrical outlet.

Antenna and Ground—The efficiency of any antenna varies greatly with the frequency of incoming radio waves, a given length being excellent at certain frequencies and comparatively poor at others. For uniform results throughout a wide tuning range such as found in this instrument, therefore, an antenna of adjustable length would be desirable theoretically. From a practical standpoint, however, very good results will be obtained using two antennas of different length, one 24–29 feet for short-wave reception and the other 50–100 feet for reception in the standard broadcast band (540–1500 kc), the lead-in considered as part of the total length in each case.

The shorter antenna may be used alone if preferred, but probably will not be satisfactory for receiving distant or low-powered stations in the standard broadcast band. Further, no advantage will be gained by its use on the shorter wave lengths unless it can be installed so that the majority of its length is unshielded (not contained in a building of metallic construction) and sufficiently remote from sources of man-made interference (such as house-wiring, power lines, street-railways and passing automobiles) to prevent excessive noise. If these conditions cannot be fulfilled, it will be preferable to erect a single antenna of compromise length (100–105 feet overall) which, in addition to providing excellent results in the standard broadcast band, will also favor reception in the short-wave broadcast bands located at 49, 31, 25 and 19 meters.

Good reception in many installations will be obtained without connecting the instrument to an external ground, since the power line characteristics often render a separate radio ground unnecessary. In any case, however, best results will be insured by grounding the set in the conventional manner to a water-pipe or radiator or to a metallic pipe or stake driven from five to eight feet into the soil. The ground lead, when used, should be short, preferably not more than 15 feet in length, and connected to a clean portion of the pipe or stake surface by means of an approved ground clamp.

A terminal board is provided at the rear of the receiver chassis for connecting to the antenna and ground. Attach the antenna lead to the left-hand terminal (marked "ANT") and the ground lead to the right-hand terminal (marked "GND"). Tighten the terminals with a screw driver to insure permanent electrical connections.

Power Supply—Connect the power cord of the instrument to an electrical outlet supplying alternating current at the voltage and frequency (cycles) specified on the rating label. While any voltage within the specified limits may be employed, a change in the internal connections will be required if the local voltage is less than 110 (for 105–125 volt models) or 220 (for 200–250 volt models). The alternative connections are shown in the Service Data section of this booklet and the changeover, when necessary, preferably should be made by the dealer. Consult your power company if you are in doubt as to the specific voltage or frequency of the supply.

OPERATION

Controls

The four control knobs on the front of the cabinet, in sequence from left to right, are:

(1) ***Power Switch and Tone Control***—The power switch operates at the counter-clockwise end of the control range. A slight clockwise rotation actuates the switch, causing illumination of the dial—indicative of normal operation. Continued clockwise rotation increases the treble response gradually.

(2) ***Volume Control***—Sound level (volume) increases upon rotation of this control in a clockwise direction.

(3) ***Station Selector*** (Dual Knob)—The large knob (adjacent to panel) should be used for rapid approximate settings of the dial pointer and the small outer knob for accurate or "vernier" adjustments. The lower end of the pointer traverses a scale calibrated directly in kilocycles to facilitate the selection of stations transmitting in the standard broadcast band (540 to 1500 kc.). Stations in the short-wave range (5400 to 15,350 kc.), however, should be located with the upper end of the pointer which passes over a scale calibrated in "megacycles" (thousands of kilocycles). Bracketed segments adjacent to the upper scale indicate the positions and approximate spans of the short-wave broadcast bands, each being identified with respect to its nominal wave length: 49 M, 31 M, 25 M and 19 M (meters).

(4) ***Range Switch***—This switch is of push-pull construction and adapts the receiver for operation within either tuning range as follows:

(a) *Inward Position*—For standard broadcast band (540 to 1500 kilocycles).

(b) *Outward Position*—For short-wave range (5400 to 15,350 kilocycles).

A fifth knob is located in the phonograph playing compartment at the front right-hand corner of the motorboard. This control serves two functions as follows:

(5) ***Transfer Switch and Record Volume Control***—The transfer switch operates at the counter-clockwise end of the control range. With the knob turned fully counter-clockwise, the switch is set for Radio operation. Clockwise rotation first transfers the circuits for Phonograph operation and then increases the sound level (volume) obtained from records.

Radio Procedure

The actual operation is simple and not unlike that of more conventional instruments designed for the reception of standard broadcast programs alone. However, the full possibilities of any short-wave receiver cannot be attained until the user has a practical knowledge of short-wave transmission behavior and operating schedules. It is therefore recommended that the appended Notes on Short-Wave Reception be studied carefully.

A brief outline of the recommended operating procedure should suffice. See the foregoing description of the controls and proceed as follows:

1. Set the Transfer Switch counter-clockwise for Radio operation, and the Range Switch for the frequency range within which the desired station is included.

2. Turn the Power Switch "on" and adjust the Tone Control to its extreme clockwise position—*for full-range reproduction.* Wait a few seconds in order that the tubes may attain the proper temperature before attempting further operation.

3. Advance the Radio Volume Control to a position near the middle of its range and rotate the Station Selector until the dial indicator assumes a position coincident with the listed frequency of the desired station. Then with the vernier control (small knob), turn the selector *very slowly* over a narrow range on each side of that setting, advancing the volume control further in a clockwise direction and repeating the tuning process, if necessary, until the signal is heard.

> NOTE—This procedure is important—especially so for short-wave reception. Because of the wide band of frequencies covered by the short-wave range, tuning is critical (sharp). A station of suitable strength often will be imperceptible if passed through rapidly or in a haphazard manner.

4. After receiving the signal, turn the Radio Volume Control counter-clockwise until the volume is reduced to a low level. Then readjust the Station Selector accurately to the position mid-way between the points where the quality becomes poor or the signal disappears. *This setting minimizes the proportion of background noise and provides the fine quality of reproduction possible with this instrument.*

5. Adjust the Radio Volume Control to the desired volume level.

> NOTE—*The automatic volume control* built into this instrument maintains the volume level substantially constant irrespective of normal fluctuations of signal strength (fading). Also, other stations with good signal strength will be received at approximately the same level without manual readjustment of the volume.

6. Turn the Tone Control counter-clockwise if decreased treble response is preferred or to reduce noise interference if excessive.

7. When through operating, return the Tone Control to its counter-clockwise extremity, thus switching "off" the power.

Phonograph Procedure

To operate the electrical phonograph, refer to the section on "Controls" and proceed as follows:

1. Turn the Transfer Switch and Record Volume Control knob clockwise, for phonograph operation.

2. Apply power by turning the Tone Control clockwise from the "off" position. Set this control in the extreme clockwise position for *full-range* reproduction. A few seconds are required for the tubes to heat before operation is possible.

3. Place the desired record on the turntable. Insert a *new* needle in the pickup as far as it will go and tighten the needle screw. For long-playing (33⅓ R. P. M.) records, use *only* the *orange Chromium* needle. For standard (78 R. P. M.) records, use the latter needle or, if preferred, either the *green Chromium* or the full volume *Tungstone* needle. Ordinary steel needles (full volume) can be used with standard (78 R. P. M.) records, provided a new needle is inserted for each selection.

> NOTE—With care, the *orange* Chromium needle should play 75, the *green* Chromium 100, and the Tungstone 100 to 150 records. *Never re-insert in the pickup a Chromium needle which has been used (however slightly), as damage to the record grooves would result.* Do not use *Tungstone* needles with thin, flexible records or with transparent-faced (illustrated) records.

4. Pull the starting lever (right-hand side of turntable) forward to start the motor. Set the speed shifter (left-hand side of turntable) for the speed—78 or 33⅓ R. P. M.—corresponding to the record on the turntable. Then place the needle on the smooth outer surface of the record and slide it into the first groove.

> NOTE—The speed shifter should not be moved inward (from the 78 to the 33⅓ R. P. M. position) while the turntable is at rest.

5. Adjust the Record Volume Control to obtain the desired volume.

6. For most faithful reproduction, the Tone Control should be left in the fully clockwise position while using the phonograph. Turning this control counter-clockwise decreases the treble response and reduces the needle scratch noise (particularly noticeable with old records) reproduced by the loudspeaker.

7. At the completion of the record, lift the pickup arm and move it toward the right to stop the motor (motor stops automatically at the end of a record having the *eccentric* final groove). Lower the pickup outside the turntable—never allow it to rest on the record (or turntable) when not operating the phonograph.

8. When through operating, close the lid and turn the power switch "off."

Lubrication—The motor should be lubricated with light oil once every six months. Two oil holes on top of the motor are accessible through openings in the motorboard when the turntable is removed. The ball-bearing mechanism under the turntable should be lubricated once a year by prying off the cover and packing with vaseline or light motor grease, being careful to prevent any dirt particles from entering with the grease. Make sure that the speed shifter is in the outward (78 R. P. M.) position before replacing the turntable on the spindle.

NOTES ON SHORT-WAVE RECEPTION

While the design of this instrument is such that no previous experience or special skill is required for proper operation, its full possibilities can be realized only by those familiar with the general characteristics of transmission on the shorter wave-lengths. The following notes are a summary of extensive data compiled mainly by experimentation and should be found both interesting and helpful, especially to beginners in the field of short-wave reception.

Broadcast transmission at 49 meters is most reliable when received from a distance of 300 miles (500 kilometers) or more, although good reception at distances greater than 1500 miles (2400 kilometers) can be expected only when a large portion of the signal path lies in darkness.

Thirty-one (31) meter stations afford greatest reliability of service to receivers situated at a distance exceeding 800 miles (1300 kilometers). Good reception from distant stations in this band is possible both day and night.

Reception from stations operating in the 25 meter band is most common when a span of 1000 miles (1600 kilometers) or more separates the receiver and transmitter. Such transmission over distances of less than 2000 miles (3200 kilometers) will be received best during daylight hours. The more distant stations, however, can still be heard well after nightfall under favorable conditions.

In the 19 meter band, stations situated at a distance of 1500 miles (2400 kilometers) or greater will be found most satisfactory. Signals in this band will generally be heard during daylight hours—rarely after nightfall or when any appreciable portion of the transmission path is in darkness. Wave-lengths below 19 meters are useful only when transmitted entirely through daylight and over long distances (2000 miles or more); ordinarily they cannot be received after sunset.

Transmitted signals of any wave-length are known to divide into two components—the "ground" wave and the "sky" wave. The former remains close to the earth's surface, providing reliable service only over short distances from the broadcasting station. The sky wave, however, travels into the higher layers of the atmosphere and is reflected back to the earth's surface at an appreciable distance from the station. With short-wave signals, the sky wave usually does not return within the radius covered by the ground wave, resulting in a so-called dead-spot region within which reception is impossible or extremely unsatisfactory. The length of the region wherein such conditions are effective is known as the skip distance, varying greatly from day to night and from summer to winter approximately as shown in Table I.

When attempting to receive distant or foreign stations, the time standards observed at various longitudes throughout the world must be considered. At 8:00 P. M. in New York or 7:00 P. M. in Chicago, it is of the next day—1:00 A. M. in London, 2:00 A. M. in most of Europe and 11:00 A. M. in Australia. On the American continents, therefore, regular evening broadcasts from Europe will be received in the late afternoon and from Australia in the early morning. Special programs, however, are frequently transmitted from European stations at times chosen for evening reception in America.

Although reception on the short wave-lengths is less affected by atmospherics or static and good results may be had in midsummer even during a thunder storm, the reverse is true of man-made interference. Electrical machinery such as trolleys, dial telephones, motors, electric fans, automobiles, airplanes, electrical appliances, flashing signs and oil burners create far more interference to the shorter waves than to frequencies in the standard broadcast band (200 to 555 meters).

While the foregoing statements are valid, many other factors may so influence the transmission of short waves that exceptions are probable in certain locations. Experience in the operation of short-wave receivers in a given location is the best guide as to what to expect in reception at various times.

Any person interested primarily in short-wave reception will find membership in the International Short-Wave Club of great value. The club is a non-commercial organization and issues a monthly magazine (International Short-Wave Radio) which contains up-to-date information pertaining to short-wave broadcasting, amateur activities and commercial, police and aircraft services. The annual membership fee, including the magazine subscription, is one dollar ($1.00), U. S. Currency; single copies of the periodical may be procured by non-members for ten cents ($0.10). U. S. Currency, each. Address International Short-Wave Club, P. O. Box 713, Klondyke, Ohio, U. S. A.

Table I—Effect of Time of Day and Season of Year on Short-Wave Transmission*

Wave-length (Meters)	Ground-Wave Range		Sky Wave (Mid-Summer) Approximate Range				Sky Wave (Mid-Winter) Approximate Range			
			Noon		Midnight		Noon		Midnight	
	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.
100	90	145	—90	—145	90—600	145—960	90—100	145—160	90—2500	145—4000
49	75	120	100—200	160—320	250—5000	400—8000	200—600	320—960	400—∞	640—∞
31	60	97	200—700	320—1125	1000—∞	1600—∞	500—2000	800—3200	1500—∞	2400—∞
25	50	80	300—1000	480—1600	1500—∞	2400—∞	600—3000	960—4800	2000—∞	3200—∞
19	35	56	400—2000	640—3200	2500—∞	4000—∞	900—4000	1450—6400	X	X
15	15	24	700—4000	1125—6400	X	X	1500—∞	2400—∞	X	X

∞—Unlimited distance. X—Ordinarily cannot be heard.

*Time and season apply to transmitting station. Distances specified are based on relatively high-power transmission and favorable conditions of reception.

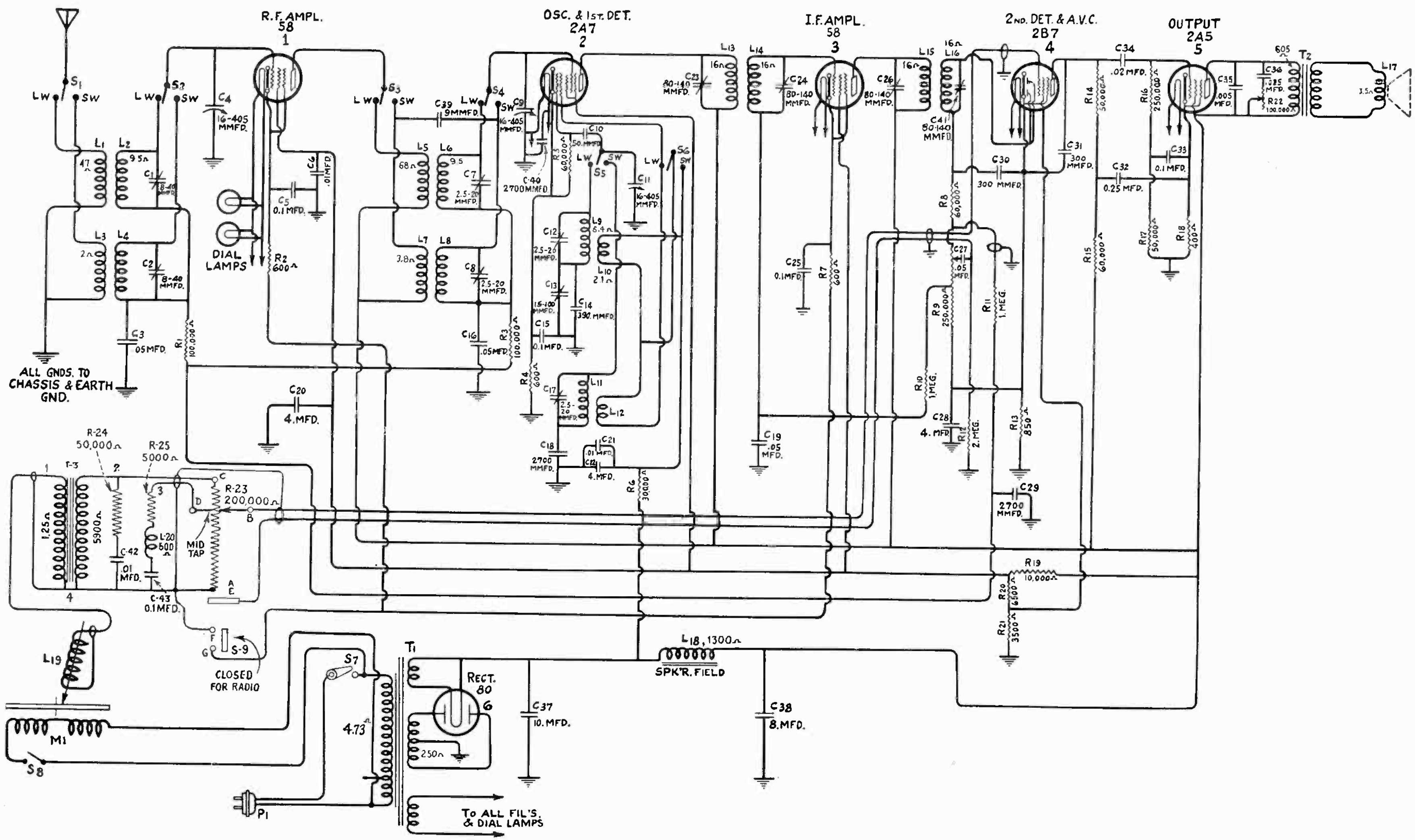


Figure A—Schematic Circuit Diagram

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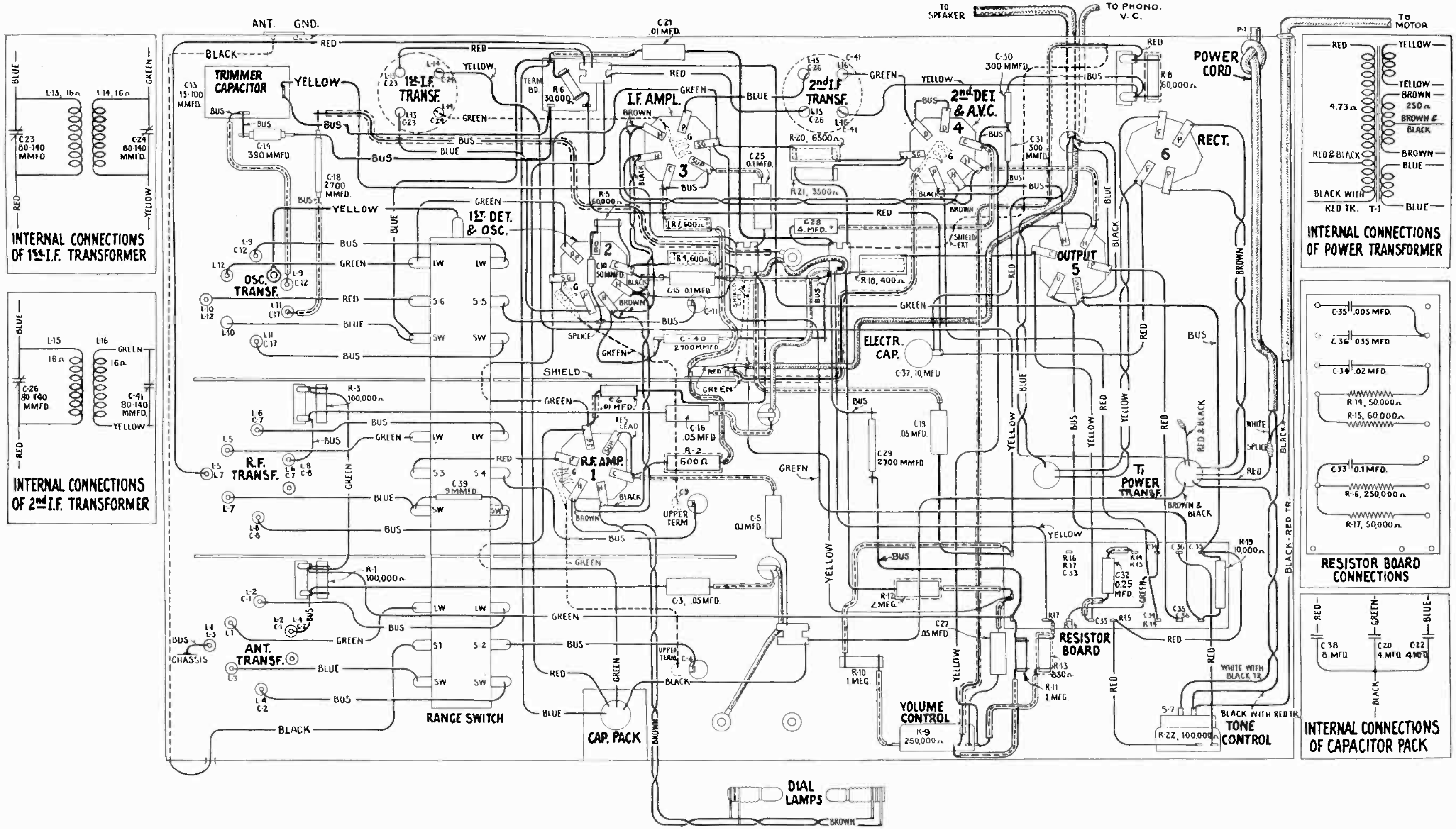

Figure B—Chassis Wiring Diagram

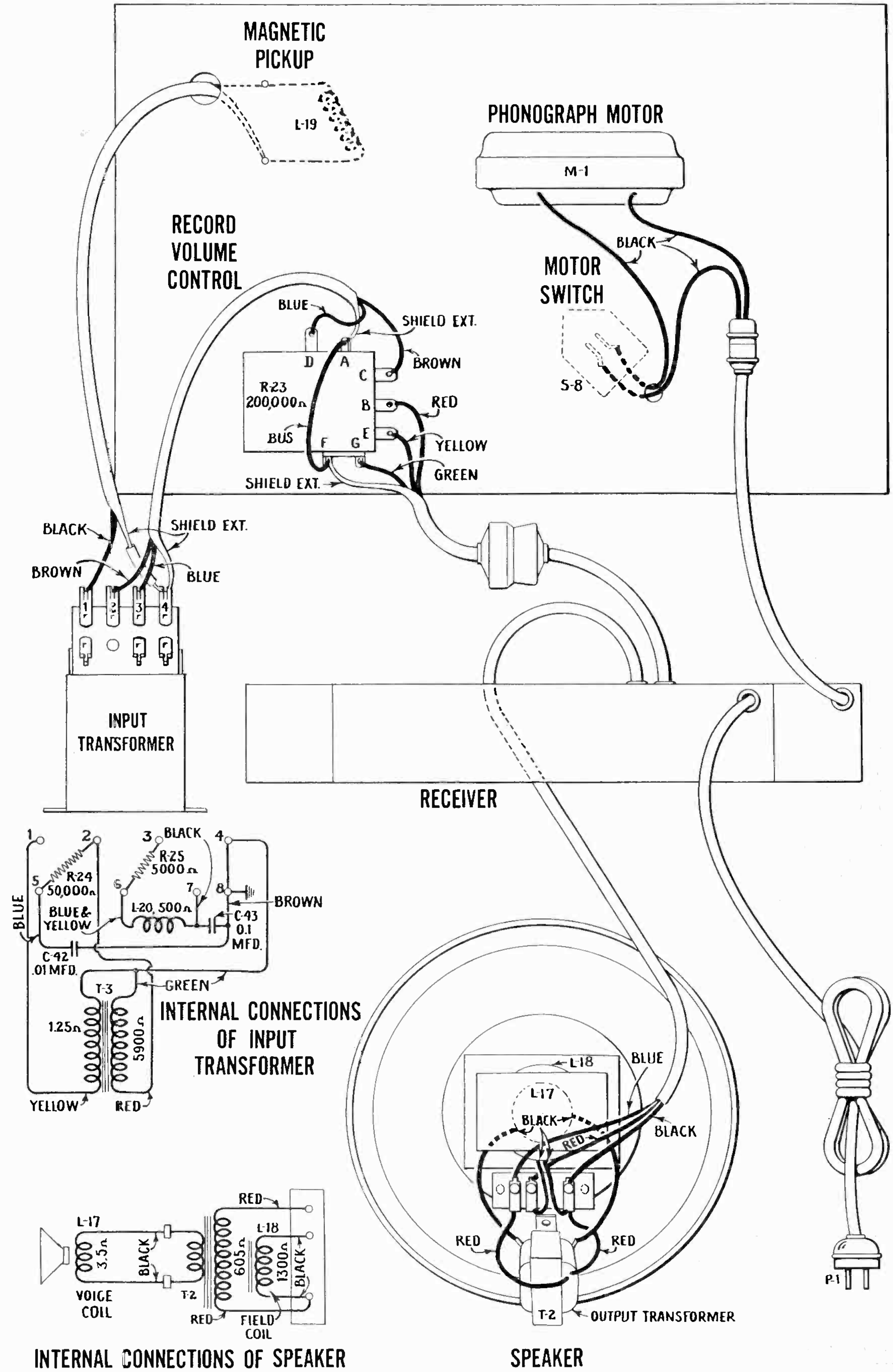

Figure C—Assembly Wiring Diagram

SERVICE DATA

Electrical Specifications

Voltage Rating....................................105–125 Volts
Frequency Rating .... 25, 30. 50 and 60 Cycles
Power Consumption . . 30, 50 and 60 Cycle, 105 Watts; 25 Cycle, 110 Watts
Number and Type of Radiotrons..........................2 RCA-58
1 RCA-2A7, 1 RCA-2B7, 1 RCA-2A5, 1 RCA-80—Total 6
Tuning Ranges...... 540 K. C.–1500 K. C. and 5400 K. C.–15,350 K. C.
Undistorted Output....................................1.75 Watts

This "Selective Short-Wave" combination instrument utilizes the new six-tube double band superheterodyne together with the standard two-speed motor board assembly. Excellent quality of record reproduction, together with unusual radio performance, characterizes this instrument.

The receiver is a six-tube two-band A. C. operated Superheterodyne receiver combining the standard and short-wave broadcasting bands. The frequency ranges are selected by means of a two-position switch. Other features include a double reduction vernier tuning drive using two concentric knobs giving a 10–1 and a 55–1 ratio of speed reduction, a continuously variable tone control, eight-inch electrodynamic loudspeaker, automatic volume control, single Pentode output tube and the inherent sensitivity, selectivity and tone quality of the Superheterodyne.

The chassis is of compact construction, affording unusual accessibility to all parts and adjustments. An "Airplane" type dial calibrated in frequency and showing the location of the short-wave bands is a special feature of this instrument. Figure A shows the schematic circuit, Figure B the wiring diagram, Figure C the assembly wiring and Figure D the location of the line-up capacitors. Service data on the magnetic pickup is given on one of the following pages.

Line-Up Capacitor Adjustments

In order to properly align this receiver it is essential that Stock No. 9050 Test Oscillator be used. This oscillator covers the frequencies of 150 K. C. to 25,000 K. C. continuously, has good stability and includes an attenuator. In addition to the oscillator, a non-metallic screwdriver such as Stock No. 7065 and an output meter are required. The output meter should be preferably a thermo-couple galvanometer connected across or in place of the cone coil of the loudspeaker.

I. F. Tuning Adjustments—Two transformers comprising four tuned circuits are used in the intermediate amplifier. These are tuned to 370 K. C. and the adjustment screws are accessible as shown in Figure D. Proceed as follows:

(a) Short-circuit the antenna and ground terminals and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the chassis.

(b) Connect the test oscillator output between the first detector control grid, and chassis ground. Connect the output meter across the voice coil of the loudspeaker and adjust the oscillator output so that, with the receiver volume control at maximum, a slight deflection is obtained in the output meter.

(c) Adjust the secondary and primary of the first and then the second I. F. transformers until a maximum deflection is obtained. Keep the oscillator output at a low value so that only a slight deflection is obtained on the output meter at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. adjustments.

R. F. and Oscillator Adjustments—The R. F. line-up capacitors are located at the bottom of the coil assemblies instead of their usual position on the gang capacitor. They are all accessible from the bottom of the chassis except the 600 K. C. series capacitor, which is accessible from the rear of the chassis. Proceed as follows:

(a) Connect the output of the oscillator to the antenna and ground terminals of the receiver. Check the position of the indicator pointer when the tuning capacitor plates are fully meshed. It should be coincident with the radial line adjacent to the dial reading of 540. Then set the Test Oscillator at 1400 K. C., the dial indicator at 1400 and the oscillator output so that a slight deflection will be obtained in the output meter when the volume control is at its maximum position.

(b) With the Range Switch at the "in" position, adjust the three trimmers under the three R. F. coils designated as L. W. in Figure D, until a maximum deflection is obtained in the output meter. Then shift the Test Oscillator frequency to 600 K. C. The trimmer capacitor accessible from the rear of the chassis should now be adjusted for maximum output while rocking the main tuning capacitor back and forth through the signal. Then repeat the 1400 K. C. adjustment.

(c) Now place the Range Switch at the "out" position, shift the Test Oscillator to 15,000 K. C. and set the dial at 15 on megacycle scale. Adjust the three trimmer capacitors designated as S.W. in Figure D for a peak, beginning with the oscillator trimmer. It will be noted that the oscillator and first detector trimmers will have two peaks. The position which uses the lower trimmer capacitance, obtained by turning the screw counter-clockwise, is the proper adjustment for the oscillator while the position that uses a higher capacitance is correct for the detector. *Both of these adjustments must be made as indicated irrespective of output.* The R. F. is merely peaked. In conjunction with the detector adjustment, it is necessary to rock the main tuning capacitor back and forth while making the adjustment. This completes the line-up adjustments.

The important points to remember are the need for using the minimum oscillator output to obtain a deflection in the output meter with the volume control at its maximum position and the manner of obtaining the proper high frequency oscillator and detector adjustments.

Power Transformer Connections

The power transformer used in this model has a tapped primary winding. The transformer is normally connected for lines ranging in voltage from 110 to 125 volts. If for any reason the line is normally below 110 volts,

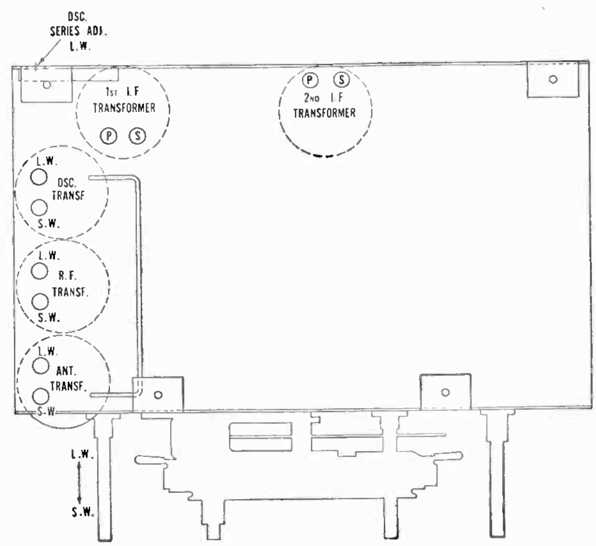

Figure D—Location of Line-Up Capacitors

the connections should be changed so the tap will be used. This is done by unsoldering the black with red tracer transformer lead connected to the power switch (on tone control) and substituting the red and black lead normally taped up. The black with red tracer lead should then be carefully taped to prevent short-circuit.

TUBE SOCKET VOLTAGES (RADIO OPERATION)

115 VOLTS, A. C. Line—No Signal

Radiotron No.	Cathode to Control Grid, Volts	Cathode to Screen Grid, Volts	Cathode to Plate, Volts	Plate Current M. A.	Heater Volts
1. RCA-58 R. F.	3.0	100	265	6.0	2.32
2. RCA-2A7 1st Det. Osc.	3.0	100*	265*	2.0*	2.32
3. RCA-58 I. F.	3.0	100	265	6.0	2.32
4. RCA-2B7 2nd Det. A. V. C.	1.5	35	100	1.5	2.32
5. RCA-2A5 Power	16.0	255	240	35.0	2.32
6. RCA-80 Rectifier	725 Volts R. M. S.—75 M. A. Total Current				4.80
* The voltages and current refer to the detector part of the tube.					

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SERVICE DATA ON MAGNETIC PICKUP

The Magnetic Pickup used in this combination instrument is of a new design with an improved frequency range. While in physical appearance it is similar to that of the older type, details of construction are considerably different. It consists essentially of a chromium steel magnet, two thin pole pieces, a mechanism support and bracket, a coil, and an armature that is damped by means of an anchored damping block.

The use of the anchored damping block eliminates any bad peaks in the frequency range. The frequency-response characteristic is substantially flat from 50 to 5,000 cycles.

Replacing Magnet Coil, Pivot Rubbers, Armature or Damping Block

In order to replace a defective coil or the hardened pivot rubbers (see Figure F), it is necessary to proceed as follows:

(a) Remove the pickup cover by removing the center holding screw and needle screw.

(b) Remove the pickup magnet and the magnet clamp by pulling them forward.

(c) Unsolder the coil leads and remove the mechanism assembly from the back plate by releasing the two mounting screws and the damping block clamping screw.

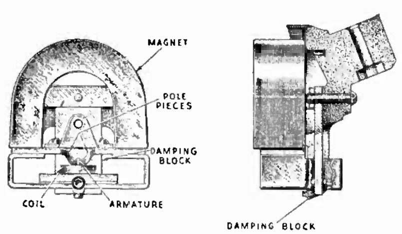


Figure E

(d) Remove screws A and B, Figure F, and then remove the mechanism assembly from the pole pieces.

(e) The coil or the front pivot rubber may now be removed and replaced. If it is desired to replace the rear pivot rubber, then the end of the armature soldered to the mechanism support must be unsoldered and the damping block removed. The rear pivot rubber now may be replaced. After putting the pivot rubbers in place a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block.

(f) The mechanism should now be reassembled, except for the magnet, which must be magnetized. After being magnetized, the mechanism—with the pole pieces upward—should be placed so that the magnet may be slid from the magnetizer onto the pole pieces without breaking physical contact. After placing the pole pieces on the magnet, the entire assembly should be remagnetized thoroughly, being careful not to change the polarity obtained by the initial magnetization.

(g) After assembling to the mechanism, the entire assembly should be fastened to the back plate by means of the screws provided, making sure the damping block is securely clamped. At the same time, the metal dust cover must be placed in position.

(h) After remagnetizing, it is necessary to correctly center the armature. This may be done quite accurately by feeling its play after the needle is inserted. A little practice will quickly show which way an adjustment is necessary to have the armature centered properly. The adjustment is made by loosening screws A and B (Figure F), and sliding the mechanism slightly in relation to the pole pieces.

(i) The cover may be now replaced over the entire assembly, and the pickup returned to the tone arm.

In assembling, it may be desirable to check the armature air gap by means of a small Feeler Gauge. This air gap should be nine mils on each side of the armature. However, a little practice with the needle in place will quickly disclose whether or not the armature is centered.

Replacing the Damping Block

If it is desired to replace the damping block, it may be done in the following manner:

(a) Disassemble the pickup as described under the preceding section.

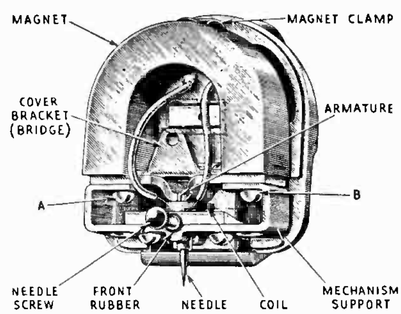


Figure F

(b) Remove the armature entirely by unsoldering it at its joint with the mechanism support.

(c) Remove the damping block from the armature and clean the bushing for holding the damping block with emery paper.

(d) Insert the armature through the new block so that it occupies the same position as that of the old. Also ascertain that the block is in correct vertical alignment with the armature. It will be noted that the hole in the damping block is somewhat smaller than the diameter of the armature. This is done so that a snug fit will be obtained.

(e) After properly locating the damping block, a soldering iron should be applied to the armature so that the block will melt slightly at its point of contact with the armature. A special tip, constructed as shown in Figure G, will prove desirable for fusing the block in place. The iron should be applied long enough to slightly melt the block and cause a small bulge on both sides, but should not be applied long enough to cause any bubbling. The pickup should then be reassembled as described in the preceding section.

Only rosin core solder should be used for soldering the coil leads in the pickup. Also rosin core solder should be satisfactory for resoldering the end of the spring in the hole in the mechanism, since both these parts have been previously tinned. In case the parts are not well tinned, it will be necessary to scrape the end of the spring and the hole in the mechanism until bright. These parts may now be tinned by using as a flux a water solution of zinc chloride (commonly called

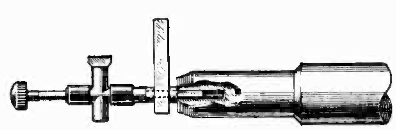


Figure G

acid flux). After tinning, dip the parts in water to wash off the acid flux and thereby prevent serious subsequent corrosion. After making sure that the pivot rubbers and damping block are properly in place, as described under (e) above, the armature may now be soldered in place in the mechanism by using rosin core solder, since the parts are now tinned. Care must be exercised to get the needle hole perfectly square with respect to the mechanism, or otherwise it will be difficult if not impossible to center the armature in the airgap as explained under (h).

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
2240	Resistor—30,000 ohms—Carbon type—1 watt (R6)	$0.22
2747	Cap—Contact cap—Package of 5	.50
3056	Shield—2nd detector Radiotron shield—Package of 2	.40
3076	Resistor—1 megohm—Carbon type—½ watt (R10, R11)—Package of 5	1.00
3252	Resistor—100,000 ohms—Carbon type—½ watt (R1, R3)—Package of 5	1.00
3470	Resistor—6,500 ohms—Carbon type—1 watt (R20)—Package of 5	1.10
3514	Resistor—250,000 ohms—Carbon type—½ watt (R16)—Package of 5	1.00
3529	Socket—Dial lamp socket	.32
3572	Socket—7-contact Radiotron socket	.38
3594	Resistor—50,000 ohms—Carbon type—½ watt (R14, R17)—Package of 5	1.00
3631	Resistor—850 ohms—Carbon type—½ watt (R13)—Package of 5	1.00
3639	Capacitor—.02 mfd. (C34)	.25
3683	Shield—Radiotron shield top	.20
3701	Capacitor—.01 mfd. (C6, C21)	.30
3702	Capacitor—.25 mfd. (C32)	.42
3768	Screw—Square head No. 6-32-¼" set screw for condenser drive—Package of 10	.35
3796	Capacitor—4. mfd. (C28)	.60
3849	Capacitor—50 mmfd. (C10)	.30
3859	Socket—4-contact Radiotron socket	.30
3861	Capacitor—Adjustable capacitor (C13)	.78
3877	Capacitor—.1 mfd. (C5, C15, C25, C33)	.32
3878	Screw—No. 4-40-3/16" screw for fastening station selector pointer—Package of 20	.25
3888	Capacitor—.05 mfd. (C19, C27)	.25
3892	Resistor—600 ohms—Carbon type—½ watt (R2, R4, R7)—Package of 5	1.00
3897	Resistor—400 ohms—Carbon type—1 watt (R18)—Package of 5	1.10
3901	Capacitor—.05 mfd. (C3, C16)	.36
3906	Mounting assembly—Variable condenser mounting assembly comprising 3 bushings, 3 lockwashers, 3 nuts, and 3 washers	.28
3937	Capacitor—300 mmfd. (C30, C31)	.34
3938	Capacitor—9 mmfd. (C39)	.25
3939	Resistor—3,500 ohms—Carbon type—½ watt (R21)—Package of 5	1.00
3942	Shield—1st detector Radiotron shield	.18
3943	Screen—Translucent screen for dial light—Package of 2	.18
3944	Shield—Antenna, R. F. or oscillator coil shield	.28
3991	Resistor—10,000 ohms—Porcelain type (R19)	.60
4031	Capacitor—2,700 mmfd. (C18, C29, C40)	.50
4032	Capacitor—390 mmfd. (C14)	.34
4119	Screw—No. 8-32-¼" headless cup point set screw for station selector knob—Package of 20	.38
6188	Resistor—2 megohm—Carbon type—½ watt (R12)—Package of 5	1.00
6282	Resistor—60,000 ohms—Carbon type—½ watt (R5, R8, R15)—Package of 5	1.00
6571	Capacitor—10 mfd. (C37)	1.20
6620	Capacitor—Comprising one .005 mfd. and one .035 mfd. (C35, C36)	.50
6676	Socket—6-contact Radiotron socket—Output	.40
6694	Condenser—3-gang variable tuning condenser (C4, C9, C11)	3.75
6695	Volume control (R9)	1.20
6696	Switch—Range switch (S1, S2, S3, S4)	2.24
6697	Transformer—First intermediate frequency transformer (L13, L14, C23, C24)	1.80
6698	Transformer—Second intermediate frequency transformer (L15, L16, C26, C41)	1.78
6699	Coil—R. F. coil (L5, L6, L7, L8, C7, C8)	2.44
6700	Coil—Oscillator coil (L9, L10, L11, L12, C12, C17)	2.30
6701	Coil—Antenna coil (L1, L2, L3, L4, C1, C2)	2.64
6702	Drive—Variable tuning condenser drive assembly complete	1.86
6703	Capacitor pack—Comprising one 8. mfd. and two 4. mfd. capacitors (C20, C22, C38)	2.46
6704	Shaft—Tuning condenser drive assembly shaft	.64
6705	Tone control complete (R22)	1.20
6841	Dial—Station selector dial—Package of 5	2.74
6842	Pointer—Station selector pointer—Package of 5	.46
7485	Socket—6-contact Radiotron socket	.40
7487	Shield—I. F. and R. F. amplifier Radiotron shield	.25
9416	Transformer—Pow ertransformer—105-125 volts—50-60 cycles (T1)	5.40
9451	Transformer—Power transformer—105-125 volts—25-50 cycles	5.40
10194	Ball—Steel ball for condenser drive assembly—Package of 20	.25
	PICKUP AND PICKUP ARM ASSEMBLIES	
3386	Cover—Pickup cover	.56
3387	Screw assembly—Pickup mounting screw assembly comprising one screw, one nut and one washer—Package of 10	.40
3388	Screw—Pickup needle holding screw—Package of 10	.60
3389	Rod—Automatic brake trip rod—Package of 5	.40
3417	Armature—Pickup armature	$0.72
3449	Screw—Cover mounting screw—Package of 10	.40
3516	Damper assembly—Comprising 1 upper and 1 lower damper 1 upper and 1 lower bearing—For pickup base	.14
3521	Cover—Pickup back cover	.18
3737	Damper—Viscoloid damping block—Package of 5	.65
6346	Back—Pickup housing back	.45
6601	Pickup—Magnetic pickup complete	4.54
3728	Coil—Pickup coil (L19)	.50
7731	Arm—Pickup arm complete less pickup and escutcheon	5.40
	TURNTABLE ASSEMBLIES	
3261	Bushing—Rubber bushing—Used on turntable spindle for long playing records—Package of 5	.40
3338	Ring—Clamp ring assembly—Comprising spring, latch lever and stud	.50
3340	Washer—Thrust washer—Package of 2	.56
3341	Pin—Groov-Pin—Package of 2	.56
3342	Spring—Latch spring—Located on clamping ring—Package of 2	.56
3343	Sleeve—Sleeve complete with ball race	2.86
3344	Cover—Grease retainer cover—Package of 2	.70
3346	Bushing—Speed shifter lever bushing—Package of 4	.66
3347	Spring—Speed shifter lever spring—Package of 2	.30
3399	Lever—Speed shifter lever with mounting screws	.50
8948	Turntable—Complete	5.50
	MOTOR ASSEMBLIES	
3398	Motor mounting assembly—Comprising 2 cup washers, 4 springs and 1 "C" washer	.48
3817	Stud—Motor mounting stud—Package of 3	.18
8989	Motor—Motor complete—105-125 volts—60 cycle	18.52
8990	Motor—Motor complete—105-125 volts—50 cycle	18.52
8991	Motor—105-125 volts—40 cycles	23.36
8992	Motor—Motor complete—105-125 volts—25 cycle	23.36
8993	Rotor and shaft for 105-125 volts, 60 cycle motor	7.00
8994	Spindle—Turntable spindle with fibre gear for 60 cycle motor	4.75
8995	Rotor and shaft for 105-125 volts—50 cycle motor	7.00
8996	Spindle—Turntable spindle with fibre gear for 50 cycle motor	4.75
8997	Rotor and shaft for 105-125 volts—40 cycle motor	8.00
8998	Spindle—Turntable spindle with fibre gear for 40 cycle motor	5.50
8999	Rotor and shaft for 105-125 volts—25 cycle motor	8.00
9001	Spindle—Turntable spindle with fibre gear for 25 cycle motor	5.50
	MISCELLANEOUS PARTS	
2917	Leather—Friction leather—Package of 20	.50
3322	Switch—Automatic brake switch with mounting screws (S8)	.75
3391	Suspension spring and washer assembly for motor board—Comprising one bolt, one top spring, one bottom spring, 2 cup washers, one "C" washer, and one nut	.50
3430	Box—Needle box with lid—Package of 2	.90
3994	Cover—Automatic switch brake cover	.26
4075	Knob—Tone control or range switch knob—Package of 5	1.00
4120	Knob—Volume control knob—Package of 5	1.18
4121	Knob—Station selector knob—Package of 5	1.18
4136	Screw—Chassis mounting screw assembly—Comprising four screws, four washers, eight cushions	.62
6614	Glass—Station selector dial glass	.30
6615	Ring—Retaining ring for dial glass—Package of 5	.34
6288	Knob—Phonograph volume control knob—Package of 5	1.00
6766	Volume control—Phonograph volume control (R23, S9)	2.28
6840	Bezel—Metal bezel for station selector dial	.56
6855	Cable—3-conductor cable with spade terminals—Reproducer cable	.44
6856	Cable—3-conductor shielded with male section of connection plug—Phonograph volume control	.85
6857	Cable—2-conductor motor cable	1.24
6858	Transformer—Phonograph input transformer—Comprising one transformer, one reactor, one .01 mfd. and 0.1 mfd. capacitors, one 5,000 and one 50,000 ohm resistor (T3, R24, R25, C42, C43, L20)	2.50
10174	Spring—Automatic brake springs—One set of 4 springs—Package of 2 sets	.50
10184	Plate—Automatic brake latch trip plate with mounting screws—Package of 5	.40
	REPRODUCER ASSEMBLIES	
6770	Transformer—Output transformer (T2)	2.00
8969	Cone—Reproducer cone (L17)—Package of 5	6.35
9460	Coil assembly—Comprising field coil magnet and cone support (L18)	6.00
9473	Reproducer complete	8.00

RCA Victor Company, Inc.

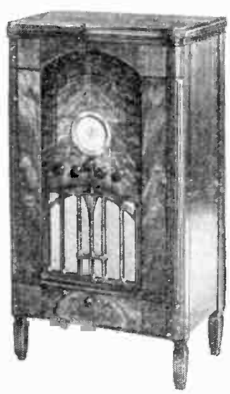
CAMDEN, N. J., U. S. A.

23762 Printed in U. S. A.

RCA Victor
Model 322 "DUO"

Six-Tube, Three-Band A. C. Radio-Phonograph

SERVICE NOTES



SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

A RADIO CORPORATION OF AMERICA SUBSIDIARY

REPRESENTATIVES IN PRINCIPAL CITIES

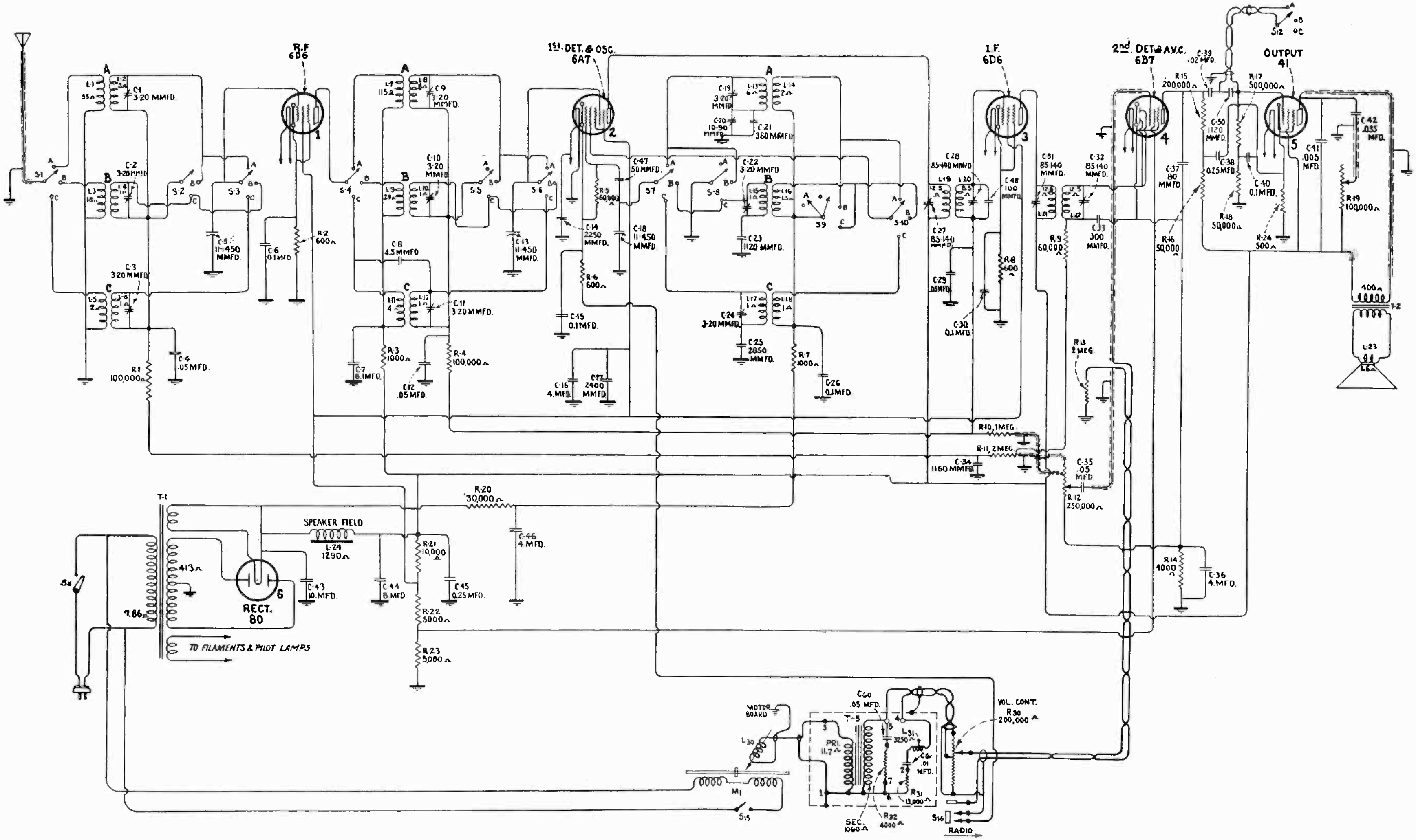


Figure 1—Schematic Circuit Diagram

RCA VICTOR MODEL 322

Six-Tube, Three-Band A. C. Radio-Phonograph

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Voltage Rating	105–125 Volts and 105–130/200–250 Volts (Double Range Transformer)
Frequency Rating	25, 30, 40, 50 and 60 Cycles
Power Consumption	130 Watts (60 Cycles)
Type and Number of Radiotrons	2 RCA-6D6, 1 RCA-6A7, 1 RCA-6B7, 1 RCA-41, 1 RCA-80—Total, 6
Tuning Frequency Range	Band A— 540 K. C.– 1720 K. C. Band B—1720 K. C.– 5400 K. C. Band C—5400 K. C.–18000 K. C.
Line-up Frequencies	460 K. C., 600 K. C., 1720 K. C., 5160 K. C., 18000 K. C.
Maximum Undistorted Output	1.9 Watts
Maximum Output	3.5 Watts
Pickup Impedance at 1000 Cycles	7 Ohms
Type of Tone Arm	Inertia
Turntable Speed	78 R. P. M. Only

PHYSICAL SPECIFICATIONS

Height	42⅛ Inches
Width	23⅝ Inches
Depth	15 Inches

This six-tube, three-band A. C. radio-phonograph combination instrument combines the performance of the all-wave chassis and the perfected manual phonograph mechanism. Outstanding world-wide radio performance and unusual musical record quality characterize this instrument.

The receiver is of the "all-wave" type and has a continuous tuning range of from 540 K. C. to 18,000 K. C. This tuning range includes all of the important short-wave broadcasting, police and aircraft call bands, together with the standard broadcast band. Excellent sensitivity, selectivity and tone quality, together with a number of important operating features, make this an outstanding receiver of its type.

Operating features include a full-vision "airplane" type dial, double-ratio vernier drive, high-frequency tone control, three-position band switch with visual band indicator on dial, and an automatic volume control. High tonal fidelity is realized by adequate power output, 1.9 watts undistorted, and a well-designed reproducer unit. The record-reproducing facilities make use of the audio amplifier and loudspeaker of the receiver.

DESCRIPTION OF ELECTRICAL CIRCUIT

RADIO

The general circuit arrangement consists of an R. F. stage, a combined oscillator and first detector, an I. F. stage, a combined second detector, first audio stage and automatic volume control and a single Pentode output stage. An RCA-80 rectifier, together with a suitable filtering system, provides plate and grid voltages for all tubes and field excitation for the loudspeaker. Figure 1 shows the schematic circuit diagram, Figure 2 the chassis wiring, and Figure 3 the loudspeaker wiring.

The signal enters the receiver through a shielded antenna lead and is applied to the grid of the R. F. tube through the antenna coupling transformer. The secondary of this transformer is tuned to the signal frequency by means of one unit of the gang-capacitor. The output of this stage is transformer coupled to the grid circuit of the first detector, which is also tuned to the signal frequency by a unit of the gang-capacitor.

Combined with the signal in the first detector is the local oscillator, which is always at a 460 K. C. frequency difference (higher) from the signal frequency. A separate coil system and the third unit of the gang-capacitor are used in this circuit.

In conjunction with these three tuned circuits, it is well to point out that three different groups of tuned circuits are used, one for each tuning band. A three-position selector switch is provided for selecting the

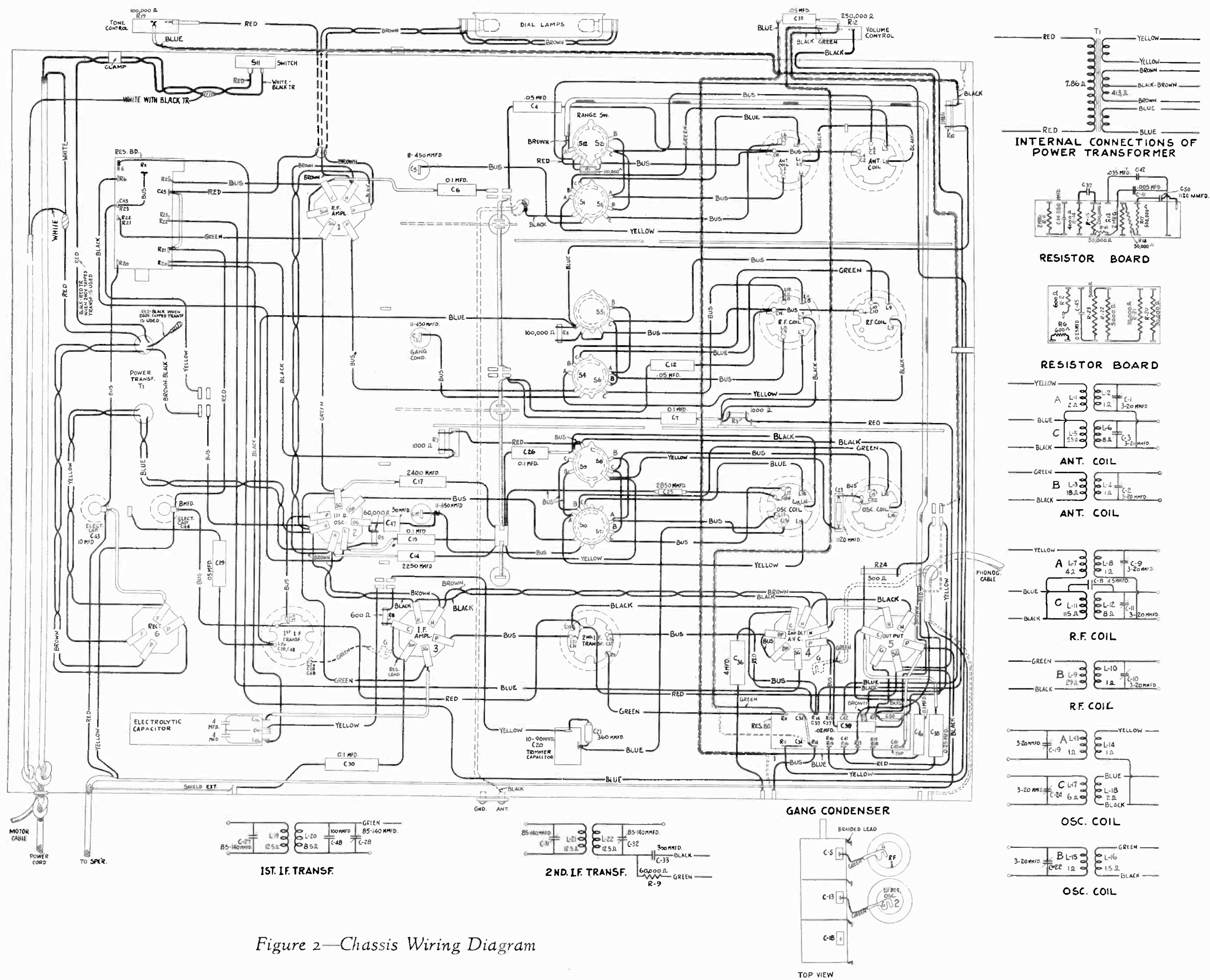


Figure 2—Chassis Wiring Diagram

band in which the desired signal is located. In addition to selecting the desired coil system, additional groups of contacts are provided for short-circuiting the preceding lower frequency R. F. and detector coils and the two preceding oscillator coils. This is to prevent "dead" spots due to the absorption effects caused by the coils, the natural period of which, with tuning capacitor disconnected, falls in the next higher frequency band.

The output of the first detector, which is the I. F. signal (460 K. C.), is fed directly through two tuned circuits to the grid of the I. F. amplifier stage. The I. F. stage, which utilizes Radiotron RCA-6D6, uses two transformers, which consist of four tuned circuits, all of which are tuned to 460 K. C.

The output of the I. F. amplifier is then applied to the diode electrodes of the RCA-6B7, which is a combined second detector, A. F. amplifier and automatic volume control. The direct current component of the rectified signal produces a voltage drop across resistor R-12. The full voltage drop constitutes the automatic bias voltage for the R. F., while a tap is provided for the first detector and I. F. voltage. These automatic bias voltages for the R. F., first detector and I. F. give the automatic volume control action of the receiver. The volume control selects the amount of audio voltage that is applied to the grid of the RCA-6B7 and thereby regulates the audio output of the entire receiver.

The output of the RCA-6B7 is resistance coupled to the grid of the RCA-41 tube, which is the power output amplifier. This tube is operated as a Pentode and provides high audio gain and satisfactory output power. The plate circuit of the output stage is matched to the cone coil of the reproducer by means of a stepdown transformer.

It should be noted that a small coupling capacitor C-50 is connected in series with C-39 during operation on bands B and C. This is to reduce the low frequency output on these bands, which ensures better operation. During record reproduction it is important that the band switch be at the A position.

The tone control consists of a variable resistor and fixed capacitor connected in series across the primary of the output transformer. At the minimum resistance position of the variable resistor, maximum attenuation of the high audio frequencies is obtained.

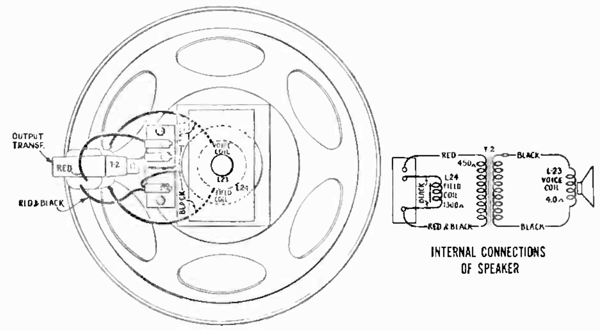


Figure 3—Loudspeaker Wiring

Plate and grid voltages for all tubes are supplied from the output of the rectifier-filter system. An RCA-80 is used as a rectifier and a suitable network of capacitors and resistors gives the necessary filtering and voltages. The loudspeaker field is used as a filter reactor.

PHONOGRAPH

The phonograph facilities consist of the standard perfected manual motor-board assembly, audio amplifier of the receiver and the loudspeaker.

A low-impedance pickup, a compensated input system consisting of a transformer, record volume control and compensation network are connected to the input of the audio section of the RCA-6B7. The circuit functions from this point to the loudspeaker are identical with that of the audio output from the detector during radio operation. The radio receiver is made inoperative during record reproduction by opening the cathode circuit of the RCA-6A7.

SERVICE DATA

(1) LINE-UP PROCEDURE

The line-up procedure of this receiver is somewhat involved and it is important that these instructions be carefully followed when making adjustments. Properly aligned, this receiver has outstanding performance; improperly aligned, it may be impossible to receive signals on all bands.

Equipment

To properly align this receiver, proper test equipment must be used. This consists of a modulated R. F. oscillator having proper frequency range, an output indicator, an alignment tool and a tuning wand. These parts have been developed by the manufacturer of this receiver for use by service men to duplicate the original factory adjustments.

Checking with Tuning Wand

Before making any R. F., oscillator or first detector adjustments, the accuracy of the present adjustments may be checked by means of the tuning wand (Stock No. 6679). The tuning wand consists of a bakelite rod having a brass cylinder at one end and a special finely divided iron insert at the other end. Inserting the cylinder into the center of a coil lowers its inductance, while inserting the iron end increases its inductance. From this, it is seen that unless the trimmer adjustment for a particular coil is perfect at alignment frequencies, inserting one end of the wand may increase the output of a particular signal. A perfect adjustment is evidenced by a lowering of output when either end of the wand is inserted into a coil.

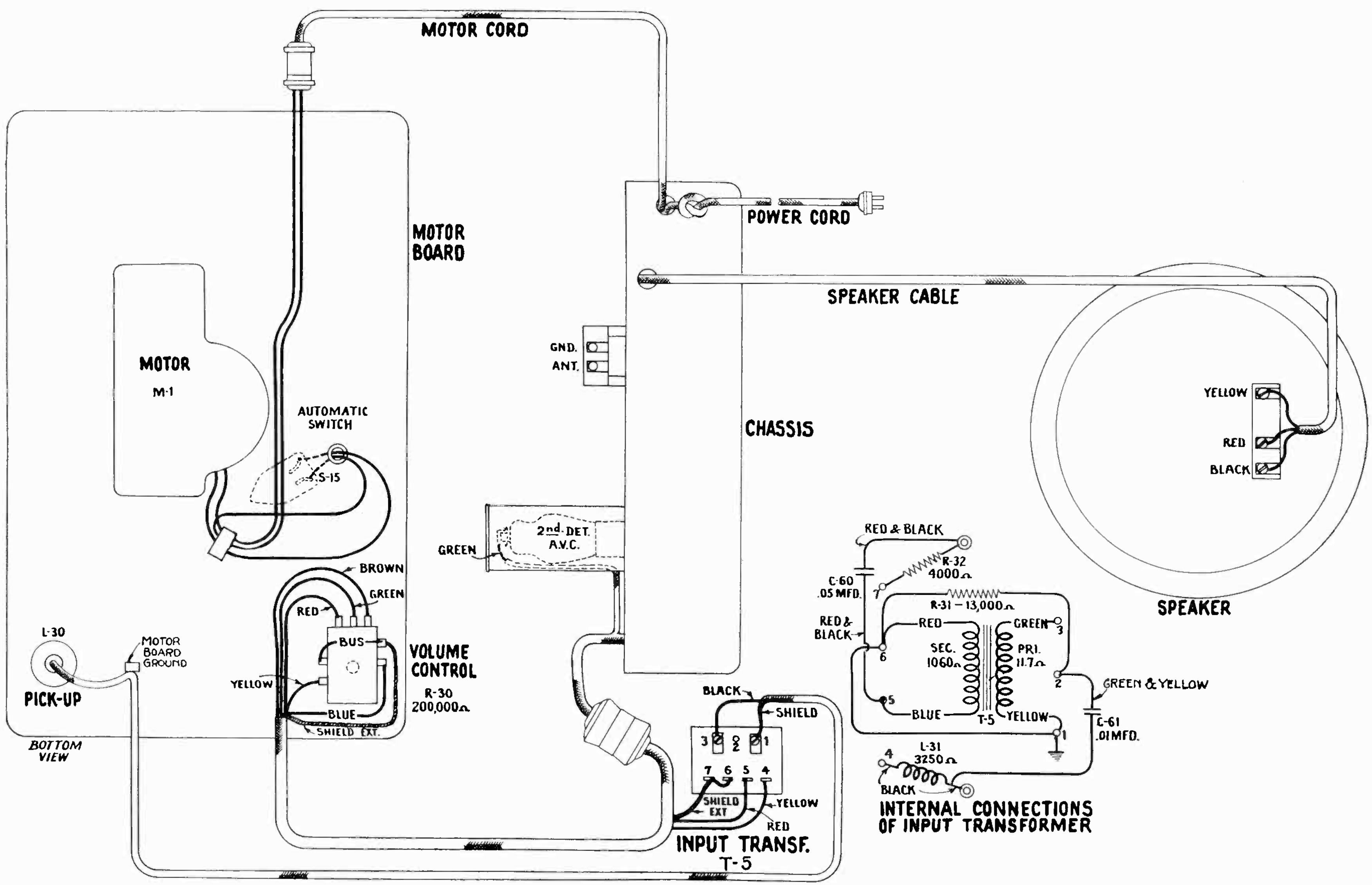


Figure 4—Assembly Wiring Diagram

The shields over the R. F. coil assembly have a hole at their top for entrance of the tuning wand. The location of the various coils inside of the shield is shown in Figure 5. An example of the proper manner of using the tuning wand would be to assume the external oscillator were set at 1720 and the signal tuned in, and the output indicator should be connected across the voice coil of the loudspeaker. Then the tuning wand would be inserted, first one end and then the other end, into the top of the three transformers at the left of the R. F. assembly, facing the front of the chassis. A perfect adjustment of the trimmer would be evidenced by a reduction in output when each end of the wand is inserted in each of the three transformers. If one end—for example, the iron end—when inserted in one coil caused an increase in output, then that circuit is low. An increase in the trimmer capacitance would be the proper remedy.

(2) I. F. TUNING CAPACITOR ADJUSTMENTS

This receiver has one I. F. stage, which uses two transformers. The transformers are all peaked at 460 K. C.

A detailed procedure for making this adjustment follows:

(a) Connect the output of an external oscillator tuned to 460 K. C. between the first detector grid and ground. Connect the output indicator across the voice coil of the loudspeaker.

(b) Place the oscillator in operation at 460 K. C. Place the receiver in operation and adjust the station selector until a point is reached (band A) where no signals are heard and turn the volume control to its maximum position. Reduce the oscillator input until a slight indication is obtained in the output indicator.

(c) Refer to Figure 6. Adjust each trimmer of the I. F. transformers until a maximum output is obtained. Go over the adjustments a second time.

This completes the I. F. adjustments. However, it is good practice to follow the I. F. adjustments with the R. F. and oscillator adjustments due to interlocking which always occurs.

(3) R. F. OSCILLATOR AND FIRST DETECTOR ADJUSTMENTS

Four R. F., oscillator and first detector adjustments are required in band "A." Three are required in bands "B" and "C."

To properly align the various bands, each band must be aligned individually. The preliminary set-up requires the external oscillator to be connected between the antenna and ground terminals of the receiver and the output indicator must be connected across the voice coil of the loudspeaker. The volume control must be at its maximum position and the input from the oscillator must be at the minimum value possible to get an output indication under these conditions. In the high-frequency bands, it may be necessary to disconnect the oscillator from the receiver and place it at a distance in order to get a sufficiently low input to the receiver.

The dial pointer must be properly set before starting any actual adjustments. This is done by turning the variable capacitor until it is at its maximum capacity position. One end of the pointer should point exactly at the horizontal line at the lowest frequency end of band "A," while the other end should point to within 1/64 inch of the horizontal line at the highest frequency end of band "A."

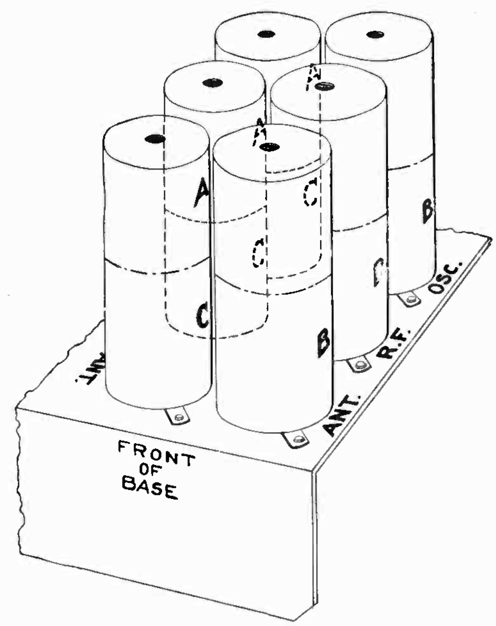


Figure 5—Location of Coils in Shields

Figure 6 shows the location of the trimmers for each band. Care must be exercised to merely adjust the trimmers in the band under test.

Band "A"

(a) Set the Band Switch at "A."

(b) Tune the external oscillator to 1,720 K. C., set the pointer at 1,720 K. C. and adjust the oscillator, detector and R. F. trimmers for maximum output.

(c) Shift the external oscillator frequency to 600 K. C. Tune in the 600 K. C. signal, irrespective of scale calibration, and adjust the series trimmers, located on rear apron of chassis, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 1,720 K. C. as described in (b).

Band "B"

(a) Set the Band Switch at "B."

(b) Tune the external oscillator to 5,160 K. C., and set the pointer at 5,160 K. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

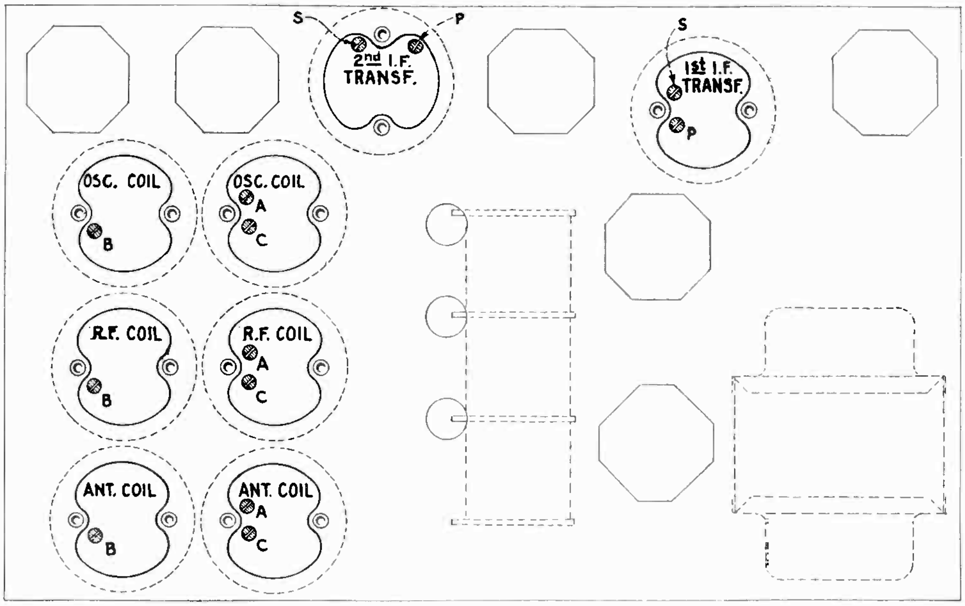


Figure 6—Location of Line-up Capacitors

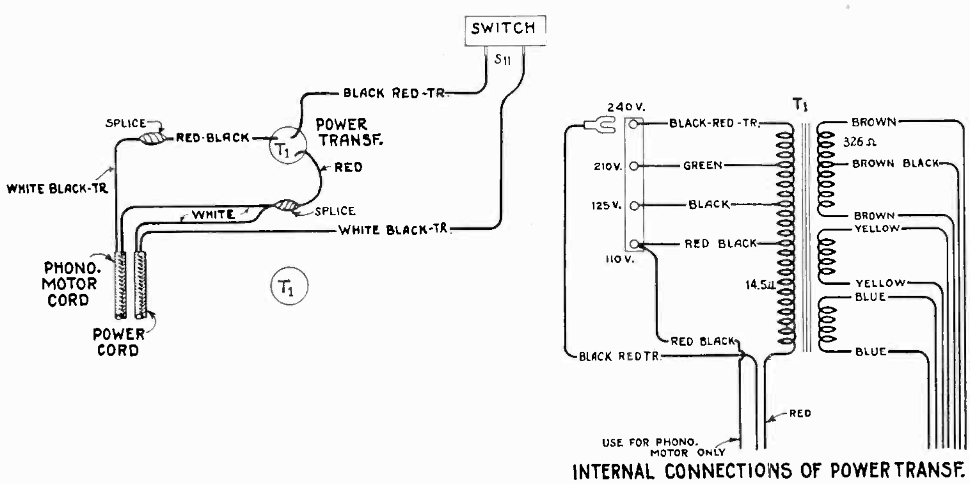


Figure 7—Universal Power Transformer Connections

(c) Check for the image signal, which should be received at approximately 4,240 K. C. on the dial. It will be necessary to increase the external oscillator output for this check.

(d) The antenna and detector trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

Band "C"

(a) Set the Band Switch at "C."

(b) Tune the external oscillator to 18,000 K. C., set the pointer at 18 M. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(c) Check for the image signal, which should be received at approximately 17,080 on the dial. It may be necessary to increase the external oscillator output for this check.

(d) Reduce the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal disappears. The first detector circuit is then aligned with the oscillator circuit and the RCA-6A7 tube is blocked. Then increase the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal is peaked for maximum output.

(e) The antenna trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

(4) POWER TRANSFORMER CONNECTIONS

The 220-volt power transformer furnished with some instruments includes taps for operating on 110-volt lines. Figure 6 shows the schematic circuit of the transformer and the proper voltage to be applied to the various taps. The taps are located on the power transformer assembly and are accessible without removing the chassis from the cabinet.

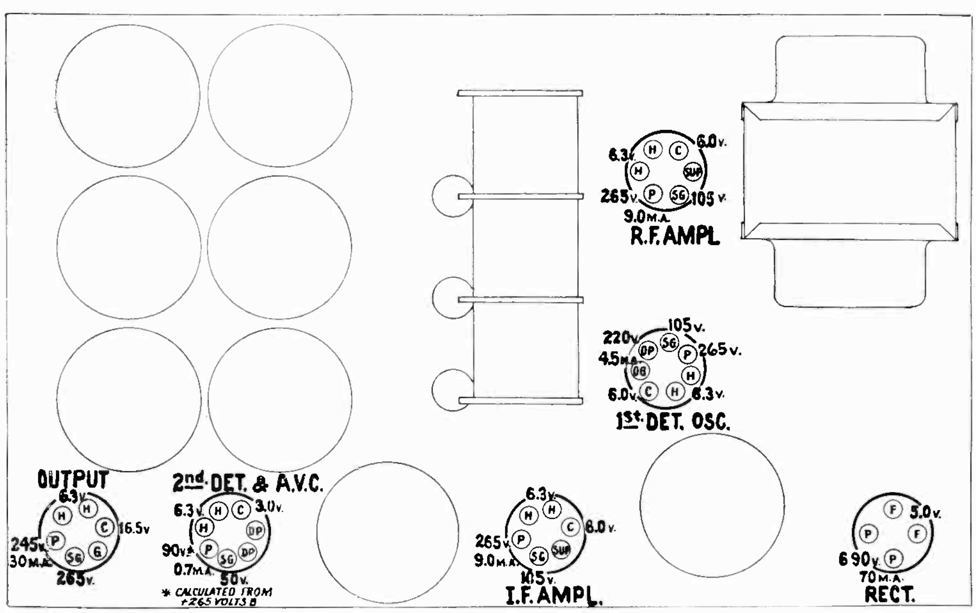
(5) VOLTAGE READINGS

The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if low-resistance meters are used, such allowances must be made. Figure 8 shows the actual voltage at each socket contact.

(6) SERVICE DATA ON MAGNETIC PICKUP

The Magnetic Pickup used in this combination instrument is of a new design with an improved frequency range. While in physical appearance it is similar to that of the older type, details of construction are considerably different. It consists essentially of a chromium steel magnet, two thin pole pieces, a mechanism support and bracket, a coil, and an armature that is damped by means of an anchored damping block.

The use of the anchored damping block eliminates any bad peaks in the frequency range. The frequency-response characteristic is substantially flat from 50 to 5,000 cycles.



ALL D. C. VOLTAGES ARE TO GROUND

Figure 8—Tube Socket Voltages

In assembling, it may be desirable to check the armature air gap by means of a small Feeler Gauge. This air gap should be .009″ on each side of the armature. However, a little practice with the needle in place will quickly disclose whether or not the armature is centered.

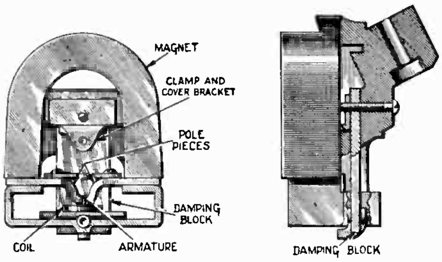


Figure 9—Details of Magnetic Pickup

(7) REPLACING MAGNET COIL, PIVOT RUBBERS, ARMATURE OR DAMPING BLOCK

In order to replace a defective coil or the hardened pivot rubbers (see Figure 9), it is necessary to proceed as follows:

(a) Remove the pickup cover by removing the center holding screw and needle screw.

(b) Remove the pickup magnet and the magnet clamp by pulling them forward.

(c) Unsolder the coil leads and remove the mechanism assembly from the back plate by releasing the two mounting screws and the damping block clamping screw.

(d) Remove screws A and B, Figure 10, and then remove the mechanism assembly from the pole pieces.

(e) The coil or the front pivot rubber may now be removed and replaced. If it is desired to replace the rear pivot rubber, then the end of the armature soldered to the mechanism support must be unsoldered and the damping block removed. The rear pivot rubber now may be replaced. After putting the pivot rubbers in place a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block.

(f) The mechanism should now be reassembled, except for the magnet, which must be magnetized. After being magnetized, the mechanism—with the pole pieces upward—should be placed so that the magnet may be slid from the magnetizer onto the pole pieces without breaking physical contact. After placing the pole pieces on the magnet, the entire assembly should be remagnetized thoroughly, being careful not to change the polarity obtained by the initial magnetization.

RADIOTRON SOCKET VOLTAGES

115-Volt A. C. Line—No Signal—Volume Control Maximum

Radiotron Number		Cathode to Ground, Volts, D. C.	Screen Grid to Ground, Volts, D. C.	Plate to Ground, Volts, D. C.	Plate Current, M. A.	Heater Volts, A. C.
RCA-6D6—R. F.		6.0	105	265	9.0	6.3
RCA-6A7	Det.	6.0	105	265	3.5	6.3
	Osc.	—	—	220	4.5	
RCA-6D6—I. F.		6.0	105	265	9.0	6.3
RCA-6B7—2nd Detector		3.0	50	90*	0.7	6.3
RCA-41—Power		16.5	265	245	30.0	6.3
RCA-80—Rectifier		—	—	690 (RMS—P to P)	70.0	5.0

* Voltage calculated from 265 v. + B.

(g) After assembling to the mechanism, the entire assembly should be fastened to the back plate by means of the screws provided, making sure the damping block is securely clamped. At the same time, the metal dust cover must be placed in position.

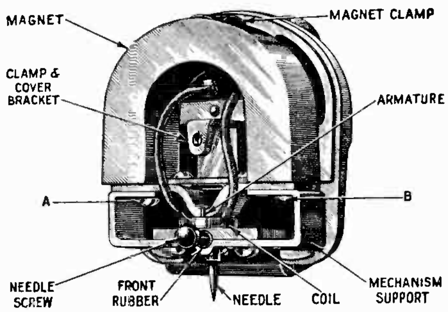


Figure 10—Pickup Nomenclature

(h) After remagnetizing, it is necessary to correctly center the armature. This may be done quite accurately by feeling its play after the needle is inserted. A little practice will quickly show which way an adjustment is necessary to have the armature centered properly. The adjustment is made by loosening screws A and B (Figure 10), and sliding the mechanism slightly in relation to the pole pieces.

(i) The cover may be now replaced over the entire assembly, and the pickup returned to the tone arm.

(8) REPLACING THE DAMPING BLOCK

If it is desired to replace the damping block, it may be done in the following manner:

(a) Disassemble the pickup as described under the preceding section.

(b) Remove the armature entirely by unsoldering it at its joint with the mechanism support.

(c) Remove the damping block from the armature and clean the bushing for holding the damping block with emery paper.

(d) Insert the armature through the new block so that it occupies the same position as that of the old. Also ascertain that the block is in correct vertical alignment with the armature. It will be noted that the hole in the damping block is somewhat smaller than the diameter of the armature. This is done so that a snug fit will be obtained.

(e) After properly locating the damping block, a soldering iron should be applied to the armature so that the block will melt slightly at its point of contact with the armature. A special tip, constructed as shown in Figure 11, will prove desirable for fusing the block in place. The iron should be applied long enough to slightly melt the block and cause a small bulge on both sides, but should not be applied long enough to cause any bubbling. The pickup should then be reassembled as described in the preceding section.

Only rosin core solder should be used for soldering the coil leads in the pickup. Also rosin core solder should be satisfactory for resoldering the end of the spring in the hole in the mechanism, since both these parts have been previously tinned. In case the parts are not well tinned, it will be necessary to scrape the end of the spring and the hole in the mechanism until bright. These parts may now be tinned by using as a flux a water solution of zinc chloride (commonly called acid flux). After tinning, dip the parts in water to wash off the acid flux and thereby prevent serious subsequent corrosion. After making sure that the pivot rubbers and damping block are properly in place,

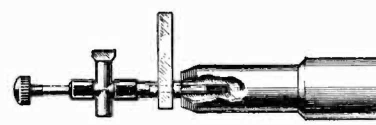


Figure 11—Special Soldering-Iron Tip

as described under (e) above, the armature may now be soldered in place in the mechanism by using rosin core solder, since the parts are now tinned. Care must be exercised to get the needle hole perfectly square with respect to the mechanism, or otherwise it will be difficult if not impossible to center the armature in the air gap as explained under (h), section (7).

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4427	Bracket—Volume control or tone control mounting bracket	$0.18
4729	Cable—2-conductor shielded—From range switch to resistor board	.20
2747	Cap—Contact cap—Package of 5	.50
3861	Capacitor — Adjustable trimmer capacitor (C20)	.78
4442	Capacitor—50 mmfd. (C47)	.22
4662	Capacitor—80 mmfd. (C37)	.24
4413	Capacitor—360 mmfd. (C21)	.22
4412	Capacitor—1120 mmfd. (C23)	.25
4634	Capacitor—1120 mmfd. (C50)	.35
4515	Capacitor—1160 mmfd. (C34)	.22
4670	Capacitor—2250 (C14)	.30
4523	Capacitor—2400 mmfd. (C17)	.26
4524	Capacitor—2850 mmfd. (C25)	.35
4435	Capacitor—.02 mfd. (C39)	.25
4518	Capacitor—.05 mfd. (C35)	.52
4417	Capacitor—.05 mfd. (C4, C12, C29)	.25
3877	Capacitor—.1 mfd. (C40)	.32
4415	Capacitor—.1 mfd. (C6, C15, C30)	.30
4645	Capacitor—.1 mfd. (C7, C26)	.25
3597	Capacitor—.25 mfd. (C38, C45)	.40
4525	Capacitor—4.0 mfd. (C36)	.70
4428	Capacitor—8 mfd. (C44)	1.05
7790	Capacitor—10 mfd. (C43)	1.05
4692	Capacitor pack—Comprising one 0.035 mfd. and one 0.005 mfd. capacitors (C41, C42)	.30
7589	Capacitor Pack—Comprising two 4. mfd. capacitors (C16, C46)	1.64
4358	Clamp—Electrolytic capacitor mounting clamp	.15
4516	Coil—Antenna coil "PB" (L3, L4, C2)	1.65
7803	Coil—Antenna coil "B & SW" (L1, L2, L5, L6, C1, C3)	1.82
4514	Coil—Detector Coil "PB" (L9, L10, C10)	1.65
7805	Coil—Detector coil "B & SW" (L7, L8, L11, L12, C8, C9, C11)	2.15
7807	Coil—Oscillator coil "B & SW" (L13, L14, L17, L18, C19, C24)	1.62
4511	Coil—Oscillator coil "PB" (L15, L16, C22)	1.52
7801	Condenser—3-gang variable tuning condenser (C5, C13, C18)	4.42
4340	Lamp—Dial lamp—Package of 5	.60
3632	Resistor—500 ohms—Carbon type—1 watt (R24)—Package of 5	1.10
3218	Resistor—600 ohms—Carbon type—¼ watt (R2, R6, R8)—Package of 5	1.00
4370	Resistor—1000 ohms—Carbon type—¼ watt (R3, R7)—Package of 10	2.00
3997	Resistor—4000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
6318	Resistor—10,000 ohms (R21)	.80
3114	Resistor—50,000 ohms—Carbon type—¼ watt (R16, R18)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R5)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1, R4)—Package of 5	1.00
3116	Resistor—200,000 ohms—Carbon type—¼ watt (R15)—Package of 5	1.00
6186	Resistor—500,000 ohms—Carbon type—¼ watt (R17)—Package of 5	$1.00
3033	Resistor—1 megohm—Carbon type—¼ watt (R10)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R11, R13)—Package of 5	1.00
3413	Resistor—5000 ohms—Carbon type—½ watt (R22, R23)—Package of 5	1.00
4513	Resistor — 30,000 ohms — Carbon type — 3 watt (R20)	.25
4521	Shield—Antenna R. F. or oscillator coil shield	.42
3942	Shield—First detector or output Radiotron shield	.18
7487	Shield—I. F. amplifier Radiotron shield	.25
4705	Shield—R. F. amplifier Radiotron shield	.30
3782	Shield—Second detector Radiotron shield	.26
3529	Socket—Dial lamp socket	.32
3859	Socket—4-contact Radiotron socket	.30
6676	Socket—6-contact output Radiotron socket	.40
7485	Socket—6-contact Radiotron socket	.40
3572	Socket—7-contact Radiotron socket	.38
4379	Strip—Antenna terminal engraved "ANT-GND"	.20
4684	Switch—Operating switch (S11)	.45
4728	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10)	4.32
4517	Tone control (R19)	.90
4431	Transformer — First intermediate frequency transformer (L19, L20, C27, C28, C48)	2.28
4433	Transformer—Second intermediate frequency transformer (L21, L22, C31, C32, C33, R9)	2.15
9511	Transformer—Power transformer 105–125 volts, 50–60 cycles (T1)	4.78
9512	Transformer—Power transformer 105–125 volts, 25–40 cycles	6.58
9513	Transformer—Power transformer—105–250 volts—40–60 cycles	4.85
4519	Volume control (R12)	1.25
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	.28
10194	Ball—Steel ball for condenser drive assembly—Package of 20	.25
4422	Clutch—Clutch drive assembly for variable condenser drive	.88
4661	Dial—Station selector dial	.62
4510	Drive—Tuning condenser drive assembly	2.42
4704	Indicator—Band indicator (celluloid)	.12
4520	Indicator—Station selector indicator pointer	.18
3943	Screen—Dial light screen (celluloid)—Package of 2	.18
3993	Screw—Number 6-32-5/32 square head set screws for band indicator operating arm—Package of 10	.25
4669	Screw—Number 8-32-5/32 set screw for variable condenser drive assembly—Package of 10	.25
4377	Spring—Band indicator and arm tension spring—Package of 5	.25
4378	Stud—Band indicator operating arm stud—Package of 5	.25

REPLACEMENT PARTS—(Continued)

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	MOTOR ASSEMBLIES	
4577	Connector—Male section two-prong motor connector plug	$0.30
8989	Motor—105–125 volts—60 cycle motor complete	18.52
8990	Motor—105–125 volts—50 cycle motor complete	18.52
8991	Motor—105–125 volts—40 cycle motor complete	23.36
8992	Motor—105–125 volts—25 cycle motor complete	23.36
8993	Rotor and shaft—For 105–125 volt—60 cycle motor	7.00
8995	Rotor and shaft—For 105–125 volt—50 cycle motor	7.00
8999	Rotor and shaft—For 105–125 volt—25 cycle motor	8.00
8994	Spindle—Turntable spindle with fibre gear for 60 cycle motor	4.75
8996	Spindle—Turntable spindle with fibre gear for 50 cycle motor	4.75
9001	Spindle—Turntable spindle with fibre gear for 25 cycle motor	5.50
3817	Stud—Motor mounting stud—Package of 3	.18
3398	Motor mounting—Spring and washer assembly—Comprising 2 cup washers, 4 springs and 1 "C" washer	.48
	PICKUP AND ARM ASSEMBLIES	
7842	Arm—Pickup arm complete, less escutcheon and pickup	4.75
3417	Armature—Pickup armature	.72
6346	Back—Pickup housing back	.45
3385	Coil—Pickup coil (L30)	.50
3386	Cover—Pickup cover	.56
3521	Cover—Magnetic pickup back cover	.18
3418	Cushions—Pickup rubber cushions—Comprising one damper and two spacer cushions and one damper bushing—5 sets	1.10
3516	Damper assembly—Comprising one upper and one lower damper, one upper bushing and one lower bearing—Located in bottom of pickup base	.14
3390	Escutcheon—Pickup arm escutcheon complete with mounting rivets	.46
6335	Pickup—Pickup unit complete	4.00
3389	Rod—Automatic brake trip rod with lock nut—Package of 5	.40
3387	Screw assembly—Pickup mounting screw assembly comprising one screw, one nut and one washer—10 sets	.40
3388	Screw—Pickup needle holding screw—Package of 10	.60
3419	Screw—Pickup cover mounting screw—Package of 10	.40
	REPRODUCER ASSEMBLY	
4473	Board—Terminal board assembly	.26
9460	Coil—Field coil, magnet and cone support (L24)	6.00
8935	Cone—Reproducer cone (L23)—Package of 5	5.25
9527	Reproducer—Complete	8.00
4472	Transformer—Output transformer (T2)	1.40

Stock No.	Description	List Price
	SWITCH ASSEMBLIES	
3994	Cover—Motor switch cover	$0.26
10184	Plate—Automatic brake latch plate—Package of 5	.40
10174	Springs—Automatic brake springs—Package of 4	.50
6896	Switch—Eccentric automatic switch complete	2.50
3322	Switch—Motor switch (S15)	.75
	TURNTABLE ASSEMBLIES	
7084	Cover—Turntable cover	.40
7838	Turntable complete	2.15
	MISCELLANEOUS ASSEMBLIES	
3166	Bolt—Reproducer mounting assembly—Comprising 2 bolts, 2 nuts, 2 lockwashers and 1 plate	.50
4677	Bezel—Station selector (escutcheon) bezel	.56
3430	Box—Needle box with lid—Package of 2	.90
4696	Cable—2-conductor motor cable with section of connector plug—From receiver chassis to motor cord connector	.95
4695	Cable—3-conductor shielded cable with grid and female section of connector—From receiver chassis to volume control cable connector	1.05
7843	Cable—5-conductor shielded with male section of connector plug—From phonograph volume control to input transformer	.98
4153	Connector—Female section (4-contact) of connector for cable Stock No. 4695	.48
4573	Connector—Female section (2-contact) of connector plug for cable Stock No. 4696	.30
6614	Glass—Station selector dial glass	.30
3829	Knob—Phonograph volume control knob—Package of 5	1.10
4449	Knob—Station selector volume control, range switch or operating switch knob—Package of 5	.60
6123	Plug—Male section (4-prong) of phonograph volume control and input transformer cable plug	.30
3396	Receptacle—Needle receptacle	.52
4678	Ring—Dial retaining ring—Package of 5	.34
4393	Screw—8–32–5/16" headless set screw for knob No. 3829—Package of 10	.25
4698	Screw—Chassis mounting screw assembly—Comprising 1 screw, 1 lockwasher, 1 washer, 2 cushions and 1 spacer	.45
3391	Suspension spring and washer assembly—For motor board—Comprising 1 bolt, 1 top spring, 1 bottom spring, 2 cup washers, 1 "C" washer and 1 nut	.50
7844	Transformer—Phonograph input transformer pack comprising one transformer, one reactor, one 4000 ohm and one 13,000 ohm resistor, one .01 mfd. and one .05 mfd. capacitor (T5, L31, R31, R32, C60, C61)	5.38
6766	Volume control—Phonograph volume control (R30, S16)	2.28

RCA Victor

D. C. "Duo" Model 327

Six-Tube, 220-Volt D. C., Two-Band Radio-Phonograph

SERVICE NOTES

SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

A RADIO CORPORATION OF AMERICA SUBSIDIARY

REPRESENTATIVES IN PRINCIPAL CITIES

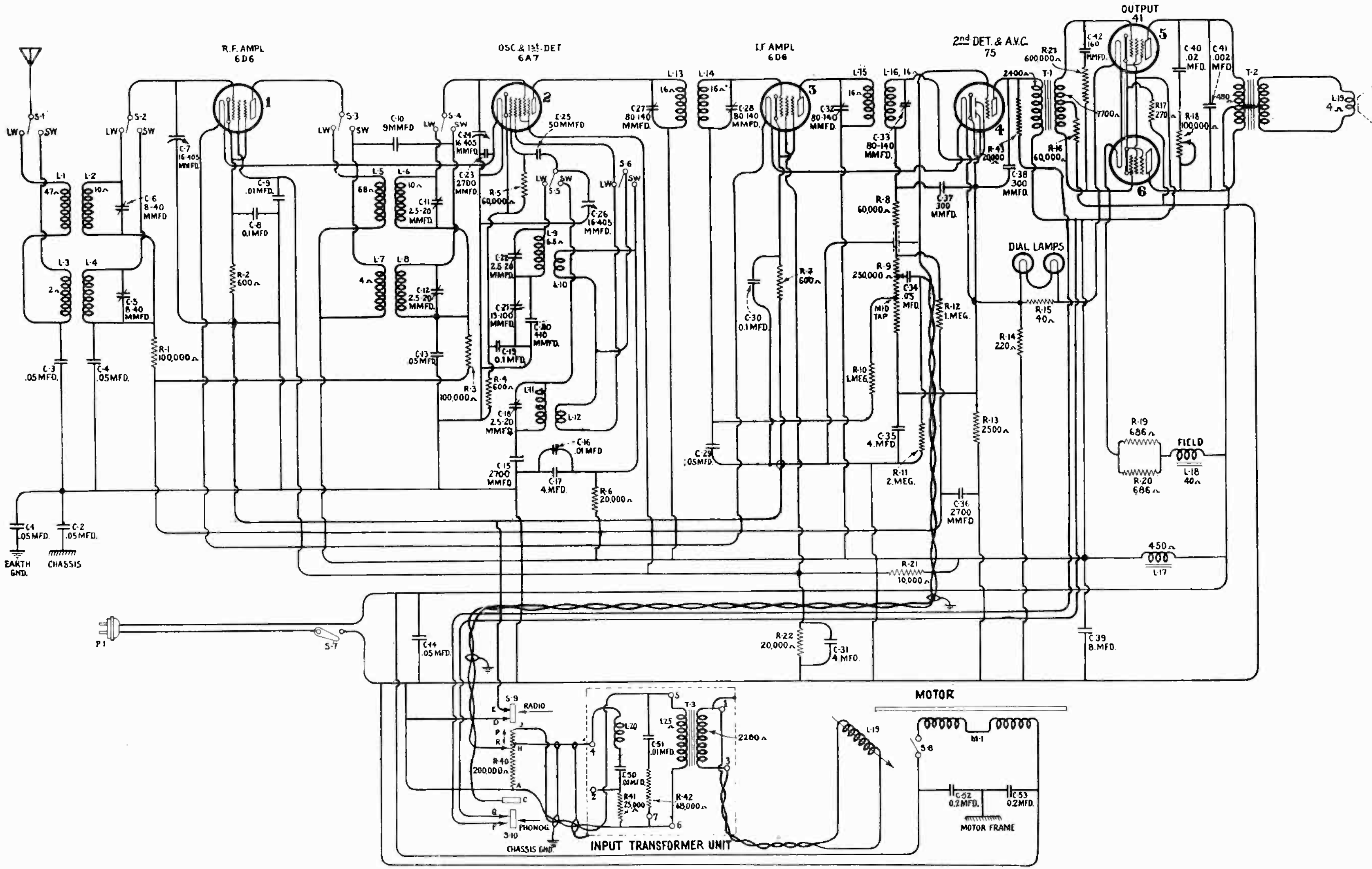


Figure 1—Schematic Circuit Diagram

RCA Victor Model 327

6-Tube, 220-Volt D. C., Two-Band Radio-Phonograph

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Voltage Rating	200–250 Volts D. C.
Power Consumption	180 Watts Maximum
Number and Types of Radiotrons	2 RCA-6D6, 1 RCA-6A7, 1 RCA-75, 2 RCA-41—Total, 6
Tuning Ranges	540 K. C.–1500 K. C. and 5400 K. C.–15,350 K. C.
Maximum Undistorted Power Output	2.5 Watts
Line-up Frequencies	370 K. C., 600 K. C., 1400 K. C., 15,000 K. C.

PHYSICAL SPECIFICATIONS

Height	40 Inches
Width	23 Inches
Depth	16 Inches

This radio-phonograph combination instrument uses a six-tube, two-band, 220-volt direct current superheterodyne chassis and the standard RCA Victor single-speed direct current motor board assembly. The receiver is designed to receive both the standard and short-wave broadcasting bands. The phonograph plays standard type (78 R. P. M.) records. Special features of the radio receiver include a double reduction vernier drive giving either a 10-1 or 50-1 ratio of speed reduction, a continuously variable tone control, electro-dynamic type loudspeaker, automatic volume control and a high-gain push-pull power amplifier.

Excellent sensitivity, selectivity and tone quality are characteristics of this instrument. An "airplane" type dial, calibrated in frequency and showing the location of the short-wave bands, is a special feature. Small, compact size and unusual accessibility of parts are important service features. Figure 1 shows the schematic circuit, Figure 2 the chassis wiring, and Figure 3 the speaker wiring.

DESCRIPTION OF ELECTRICAL CIRCUIT

Radio Circuit

The signal enters the receiver through the antenna coupling transformer, the secondary of which is tuned and is applied to the grid of the RCA-6D6 R. F. amplifier. The output of this stage is then coupled through a tuned stage to the grid of the RCA-6A7, which is a combined first detector and oscillator. The oscillator maintains a constant frequency difference (370 K. C. higher) from the R. F. signal, with which it is combined in the first detector grid circuit. The output of the first detector is a 370 K. C. signal, which is of course the intermediate frequency.

Two sets of coils are provided for the R. F., oscillator and first detector coils for the two tuning ranges provided. A push-pull switch permits selection of the desired band.

The intermediate frequency amplifier consists of a single RCA-6D6 and two transformers, comprising four circuits, all of which are tuned.

The output of the I. F. amplifier is then applied to the RCA-75, which is the combined second detector, automatic volume control and A. F. amplifier. The signal is applied to the diode electrodes of the tube, which act as a two-element rectifier. The direct current component of the rectified signal produces a voltage drop across resistor R-9. This voltage drop across R-9 constitutes the automatic bias voltage for the R. F., first detector and I. F. amplifier, which gives the automatic volume control action of the receiver. The volume control selects the amount of audio voltage that is applied to the RCA-75 and thereby regulates the audio output of the entire receiver.

The output of the RCA-75 is transformer coupled to the grid of the RCA-41 tubes, which constitute the output amplifier of the receiver. These are operated as a push-pull Pentode stage and give the receiver a high-gain audio amplifier (necessary for short-wave reception) and a large undistorted power output. The plate circuit of the output stage is matched to the cone coil of the reproducer by means of a step-down output transformer.

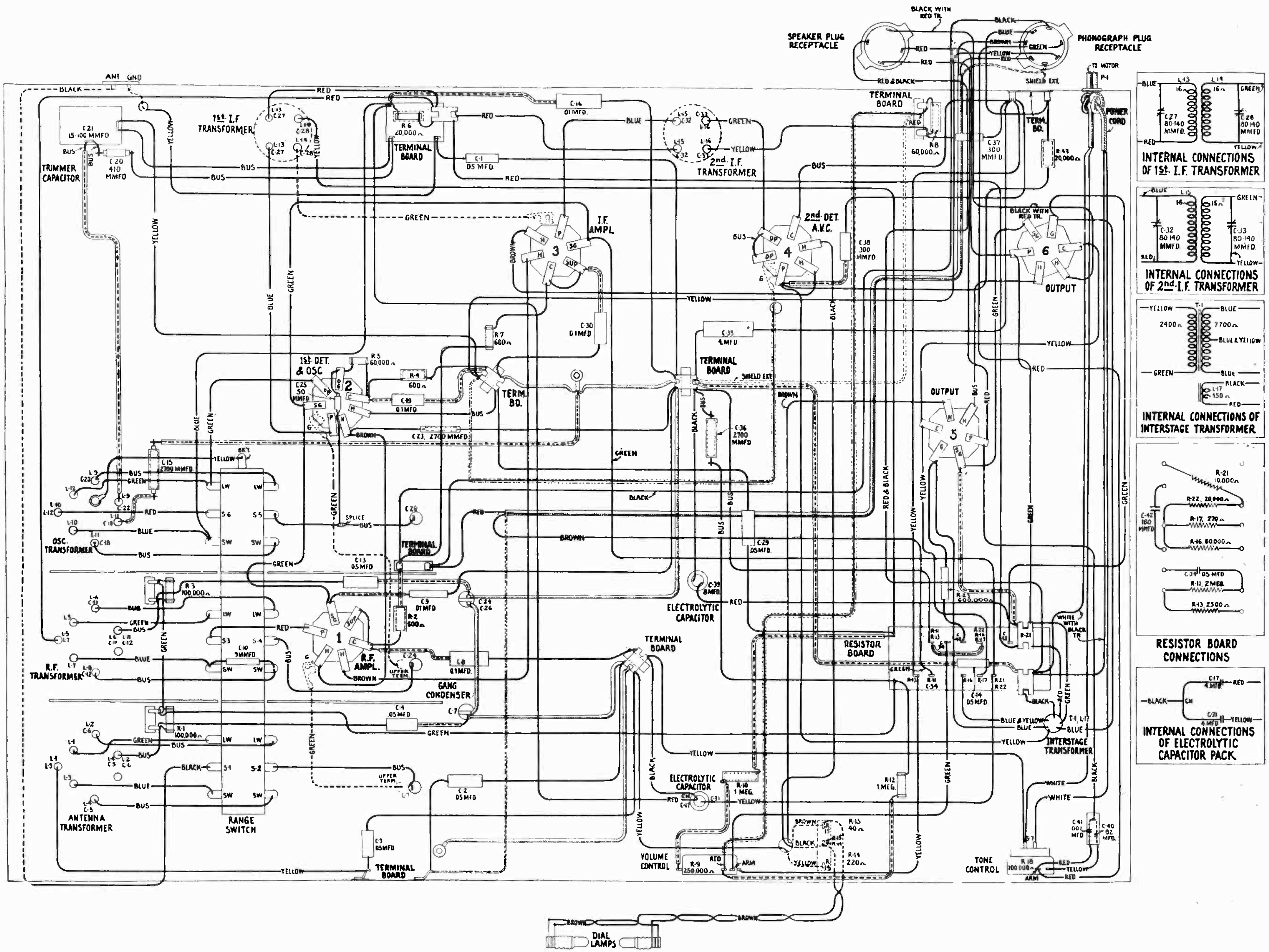


Figure 2—Wiring Diagram

The tone control consists of a variable resistor and capacitor connected in series and placed across the plates of the output stage. Reducing the amount of resistance attenuates the high frequency response of the receiver.

The power supply is taken direct from the line. All tube heaters, the speaker field and the dial lamps are connected in series with a resistor and placed across the line. Plate and grid voltages use the same source, although suitable filters and resistors are used to properly filter the line and provide correct voltages.

Phonograph Circuit

The Phonograph facilities of this instrument are designed to produce high quality record reproduction by utilizing the amplifier and reproducer unit of the radio receiver. A low impedance pickup unit, mounted on an inertia tone arm, is used to convert the mechanical variations of the record into electrical voltage variations. The output of the pickup is fed to the grid circuit of the RCA-75 second detector. A step-up transformer and compensated volume control is connected in the pickup circuit for adjusting the volume and maintaining the proper frequency characteristic for optimum reproduction. From the detector to the loudspeaker the pickup signal travels in the same channels as that of the audio frequency conponent of the radio signal.

SERVICE DATA

CAUTION—This receiver operates on 220-volt direct current without a transformer between the line and the various parts of the receiver, such as A. C. receivers use. It is therefore extremely important to use the utmost caution when operating the receiver outside of the cabinet. Also a knob must always be placed on the shaft of the main tuning capacitor, as under certain conditions the full line voltage is obtained between this point and ground.

(1) Line-Up Capacitor Adjustments

To properly align this receiver, it is essential that a modulated R. F. oscillator, such as Stock No. 9050, an output indicator (Stock No. 4317) and an alignment tool (Stock No. 4160) be available. Figure 4 shows the location of the various line-up capacitors.

I. F. Tuning Adjustments

Two transformers comprising four tuned circuits are used in the intermediate amplifier. These are tuned to 370 K. C. and the adjustment screws are accessible as shown in Figure 4. Proceed as follows:

(a) Short-circuit the antenna and ground leads and tune the receiver so that no signal is heard. Set the volume control at maximum and connect a ground to the ground terminal.

(b) Connect the test oscillator output between the first detector control grid and chassis ground, preferably through a series condenser. Connect the output meter across the voice coil of the loudspeaker and adjust the oscillator output so that, with the receiver volume control at maximum, a slight deflection is obtained in the output meter.

(c) Adjust the secondary and primary of the first and then the second I. F. transformers until a maximum deflection is obtained. Keep the oscillator output at a low value so that only a slight deflection is obtained on the output meter at all times. Go over these adjustments a second time, as there is a slight interlocking of adjustments. This completes the I. F. adjustments.

R. F. and Oscillator Adjustments

The R. F. line-up capacitors are located at the bottom of the coil assemblies instead of their usual

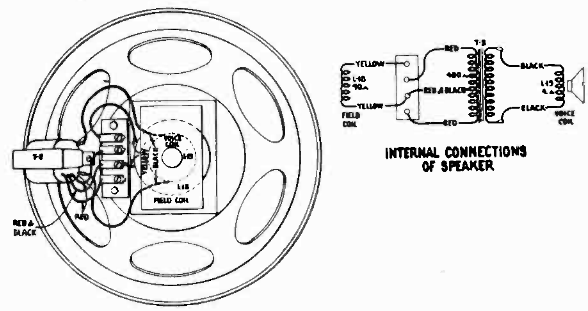


Figure 3—Loudspeaker Wiring

position on the gang capacitor. They are all accessible from the bottom of the chassis except the 600 K. C. series capacitor, which is accessible from the rear of the chassis. Proceed as follows:

(a) Connect the output of the oscillator to the antenna and ground terminals of the receiver. Check the position of the indicator pointer when the tuning capacitor plates are fully meshed. It should be coincident with the radial line adjacent to the dial reading of 54. Then set the Test Oscillator at 1400 K. C., the dial indicator at 140 and the oscillator output so that a slight deflection will be obtained in the output meter when the volume control is at its maximum position.

(b) With the Range Switch at the "in" position, adjust the three trimmers under the three R. F. coils, designated as L in Figure 4, until a maximum deflection is obtained in the output meter. Then shift the Test Oscillator fre-

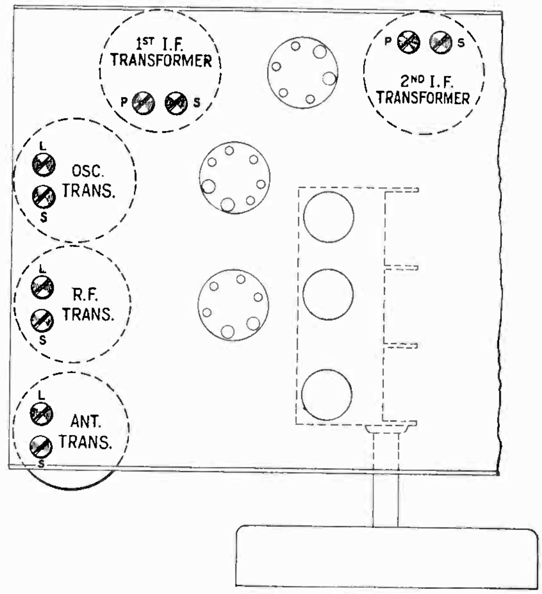
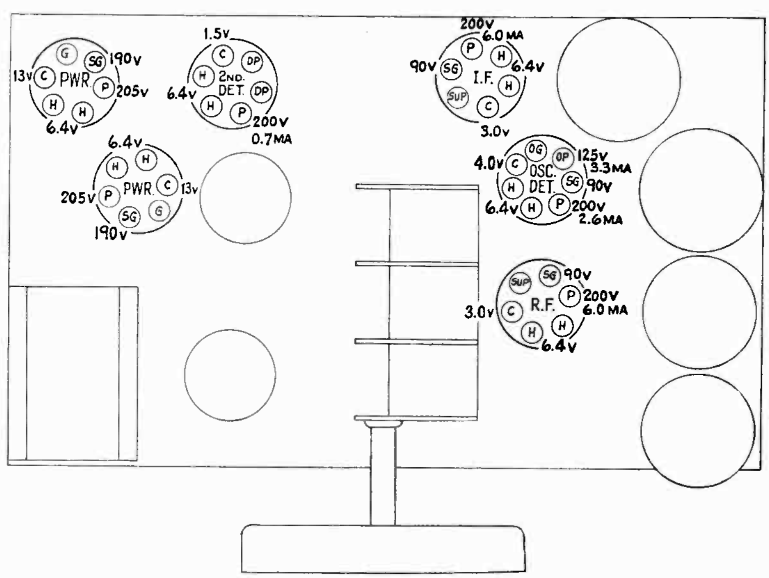


Figure 4—Location of Line-Up Capacitors—Viewing bottom of chassis



ALL D. C. VOLTAGES ARE TO – B

Figure 5—Radiotron Socket Voltages

quency to 600 K. C. The trimmer capacitor, accessible from the rear of the chassis, should now be adjusted for maximum output while rocking the main tuning capacitor back and forth through the signal. Then repeat the 1400 K. C. adjustment.

(c) Now place the Range Switch at the "out" position, shift the Test Oscillator to 15,000 K. C. and set the dial at 150. Adjust the three trimmer capacitors designated as S in Figure 4 for maximum output, beginning with the oscillator trimmer. It will be noted that the oscillator and first detector trimmers will have two positions at which the signal will give maximum output. The position which uses the lower trimmer capacitance, obtained by tuning the screw counter-clockwise, is the proper adjustment for the oscillator, while the position that uses a higher capacitance is correct for the detector. *Both of these adjustments must be made as indicated irrespective of output.* The R. F. is merely peaked. In conjunction with the detector adjustments, it is necessary to rock the main tuning capacitor back and forth while making the adjustment. This completes the line-up adjustments.

The important points to remember are the need for using the minimum oscillator output to obtain a deflection in the output meter with the volume control at its maximum position and the manner of obtaining the proper high frequency oscillator and detector adjustments.

(2) Radiotron Socket Voltages

The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if lower resistance meters are used, such allowances must be made.

(3) Service Data on Magnetic Pickup

The Magnetic Pickup used in this combination instrument is of a new design with an improved frequency range. While in physical appearance it is similar to that of the older type, details of construction are considerably different. It consists essentially of a chromium steel magnet, two thin pole pieces, a mechanism support and bracket, a coil, and an armature that is damped by means of an anchored damping block.

The use of the anchored damping block eliminates any bad peaks in the frequency range. The frequency-response characteristic is substantially flat from 50 to 5,000 cycles.

(4) Replacing Magnet Coil, Pivot Rubbers, Armature or Damping Block

In order to replace a defective coil or the hardened pivot rubbers (see Figure 8), it is necessary to proceed as follows:

(a) Remove the pickup cover by removing the center holding screw and needle screw.

(b) Remove the pickup magnet and the magnet clamp by pulling them forward.

(c) Unsolder the coil leads and remove the mechanism assembly from the back plate by releasing the two mounting screws and the damping block clamping screw.

(d) Remove screws A and B, Figure 8, and then remove the mechanism assembly from the pole pieces.

(e) The coil or the front pivot rubber may now be removed and replaced. If it is desired to replace the rear pivot rubber, then the end of the armature soldered to the mechanism support must be unsoldered and the damping block removed. The rear pivot rubber now may be replaced. After putting the pivot rubbers in place a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block.

(f) The mechanism should now be reassembled, except for the magnet, which must be magnetized. After being magnetized, the mechanism—with the pole pieces upward—should

RADIOTRON SOCKET VOLTAGES

220-Volt, D. C. Line—No Signal

Radiotron No.		Cathode to B— Volts, D. C.	Screen Grid to B— Volts, D. C.	Plate to B— Volts, D. C.	Plate Current, M. A.	Heater Volts, A. C.
RCA-6D6 R. F.		3.0	90	200	6.0	6.4
RCA-6A7	1st Detector	4.0	90	200	2.6	6.4
	Oscillator	—	—	125	3.3	
RCA-6D6 I. F.		3.0	90	200	6.0	6.4
RCA-75 2nd Detector		1.5	—	200	0.7	6.4
RCA-41 Power		13.0	190	205	25.0	6.4
RCA-41 Power		13.0	190	205	25.0	6.4

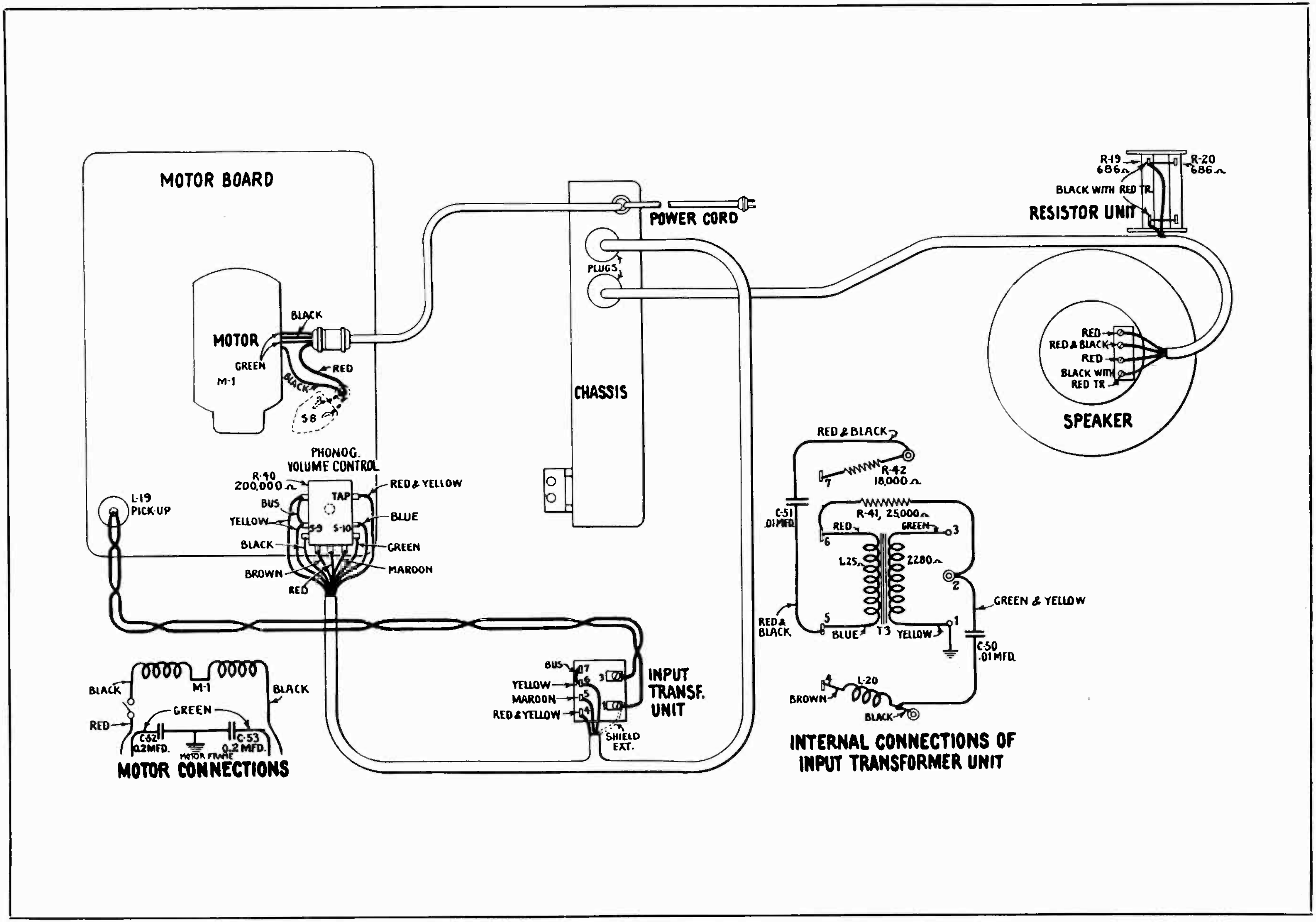


Figure 6—Assembly Wiring Diagram

be placed so that the magnet may be slid from the magnetizer onto the pole pieces without breaking physical contact. After placing the pole pieces on the magnet, the entire assembly should be remagnetized thoroughly, being careful not to change the polarity obtained by the initial magnetization.

(g) After assembling to the mechanism, the entire assembly should be fastened to the back plate by means of the screws provided, making sure the damping block is securely clamped. At the same time, the metal dust cover must be placed in position.

(h) After remagnetizing, it is necessary to correctly center the armature. This may be done quite accurately by feeling its play after the needle is inserted. A little practice will quickly show which way an adjustment is necessary to have the armature centered properly. The adjustment is made by loosening screws A and B (Figure 8), and sliding the mechanism slightly in relation to the pole pieces.

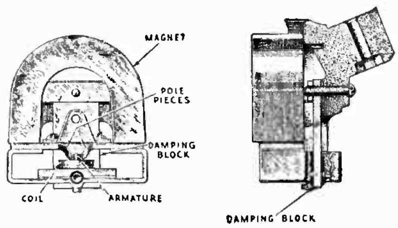


Figure 7

(i) The cover may be now replaced over the entire assembly, and the pickup returned to the tone arm.

In assembling, it may be desirable to check the armature air gap by means of a small Feeler Gauge. This air gap should be .009" on each side of the armature. However, a little practice with the needle in place will quickly disclose whether or not the armature is centered.

(5) Replacing the Damping Block

If it is desired to replace the damping block, it may be done in the following manner:

(a) Disassemble the pickup as described under the preceding section.

(b) Remove the armature entirely by unsoldering it at its joint with the mechanism support.

(c) Remove the damping block from the armature and clean the bushing for holding the damping block with emery paper.

(d) Insert the armature through the new block so that it occupies the same position as that of the old. Also ascertain that the block is in correct vertical alignment with the armature. It will be noted that the hole in the damping block is somewhat smaller than the diameter of the armature. This is done so that a snug fit will be obtained.

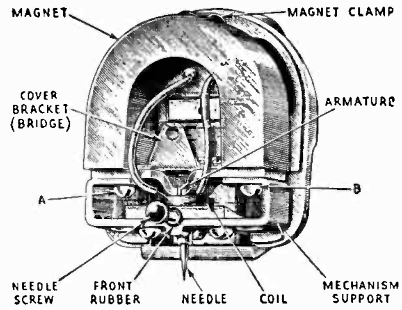


Figure 8

(e) After properly locating the damping block, a soldering iron should be applied to the armature so that the block will melt slightly at its point of contact with the armature. A special tip, constructed as shown in Figure 9, will prove desirable for fusing the block in place. The iron should be applied long enough to slightly melt the block and cause a small bulge on both sides, but should not be applied long enough to cause any bubbling. The pickup should then be reassembled as described in the preceding section.

Only rosin core solder should be used for soldering the coil leads in the pickup. Also rosin core solder should be satisfactory for resoldering the end of the spring in the hole in the mechanism, since both these parts have been previously tinned. In case the parts are not well tinned, it will be necessary to scrape the end of the spring and the hole in the mechanism until bright. These parts may now be tinned by using as a flux a water solution of zinc chloride (commonly called acid flux). After tinning, dip the parts in water to wash off the acid flux and thereby prevent serious subsequent corrosion. After making sure that the pivot rubbers and damping block are properly in place, as described under (e) above, the armature may now be soldered in place in the mechanism by using rosin core solder, since the parts are now tinned. Care must be exercised to get the needle hole perfectly square with respect to the mechanism, or otherwise it will be difficult if not impossible to center the armature in the air gap as explained under (h).

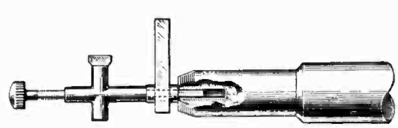


Figure 9

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
10194	Ball—Steel ball for condenser drive assembly —Package of 20	$0.25
2747	Cap—Contact cap—Package of 5	.50
3938	Capacitor—9 mmfd. (C10)	.25
3849	Capacitor—50 mmfd. (C25)	.30
6314	Capacitor—160 mmfd. (C42)—Package of 5	2.00
4352	Capacitor—300 mmfd. (C37, C38)	.25
4297	Capacitor—410 mmfd. (C20)	.30
4031	Capacitor—2700 mmfd. (C15, C23, C36)	.50
3701	Capacitor—0.01 mfd. (C9, C16)	.30
4211	Capacitor—0.05 mfd. (C1, C2, C3, C14, C34)	.30
3901	Capacitor—0.05 mfd. (C4, C13)	.36
3888	Capacitor—0.05 mfd. (C29)	.25
3877	Capacitor—0.1 mfd. (C8, C19, C30)	.32
3796	Capacitor—4.0 mmfd. (C35)	.60
6986	Capacitor—8.0 mmfd. (C39)	1.60
3861	Capacitor—Adjustable trimmer capacitor (C21)	.78
6985	Capacitor — Comprising two 4.0 mmfd. capacitors (C17, C31)	1.50
4373	Capacitor pack—Comprising one 0.002 mfd. and one 0.02 mfd. capacitors (C40, C41)	.30
6983	Coil—Antenna coil (L1, L2, L3, L4, C5, C6)	2.68
6700	Coil—Oscillator coil (L9, L10, L11, L12, C18, C22)	2.30
6699	Coil—R. F. coil (L5, L6, L7, L8, C11, C12)	2.44
6694	Condenser—3-gang variable tuning condenser (C7, C24, C26)	3.75
6841	Dial—Station selector dial scale—Package of 5	2.74
4467	Drive—Variable tuning condenser drive assembly complete	2.40
4340	Lamp—Dial lamp—Package of 5	.60
3906	Mounting assembly — Variable condenser mounting assembly—Comprising 3 bushings, 3 lock-washers, 3 nuts and 3 washers —Package of 1 set	.28
3940	Pointer—Station selector indicator—Package of 5	.50
3218	Resistor—600 ohms—Carbon type—¼ watt (R2, R4, R7)—Package of 5	1.00
4338	Resistor — 2500 ohms — Carbon type — ¼ watt (R13)—Package of 10	2.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R5, R8, R16)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1, R3)—Package of 5	1.00
3439	Resistor—600,000 ohms—Carbon type—¼ watt (R23)—Package of 5	1.00
3033	Resistor—1 megohm—Carbon type—¼ watt (R10, R12)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R11)—Package of 5	$1.00
6303	Resistor—20,000 ohms—Carbon type—½ watt (R43)—Package of 5	1.00
4337	Resistor—270 ohms—Carbon type—1 watt (R17)—Package of 10	2.20
6114	Resistor — 20,000 ohms — Carbon type — 1 watt (R6, R22)—Package of 5	1.10
4339	Resistor — 260 ohms — Porcelain type — Tapped at 220 ohms (R14, R15)	.52
3991	Resistor — 10,000 ohms — Porcelain type (R21)	.60
3943	Screen—Translucent celluloid screen—For dial lamps—Package of 2	.18
3878	Screw—No. 4-40-$\frac{3}{16}$ headless cup point set screw for fastening station selector pointer —Package of 20	.25
3768	Screw—Square head No. 6-32-¼ set screw for condenser driver—Package of 10	.35
6704	Shaft—Tuning condenser drive shaft assembly	.64
4145	Shield—First detector and oscillator Radiotron shield	.30
4103	Shield—I. F. amplifier Radiotron shield	.20
3950	Shield—R. F. amplifier Radiotron shield	.26
4216	Shield—Radiotron shield top	.10
4215	Shield—Second detector Radiotron shield	.15
3529	Socket—Dial lamp socket	.32
6676	Socket—6-contact Radiotron socket	.40
7485	Socket—6-contact second detector and AVC Radiotron socket	.40
3572	Socket—7-contact Radiotron socket	.38
6696	Switch—Range switch (S1, S2, S3, S4, S5, S6)	2.24
6697	Transformer—First intermediate frequency transformer (L13, L14, C27, C28)	1.80
6698	Transformer—Second intermediate frequency transformer (L15, L16, C32, C33)	1.78
6987	Transformer pack—Audio transformer pack —Comprising one reactor and one interstage transformer (T1, L17)	4.50
6705	Tone control (R18, S7)	1.20
6695	Volume control (R9)	1.20
	REPRODUCER ASSEMBLIES	
4600	Cable—Reproducer cable—4-conductor with male section of connector—From receiver to resistors and reproducer	.60
7825	Coil—Field coil, magnet and cone support (L18)	4.38
8969	Cone—Reproducer cone (L19)—Package of 5	6.35
7824	Reproducer complete	8.00
4599	Transformer—Output transformer (T2)	1.34

REPLACEMENT PARTS—Continued

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	MOTOR ASSEMBLIES	
3524	Brush—Motor brush—Package of 2	$0.60
3525	Cap—Brush holder cap for motor brush—Package of 2	.64
4598	Capacitor—Motor capacitor—Two 2.0 mfd. capacitors (C52, C53)	.98
4596	Escutcheon—Speed regulator escutcheon	.36
3487	Governor assembly—Comprising friction disc, two springs and two balls—Assembled and mounted	2.00
3489	Indicator pointer—Speed indicator pointer complete, with mounting screws and washers	1.65
7823	Motor—220—volt D. C. motor complete (M1)	34.66
3488	Pin—Governor (speed) regulator pin	.30
4597	Screw—Motor mounting screw assembly—Comprising four screws, four spacers, four lockwashers and four nuts	.22
	PICKUP AND ARM ASSEMBLIES	
7821	Arm—Pickup arm complete, less escutcheon and pickup	5.36
3417	Armature—Pickup armature	.72
6346	Back—Pickup housing back	.45
3385	Coil—Pickup coil (L30)	.50
3386	Cover—Pickup cover	.56
3418	Cushions—Pickup rubber cushions—Comprising one damper and two spacer cushions and one damper bushing—5 sets	1.10
3390	Escutcheon—Pickup arm escutcheon complete with mounting rivets	.46
6335	Pickup—Pickup unit complete	4.00
3389	Rod—Automatic brake trip rod with lock nut—Package of 5	.40
3387	Screw assembly—Pickup mounting screw assembly comprising one screw, one nut and one washer—10 sets	.40
3388	Screw—Pickup needle holding screw—Package of 10	.60
3419	Screw—Pickup cover mounting screw—Package of 10	.40
	SWITCH ASSEMBLIES	
3994	Cover—Motor switch cover	.26
10184	Plate—Automatic brake latch plate—Package of 5	.40
10174	Springs—Automatic brake springs—Package of 4	.50
6896	Switch—Eccentric automatic switch complete	2.50
3322	Switch—Motor switch (S8)	.75

Stock No.	Description	List Price
	TURNTABLE ASSEMBLIES	
7084	Cover—Turntable cover	$0.40
7838	Turntable complete	2.15
	MISCELLANEOUS ASSEMBLIES	
4677	Bezel—Metal bezel (escutcheon) for station selector dial glass	.56
4594	Box—Needle box	.30
4592	Cable—Phonograph input cable—9-conductor—From chassis to input transformer and volume control	2.25
6614	Glass—Station selector dial glass	.30
3829	Knob—Phonograph volume control knob—Package of 5	1.10
6989	Knob—Range switch or tone control knob—Package of 5	.65
6991	Knob—Station selector knob—Package of 5	1.15
6990	Knob—Volume control knob—Package of 5	1.15
3824	Nut—Cap nut for motor board suspension assembly—Package of 4	.82
9050	Oscillator—Test oscillator 90–25,000 K. C.	29.50†
4601	Plug—4-prong male section of connector plug for reproducer cable	.54
4602	Plug—7-prong male section of connector plug for reproducer cable	.56
4341	Resistor—Porcelain type—686 ohms (R19, R20)	2.12
4678	Ring—Retaining ring for dial glass—Package of 5	.34
4342	Screw—Receiver mounting screw assembly—Comprising four bushings, four screws and four washers	.30
4591	Screw assembly—Receiver chassis mounting assembly—Comprising eight cushions, four screws, four washers and four spacers	.44
4160	Screwdriver—Combination insulated screwdriver and socket wrench for I. F. and R. F. adjustments	1.00
4593	Socket—4-contact socket for reproducer cable plug	.42
4595	Socket—7-contact socket for phonograph input cable plug	.52
3391	Suspension spring and washer assembly—For motor board—Comprising one bolt, one top spring, one bottom spring, two cup washers, one "C" washer and one nut	.50
4603	Transformer — Input transformer pack — Comprising one input transformer, one choke coil, one 18,000 ohm resistor, one 25,000 ohm resistor and two 0.01 mfd. capacitors (T3, L20, R41, R42, C50, C51)	4.65
4590	Volume control — Phonograph volume control (R40, S9, S10)	2.18

† Full discount not allowed.

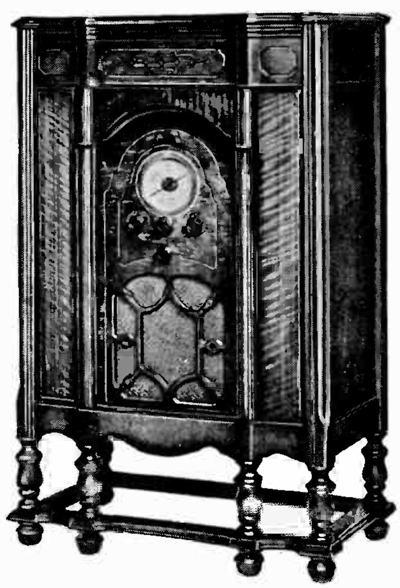
RCA Victor "All-Wave Duo"

Models 340 and 340-E

Eight-Tube Superheterodyne, Radio-Phonograph Combinations

(External I. F. Transformers)

INSTRUCTIONS



RCA Victor Company, Inc.

CAMDEN, N. J., U. S. A.

INTRODUCTION

This combination "all-wave" radio receiver and electrical phonograph embodies the widely recognized superheterodyne circuit and is capable of operation through a continuous tuning range of from 540 to 18,000 kilocycles (555 to 16.7 meters). Certain models intended primarily for European destinations are operable through an additional range of from 150 to 410 kilocycles (2000 to 732 meters) for long-wave services. All facilities provided in this instrument for reception beyond the limits of the standardized broadcast band (540 to 1500 kilocycles) are built into the radio chassis—not simply connected to an existing chassis as a short-wave adaptor—resulting in distinctly superior performance.

To facilitate tuning as far as possible, the complete main tuning range is divided into four overlapping steps, each spread over the full span of the dial. These steps, or frequency bands, together with the long-wave range provided in some models, are quickly interchangeable by means of a switch located on the front of the cabinet. Also contributing to tuning ease and accuracy are the clock-type "full-vision" illuminated dial, which is calibrated throughout in frequency, and the associated vernier (double-reduction ball-bearing) tuning drive.

The technically-informed user of this instrument naturally will be interested in its many advanced engineering features. Of chief importance is the use of *tuned-radio-frequency amplification* preceding the heterodyne circuit to minimize extraneous signal interference (image-frequency response, etc.) and to improve the "signal-noise" ratio. Two t-r-f stages are included, one being common to all bands and the second used only in conjunction with the highest-frequency band to compensate for the inherently greater circuit losses obtained in that range. Additional features of note are: (1) Its efficient automatic volume control operating uniformly at all carrier frequencies and (2) its high-powered (Class B) audio-output system utilizing the new "twin-amplifier" Radiotron RCA-53. In general, all of the best practices observed heretofore in modern, high-grade receivers of the standard broadcast type are incorporated in this "all-wave" instrument, thus insuring excellent performance over the entire tuning range.

Facilities for the electrical reproduction of either standard-speed (78 revolutions per minute) or long-playing (33⅓ R. P. M.) records of 12 inches diameter or less are accessible beneath the hinged lid of the cabinet. All parts of the electrical phonograph are assembled on a metallic motorboard which is supported upon springs to insure proper acoustical performance. The lid of the cabinet when lowered rests upon a "sound-proofing" cushion, thus confining within the phonograph compartment extraneous noise incident to record playing—a feature distinctly advantageous to reproduction quality.

INSTALLATION

Location—The instrument should be placed convenient to the antenna and ground connections and near an electrical outlet.

Set-up—After removing the instrument from its shipping container, detach the unfinished wooden cleat fastened across the rear of the chassis. Then remove the vertical wooden prop which supports the motor and the two "red" hex-head bolts from the motorboard mounting rails. The two wooden blocks which brace the motorboard in shipment finally must be removed so that the board will float freely upon its spring suspension.

Now raise the cabinet lid and withdraw all packing material from the playing compartment. Insert the used-needle cup (packed in outfit package) in the hole provided. With the speed-shifter (lever projecting toward front left-hand corner of motorboard) set in its 78 R. P. M. (outward) position, mount the turntable (also in outfit package) on the motor spindle. Make certain that the spindle drive key engages the slot in the turntable hub.

Tubes—The instrument is equipped and tested at the factory with RCA Radiotrons and is shipped with these tubes installed. Before making the required external connections, however, it will be advisable to examine the tube installation, as one or more of the tubes, shields or dome terminal clips may have been jarred loose in shipment. Refer to the tube location diagram printed on the instrument label inside the cabinet and ***make certain:***

(1) That all tubes are in the proper sockets and pressed down firmly.

(2) That all shields are rigidly in place over the tubes represented by double circles on the diagram.

(3) That the spring connectors of the short flexible (grid) leads, shown on the diagram, are securely attached to the dome terminals of the proper tubes.

NOTE—The grid lead for the RCA-2B7 Radiotron must be enclosed by the cylindrical tube shield. A slot is provided at the bottom of this shield for entrance of the lead.

Antenna and Ground—The efficiency of any antenna varies greatly with the frequency of incoming radio waves, a given length being excellent at certain frequencies and comparatively poor at others. For uniform results throughout a wide tuning range such as found in this instrument, therefore, an antenna of adjustable length would be desirable theoretically. From a practical standpoint, however, very good results will be obtained using two antennas of different length, one 24–29 feet for short-wave reception and the other 50–100 feet for reception in the long-wave, standard broadcast and police bands, the lead-in considered as part of the total length in each case.

The shorter antenna may be used alone if preferred, but probably will not be satisfactory for receiving distant or low-powered stations in the standard broadcast band. Further, no advantage will be gained by its use on the shorter wavelengths unless it can be installed so that the majority of its length is unshielded (not contained in a building of metallic construction) and sufficiently remote from sources of man-made interference (such as housewiring, power lines, street-railways and passing automobiles) to prevent excessive noise. If these conditions cannot be fulfilled, it will be preferable to erect a single antenna of compromise length (100–105 feet overall) which, in addition to providing excellent results in the standard broadcast band, will also favor reception in the short-wave broadcast bands located at 49, 31, 25 and 19 meters.

Best performance of this receiver on the shorter wave-lengths can be insured by installation of the recently-introduced "World-Wide" antenna system, available from your dealer as a convenient accessory kit. The advantages of this system are two-fold, its use providing: (1) A great improvement in efficiency, as evidenced by increased signal strength—often several times that obtainable with the conventional single-wire type, and (2) a considerable decrease in local electrical interference (man-made static) which is apt to be objectionably severe at the higher frequencies. For densely-populated districts, therefore, this system is virtually a necessity.

Good reception in many installations will be obtained without connecting the instrument to an external ground, since the power line characteristics often render a separate radio ground unnecessary. In any case, however, best results will be insured by grounding the set in the conventional manner to a water-pipe or radiator or to a metallic pipe or stake driven from five to eight feet into the soil. The ground lead when used should be short, preferably not more than 15 feet in length, and connected to a clean portion of the pipe or stake surface by means of an approved ground clamp.

A terminal board is provided at the rear of the receiver chassis for connection to the antenna and ground. Attach the antenna wire or lead-in to the left-hand terminal (marked "ANT") and the ground wire to the right-hand terminal (marked "GND"). Tighten both terminals with a screw-driver to insure permanent electrical connections.

Power Supply—Connect the power cord of the instrument to an electrical outlet supplying alternating current at the correct voltage and frequency (cycles)—see instrument-label rating which corresponds to rating symbol on chassis. As shipped from the factory, models rated 105–125 volts are connected correctly for operation at 115–125 (230–250 for 200–250 volt models) *unless otherwise indicated by a tag attached to the power cord.* Hence, if the local voltage does not lie within the present range of the instrument. the alternative form of connection must be substituted. Consult your power company if you are in doubt as to the specific voltage or frequency of the supply. Reconnections when required should be performed by your dealer, to whom complete technical information is available in a separate booklet known as the Service Notes.

OPERATION

Controls

The four control knobs on the front panel of the cabinet serve the following purposes:

(1) ***Range Switch*** (Left-hand Knob)—This switch converts the receiver for operation within any of the tuning ranges provided. As indicated on the selector dial, the letters on the switch escutcheon signify:

X—*Long-Wave Range*—150 to 410 kilocycles (2000 to 732 meters). This range is included only in certain models of the instrument (see "Introduction").

A—*Standard Broadcast Band*—540 to 1500 kilocycles (555 to 200 meters).

B—*Police Band*—1500 to 3900 kilocycles (200 to 77 meters). Services available within this band include police calls at 1574, 1712 and 2450 kilocycles, amateur radio "phone" communications between 1800 and 2000 kilocycles, and aviation communications (phone) between 2500 and 3500 kilocycles.

C—*Short-Wave Range*—3900 to 10,000 kilocycles (77 to 30 meters). Within the limits of this range are included two of the internationally-assigned short-wave broadcast bands. These are known as the 49 and 31 meter bands. (The portion of this range from 8000 to 10,000 kilocycles, which includes the latter band, is preferably received on range D.)

D—*Short-Wave Range* — 8,000 to 18,000 kilocycles (37.5 to 16.7 meters). This range embraces four of the standardized short-wave broadcast bands located at 31, 25, 19 and 16 meters, respectively.

(2) ***Station Selector*** (Upper Middle Knob with Crank)—Scale X (when included) and scales A and B on the illuminated dial are calibrated in kilocycles and traversed by the lower end of the moving pointer. The upper end of the pointer traverses scales C and D, which are calibrated in megacycles (affix three ciphers to convert to kilocycles). The scale portions covered by the police bands on scale B and by the standardized short-wave broadcast bands on scales C and D are bracketed and clearly identified; each police band is designated by the letter "P" and each broadcast band by numerals corresponding to the wave-length followed by the letter "M" (meters), such as "49M."

(3) ***Power Switch and Tone Control*** (Lower Middle Knob)—The power switch operates at the counter-clockwise end of the control range. A slight clockwise rotation actuates the switch, causing illumination of the dial—indicative of normal operation. Treble response increases gradually to a maximum with continued clockwise rotation.

(4) ***Radio Volume Control*** (Right-hand Knob)—Sound level (volume) increases with rotation of this control in a clockwise direction.

A fifth knob is located in the phonograph playing compartment at the left rear corner of the motor-board. This control serves two functions as follows:

(5) ***Transfer Switch and Record Volume Control***—The transfer switch operates at the counter-clockwise end of the control range. With the knob turned fully counter-clockwise, the switch is set for radio operation. Clockwise rotation first transfers the circuits for phonograph operation and then increases the sound level (volume) obtained from records.

Radio Procedure

The actual operation is simple and not unlike that of more conventional instruments designed for the reception of standard broadcast programs alone. However, the full possibilities of any short-wave receiver cannot be attained unless the user has a practical knowledge of short-wave transmission behavior and operating schedules. It is therefore recommended that the appended Notes on Short-Wave Reception and the inserted Short-Wave Broadcasting Station List and Program Schedule be studied carefully.

A brief outline of the recommended operating procedure should suffice. See the foregoing description of the controls and proceed as follows:

1. Set the Transfer Switch counter-clockwise (for radio operation) and the Range Switch for the frequency range within which the desired station is included.

2. Turn the Power Switch "on" and the Tone Control fully clockwise—*for full-range reproduction.* Wait a few seconds in order that the tubes may attain the proper temperature before attempting further operation.

3. Advance the Radio Volume Control to a position near the middle of its range and rotate the Station Selector until the dial indicator assumes a position coincident with the listed frequency of the desired station (on that scale which is designated by the letter corresponding to the range switch setting). Then turn the selector *very slowly* over a narrow range on each side of that setting, advancing the volume control further in a clockwise direction and repeating the tuning process, if necessary, until the signal is heard.

> NOTE—This procedure is important—especially so for short-wave reception. Because of the wide band of frequencies covered by the short-wave ranges, tuning is critical (sharp). A station of suitable strength often will be imperceptible if passed through rapidly or in a haphazard manner.

4. After receiving the signal, turn the Radio Volume Control counter-clockwise until the volume is reduced to a low level. Then readjust the Station Selector accurately to the position mid-way between the points where the quality becomes poor or the signal disappears. *This setting minimizes the proportion of background noise (static) and provides the fine quality of reproduction possible with this instrument.*

5. Adjust the Radio Volume Control to the desired volume level.

> NOTE—*The automatic volume control* built into this instrument maintains the volume level substantially constant irrespective of normal fluctuations of signal strength (fading). Also, other stations with good signal strength will be received at approximately the same level without manual readjustment of the volume.

6. If less treble response is preferred, rotate the Tone Control counter-clockwise to obtain the most pleasing quality of reproduction; static interference, when excessive, also may be reduced in this manner.

7. When through operating, turn the Tone Control fully counter-clockwise, thus switching "off" the power.

Phonograph Procedure

To operate the electrical phonograph, refer to the section on "Controls" and proceed as follows:

1. Turn the Transfer Switch and Record Volume Control Knob clockwise, for phonograph operation.

2. Apply power by turning the Tone Control clockwise from the "off" position. Set this control in the extreme clockwise position for *full-range* reproduction. A few seconds are required for the tubes to heat before operation is possible.

3. Place the desired record on the turntable. Insert a *new* needle in the pickup as far as it will go and tighten the needle screw. For long-playing ($33\frac{1}{3}$ R. P. M.) records, use *only* the *orange Chromium* needle. For standard (78 R. P. M.) records, use the latter needle or, if preferred, either the *green Chromium* or the full volume *Tungstone* needle. Ordinary steel needles (full volume) can be used with standard (78 R. P. M.) records, provided a new needle is inserted for each selection.

> NOTE—With care, the orange Chromium needle should play 75, the green Chromium 100, and the Tungstone 100 to 150 records. *Never re-insert in the pickup a Chromium needle which has been used (however slightly), as damage to the record grooves would result.* Do not use *Tungstone* needles with thin, flexible records or with transparent-faced (illustrated) records.

4. Pull the starting lever (right-hand side of turntable) forward to start the motor. Set the speed shifter (left-hand side of turntable) for the speed—78 or $33\frac{1}{3}$ R. P. M.—corresponding to the record on the turntable. Then place the needle on the smooth outer surface of the record and slide it into the first groove.

> NOTE—The speed shifter should not be moved inward (from the 78 to the $33\frac{1}{3}$ R. P. M. position) while the turntable is at rest.

5. Adjust the Record Volume Control to obtain the desired volume.

6. For most faithful reproduction, the Tone Control should be left in the fully clockwise position while using the phonograph. Turning this control counter-clockwise decreases the treble response and reduces the needle scratch noise (particularly noticeable with old records) reproduced by the loudspeaker.

7. Close the lid while playing. As the lid rests on a sound-proof cushion, needle scratch and other noises incident to record playing are thus rendered far less prominent.

8. At the completion of the record, lift the pickup arm and move it toward the right to stop the motor (motor stops automatically at the end of a record having the *eccentric* final groove). Lower the pickup outside the turntable—never allow it to rest on the record (or turntable) when not operating the phonograph.

9. When through operating, close the lid and turn "off" the power switch.

Lubrication—The motor should be lubricated with light oil once every six months. Two oil holes on top of the motor are accessible through openings in the motorboard when the turntable is removed. The ball-bearing mechanism under the turntable should be lubricated once a year by prying off the cover and packing with vaseline or light motor grease, being careful to prevent any dirt particles from entering with the grease. Make sure that the speed shifter is in the outward (78 R. P. M.) position before replacing the turntable on the spindle.

NOTES ON SHORT-WAVE RECEPTION

While the design of this instrument is such that no previous experience or special skill is required for proper operation, its full possibilities can be realized only by those familiar with the general characteristics of transmission on the shorter wave-lengths. The following notes are a summary of extensive data compiled mainly by experimentation and should be found both interesting and helpful, especially to beginners in the field of short-wave reception.

Broadcast transmission at 49 meters is most reliable when received from a distance of 300 miles (500 kilometers) or more, although good reception at distances greater than 1500 miles (2400 kilometers) can be expected only when a large portion of the signal path lies in darkness.

Thirty-one (31) meter stations afford greatest reliability of service to receivers situated at a distance exceeding 800 miles (1300 kilometers). Good reception from distant stations in this band is possible both day and night.

Reception from stations operating in the 25 meter band is most common when a span of 1000 miles (1600 kilometers) or more separates the receiver and transmitter. Such transmission over distances of less than 2000 miles (3200 kilometers), will be received best during daylight hours. The more distant stations, however, can still be heard well after nightfall under favorable conditions.

In the 19 meter band, stations situated at a distance of 1500 miles (2400 kilometers) or greater will be found most satisfactory. Signals in this band will generally be heard during daylight hours—rarely after nightfall or when any appreciable portion of the transmission path is in darkness. Wave-lengths below 19 meters are useful only when transmitted entirely through daylight and over long distances (2000 miles or more); ordinarily they cannot be received after sunset.

Transmitted signals of any wave-length are known to divide into two components—the "ground" wave and the "sky" wave. The former remains close to the earth's surface, providing reliable service only over short distances from the broadcasting station. The sky wave, however, travels into the higher layers of the atmosphere and is reflected back to the earth's surface at an appreciable distance from the station. With short-wave signals, the sky wave usually does not return within the radius covered by the ground wave, resulting in a so-called dead-spot region within which reception is impossible or extremely unsatisfactory. The length of the region wherein such conditions are effective is known as the skip distance, varying greatly from day to night and from summer to winter approximately as shown in Table I.

When attempting to receive distant or foreign stations, the time standards observed at various longitudes throughout the world must be considered. At 8:00 P. M. in New York or 7:00 P. M. in Chicago, it is of the next day—1:00 A. M. in London, 2:00 A. M. in most of Europe and 11:00 A. M. in Australia. On the American continents, therefore, regular evening broadcasts from Europe will be received in the late afternoon and from Australia in the early morning. Special programs, however, are frequently transmitted from European stations at times chosen for evening reception in America.

Although reception on the short wave-lengths is less affected by atmospherics or static and good results may be had in midsummer even during a thunder storm, the reverse is true of man-made interference. Electrical machinery such as trolleys, dial telephones, motors, electric fans, automobiles, airplanes, electrical appliances, flashing signs and oil burners create far more interference to the shorter waves than to frequencies in the standard broadcast band (200 to 555 meters).

While the foregoing statements are valid, many other factors may so influence the transmission of short waves that exceptions are probable in certain locations. Experience in the operation of short-wave receivers in a given location is the best guide as to what to expect in reception at various times.

Any person interested primarily in short-wave reception will find membership in the International Short-Wave Club of great value. The club is a non-commercial organization and issues a monthly magazine (International Short-Wave Radio) which contains up-to-date information pertaining to short-wave broadcasting, amateur activities and commercial, police and aircraft services. The annual membership fee, including the magazine subscription, is one dollar ($1.00), U. S. Currency; single copies of the periodical may be procured by non-members for ten cents ($0.10) U. S. Currency, each. Address International Short-Wave Club, P. O. Box 713, Klondyke, Ohio, U. S. A.

Table I—Effect of Time of Day and Season of Year on Short-Wave Transmission*

Wave-length (Meters)	Ground Wave Range		Sky Wave (Mid-Summer) Approximate Range				Sky Wave (Mid-Winter) Approximate Range			
			Noon		Midnight		Noon		Midnight	
	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.
100	90	145	—90	—145	90—600	145—960	90—100	145—160	90—2500	145—4000
49	75	120	100—200	160—320	250—5000	400—8000	200—600	320—960	400—∞	640—∞
31	60	97	200—700	320—1125	1000—∞	1600—∞	500—2000	800—3200	1500—∞	2400—∞
25	50	80	300—1000	480—1600	1500—∞	2400—∞	600—3000	960—4800	2000—∞	3200—∞
19	35	56	400—2000	640—3200	2500—∞	4000—∞	900—4000	1450—6400	X	X
15	15	24	700—4000	1125—6400	X	X	1500—∞	2400—∞	X	X

∞—Unlimited distance.   X—Ordinarily cannot be heard.

* Time and season apply to transmitting station. Distances specified are based on relatively high-power transmission and favorable conditions of reception.

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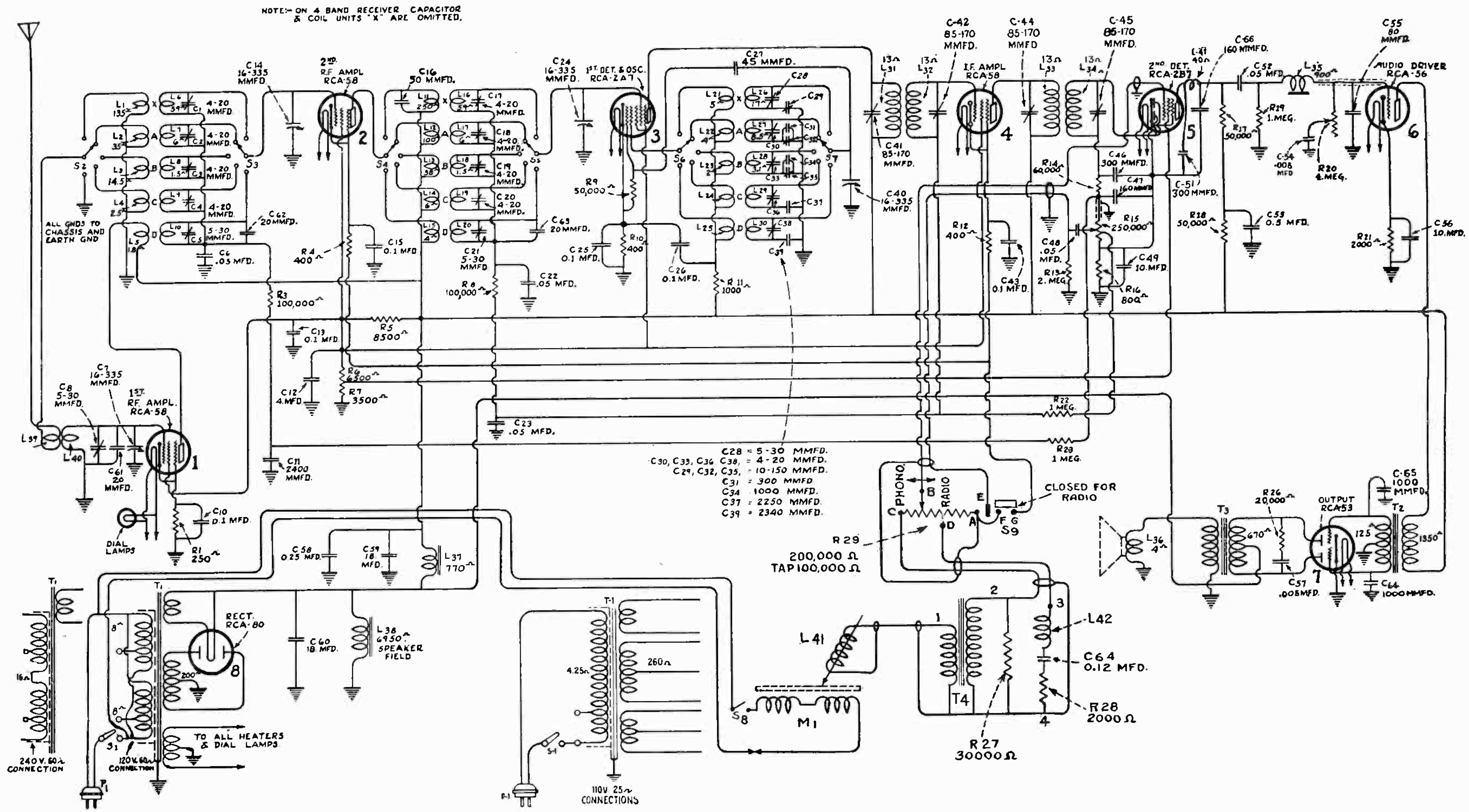

Figure A—Schematic Circuit Diagram

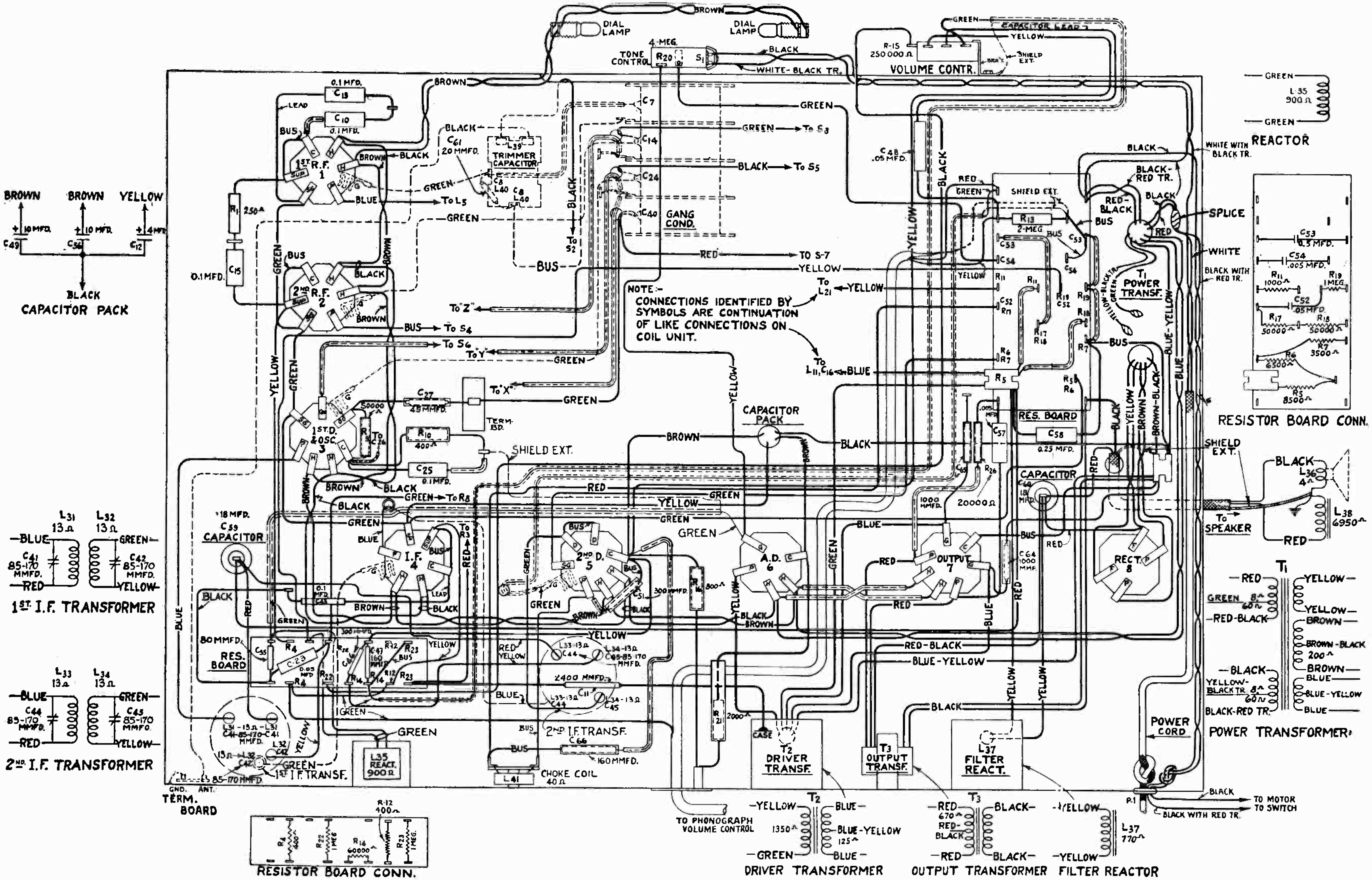

Figure B—Chassis Wiring

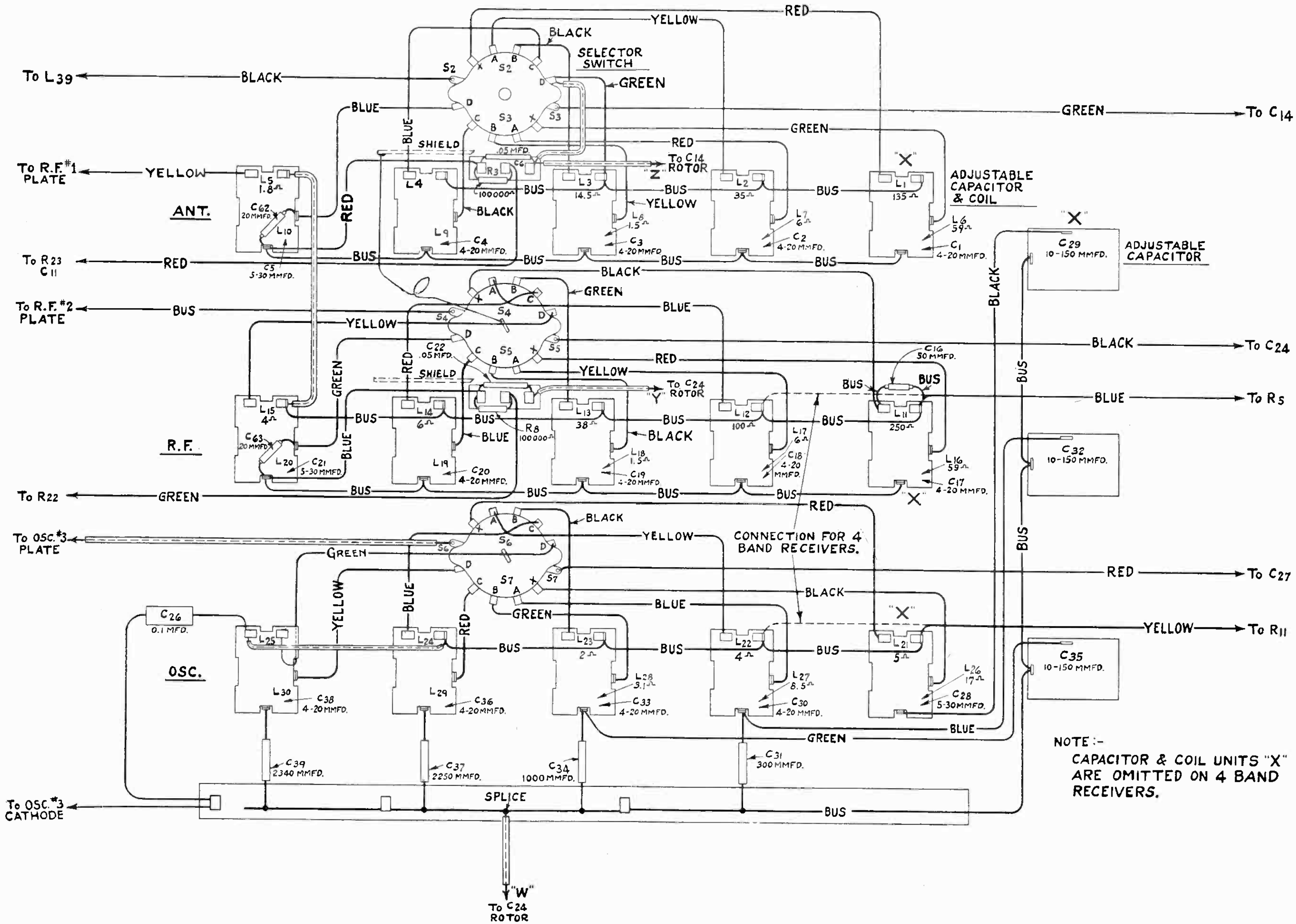

Figure C—Wiring Diagram of Coil Assembly

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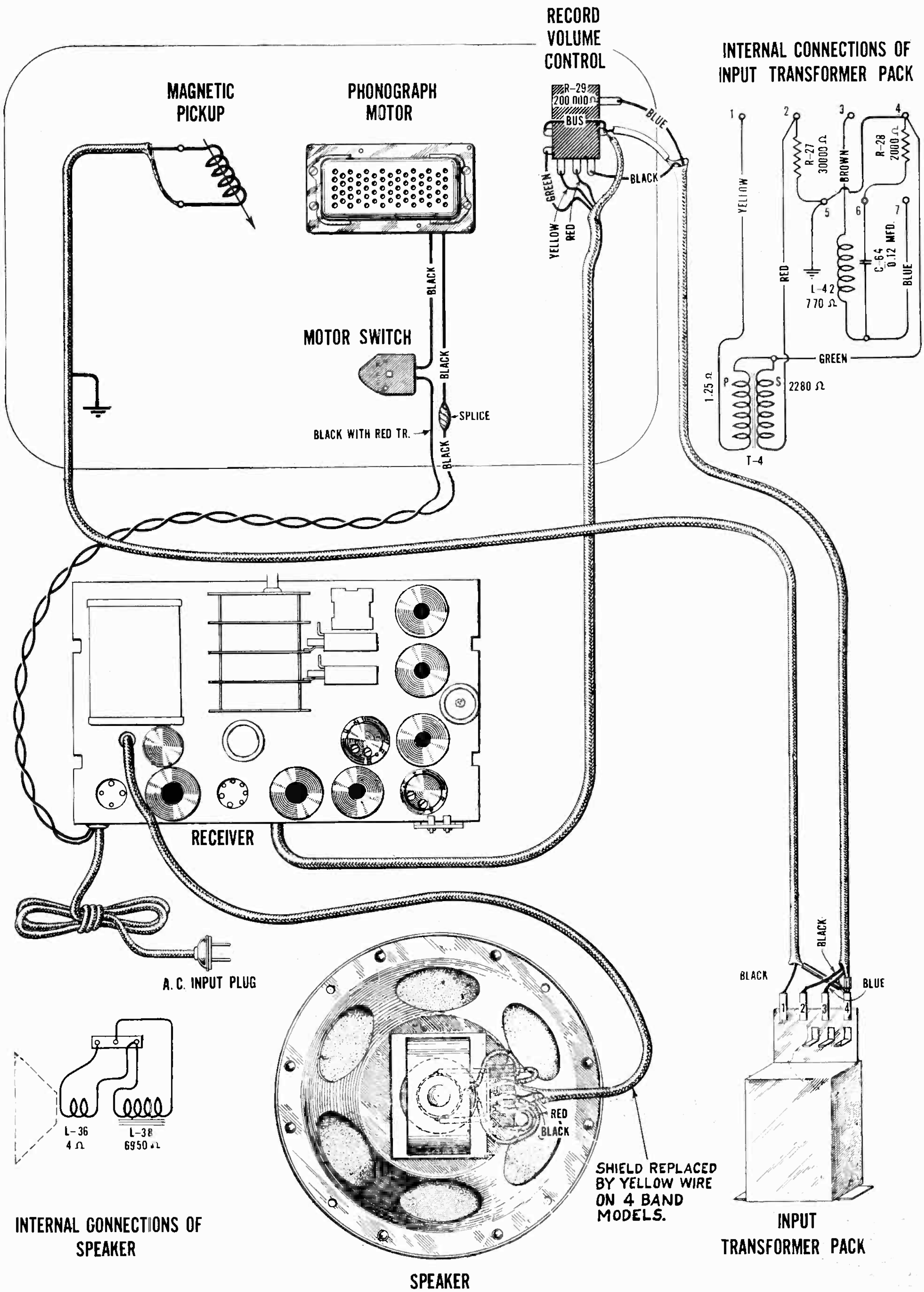

Figure D—Assembly Wiring

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SERVICE DATA

Electrical Specifications

Voltage Rating ....105–125 Volts
Frequency Rating ....25, 30, 50 and 60 Cycles
Power Consumption ....140 Watts
Type and Number of Radiotrons....3 RCA-58, 1 RCA-2A7, 1 RCA-2B7, 1 RCA-56, 1 RCA-53, 1 RCA-80—Total 8
Type of Circuit..................Straight Superheterodyne for all frequencies with Class "B" output
Undistorted Output.............................6 Watts

This all-wave combination instrument utilizes the new perfected continuous tuning superheterodyne chassis and the standard two speed motor-board assembly. Excellent quality of record reproduction, together with unusual radio performance, characterizes this instrument.

Service data for the magnetic pickup used on the tone arm of the motor-board assembly is given on the following pages. Service data for the radio receiver follows.

The tuning bands for the receiver chassis are as follows:

Selector Switch Position	*Frequency Range (Kilocycles)*	*Wave-Length Range (Meters)*
X	150–410	2000–732
A	540–1500	555–200
B	1500–3900	200–77.0
C	3900–10000	77.0–30.0
D	8000–18000	37.5–16.7

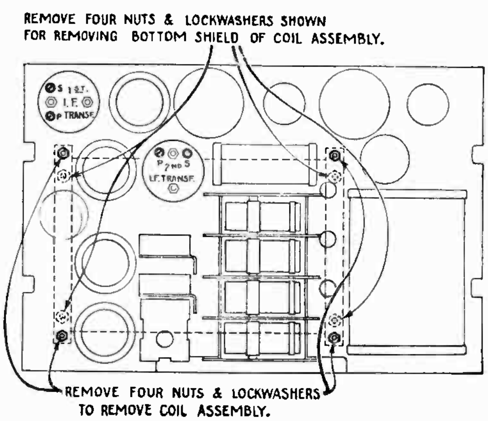


Figure E—Location of nuts and lockwashers holding coil assembly

This receiver will be supplied in two models, one including all bands and one with band X omitted. These instructions, however, will cover both types of the receiver. The variations in the wiring for the two models are plainly shown in the illustrations. Figures A, B and C show the schematic circuit and wiring diagrams.

The circuit consists of an R. F. stage using Radiotron RCA-58, a combined oscillator and first detector using Radiotron RCA-2A7, an I. F. stage using RCA-58, a second detector and A. V. C. using RCA-2B7, an A. F. driver using RCA-56, and a Class "B" output stage using an RCA-53. The RCA-80 functions as the rectifier in the power supply circuits.

The foregoing tubes and circuit functions apply to bands X, A, B and C only. In the case of band D, an additional R. F. stage utilizing an additional Radiotron RCA-58 is used. This is to increase the sensitivity and image frequency selectivity and to reduce the interference caused by tube hiss, static and signals corresponding to the intermediate frequency.

The intermediate frequency is 445 K. C. The use of this frequency gives an especially good image frequency ratio and facilitates alignment of the oscillator at the higher frequency bands.

Mechanical Construction

The chassis consists of two major assemblies, which must be disassembled for certain repair work. These assemblies consist of the chassis proper, including the main frame, power transformer, etc., and the coil assembly. The coil assembly consists of fifteen transformers supported upon individual tubular bakelite forms, each fastened to a separate porcelain strip upon which the coil terminals are mounted with their associate trimmer capacitor. This entire assembly with the selector switch is grouped in a shielded compartment which is mounted in the base of the main chassis assembly.

In order to remove this assembly it is necessary to remove the four nuts shown in Figure E and unsolder the connections of the fifteen leads shown in Figure C at the points where they connect to the main chassis. The leads should be allowed to remain on the coil assembly. After this is done, the coil assembly may be removed and repairs to it or to the main chassis may be easily made. If a coil or its associated trimmer is to be replaced, then only the bottom shield of the coil assembly must be removed. This is done by removing the four nuts that hold it to the chassis studs. This is shown in Figure E.

Line-Up Capacitor Adjustments

This receiver is aligned in a similar manner to that of a standard broadcast band receiver. That is, the three main tuning capacitors are aligned by means of three trimmers in each band and on the three lowest frequency bands a series trimmer is adjusted for aligning the oscillator circuit. The other two bands do not require this low frequency trimmer, it being fixed in value. In the case of band D, it is necessary to adjust four trimmers due to the additional R. F. stage used.

TUBE SOCKET VOLTAGES (RADIO OPERATION)

120 Volt A. C. Line

Radiotron No.	Control Grid to Cathode Volts	Screen Grid to Cathode Volts	Plate to Cathode Volts	Plate Current M. A.	Filament or Heater Volts
RCA-58, R. F.	**2.0	100	255	6.0	2.6
RCA-58, S. W. R. F.	**2.0	100	255	6.0	2.6
RCA-2A7, Det.-Osc.	**2.5	100	250	*5.0	2.6
RCA-58, I. F.	**2.0	100	255	6.0	2.6
RCA-2B7, 2nd Det.-AVC	**1.5	35	105	1.5	2.6
RCA-56, A. F. Driver	**12.0	—	245	6.0	2.6
RCA-53, Output	0	—	300	36.0	2.6
RCA-80, Rectifier	640 R. M. S. Plate to Plate			130 per Plate	5.0

* Voltages and current apply to detector portion of tube.
** These voltages cannot be measured because of the high resistance of the circuits.

The intermediate frequency amplifier is aligned in a similar manner to that of standard broadcast receivers except that it is aligned at 445 K. C. In order to properly align the receiver, it is essential that the Stock No. 9050 Test Oscillator be used. This oscillator covers the frequencies of 90 K. C. to 25,000 K. C. continuously, has good stability and includes an attenuator. In addition to the oscillator, a 300-ohm resistor for use as a "dummy" antenna, a non-metallic screwdriver (such as Stock No. 4160), and an output meter are required. The output meter should be preferably a thermocouple galvanometer connected either across or in place of the cone coil of the loudspeaker.

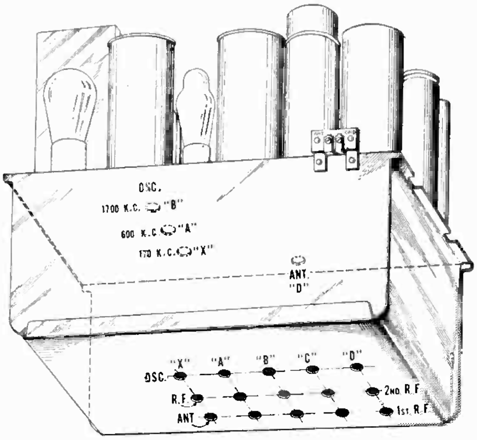


Figure F—Location of line-up capacitors

To align the intermediate frequency circuits, connect the output of the external oscillator to the grid of the first detector. For the R. F. and oscillator adjustments, the oscillator output should be connected to the antenna and ground terminals of the receiver with a 300-ohm resistor inserted in series with the antenna lead. In many cases, however, the signal strength obtained with this direct connection will be too great to permit proper alignment, even at the minimum setting of the oscillator attenuator. When this is true, the external oscillator must be loose-coupled to the receiver. This is done by connecting the 300-ohm resistor between the antenna and ground terminals of the receiver and attaching a short length of wire to the antenna post. Lay the free end of this wire across the oscillator case, adjusting its position as necessary to obtain the degree of pickup required.

The output of the external oscillator should be at the minimum value necessary to obtain a deflection in the output meter when the volume control is at its maximum position. All adjustments are made for a maximum deflection in the output meter.

The accuracy of line-up of each band may be checked without touching the trimmer condensers, by the use of the tuning wand, Stock No. 6679.

One end of the wand consists of a brass cylinder. When this is inserted in a coil the effective inductance of the coil is lowered.

The other end of the wand contains a special finely divided iron suitable for use at radio frequencies. When this is inserted in a coil the inductance is raised.

To use the tuning wand a signal is first tuned in at the frequency at which a check is desired on alignment. The wand is then inserted slowly in the Antenna and R. F. transformers, using first one end and then the other end of the wand. Unless the alignment is perfect, it will be found that the power output indicated by the meter will be increased to a peak for a critical position of the wand in the coils.

The end of the wand required indicates whether the coil is high or low.

Of course, alignment correction at the high-frequency end of a tuning range should be accomplished by the use of the trimmer condenser. If alignment correction should be required at the low-frequency end of a tuning range it may be accomplished by sliding the end coil of the transformer. The winding farthest from the trimmer panel is pushed toward the trimmer panel to increase the inductance, and farther away to decrease the inductance. On band D coils, the last two or three turns may be pushed in a similar manner to obtain the proper inductance.

This adjustment should not be attempted unless a quite appreciable improvement will result (as shown by the tuning wand).

The following chart gives the detailsof all line-up adjustments. The receiver should be lined up in the order of the adjustments given on the chart. Refer to Figure F for the location of the line-up capacitors.

Transformer Connections

The power transformer of the 50–60 cycle receiver uses two tapped primary windings. By connecting them in parallel or in series, the receiver may be used either on 110 or 220 volt lines. Figure H shows the proper manner of making the various connections possible for this transformer. Note: The transformer is normally connected for 115–125-volt lines, and a 100-volt motor supplied. The 220-volt connections must not be used unless the motor is also changed. However, 220-volt operation of the standard equipment may be obtained by using the Stock No. 9034 step-down line transformer.

The 25–60 cycle transformer uses only one 105–125-volt winding, a tap being provided for the lower voltages. Normally the transformer is connected for 115–125-volt lines, but the connection shown in Figure G may be used for 100–115-volt lines.

External Oscillator Frequency	Dial Setting	Location of Line-Up Capacitors	Position of Selector Switch	Adjust for	Number of Adjustments to be Made
445 K. C.	Any setting that does not bring in station.	At rear of chassis.	Any position that does not bring in station.	Maximum output.	4
370 K. C.	370 K. C.	Bottom of chassis.	X	Maximum output.	3
175 K. C.	Set for signal.	Top of chassis.	X	Maximum output while rocking dial back and forth.	1
1400 K. C.	1400 K. C.	Bottom of chassis.	A	Maximum output.	3
600 K. C.	Set for signal.	Top of chassis.	A	Maximum output while rocking dial back and forth.	1
3900 K. C.	3900 K. C.	Bottom of chassis.	B	Maximum output.	3
1710 K. C.	Set for signal.	Top of chassis.	B	Maximum output while rocking dial back and forth.	1
10 M. C.	10 M. C.	Bottom of chassis.	C	Maximum output. (See Note.)	3
15 or 18 M. C.	15 or 18 M. C.	Bottom and top.	D	Maximum output. (See Note.)	4

NOTE—It is important to note, when aligning bands C and D, that two peaks will be observed on the trimmers for the oscillator and for the first detector. The correct oscillator peak is the one obtained using the lower trimmer capacitance, whereas the correct detector peak is the one obtained with the greater capacitance. It is essential that the proper peak be chosen, as otherwise tracking and sensitivity will be very poor at other frequencies. When adjusting the detector trimmer, the tuning capacitor should be rocked, since there is a reaction on the oscillator tuning.

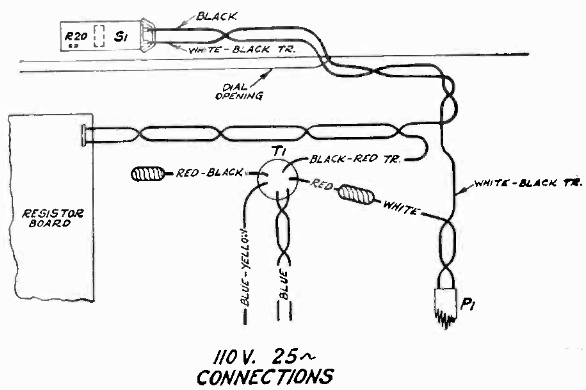


Figure G—100–115 Volt Connection of 25–60 Cycles Transformer

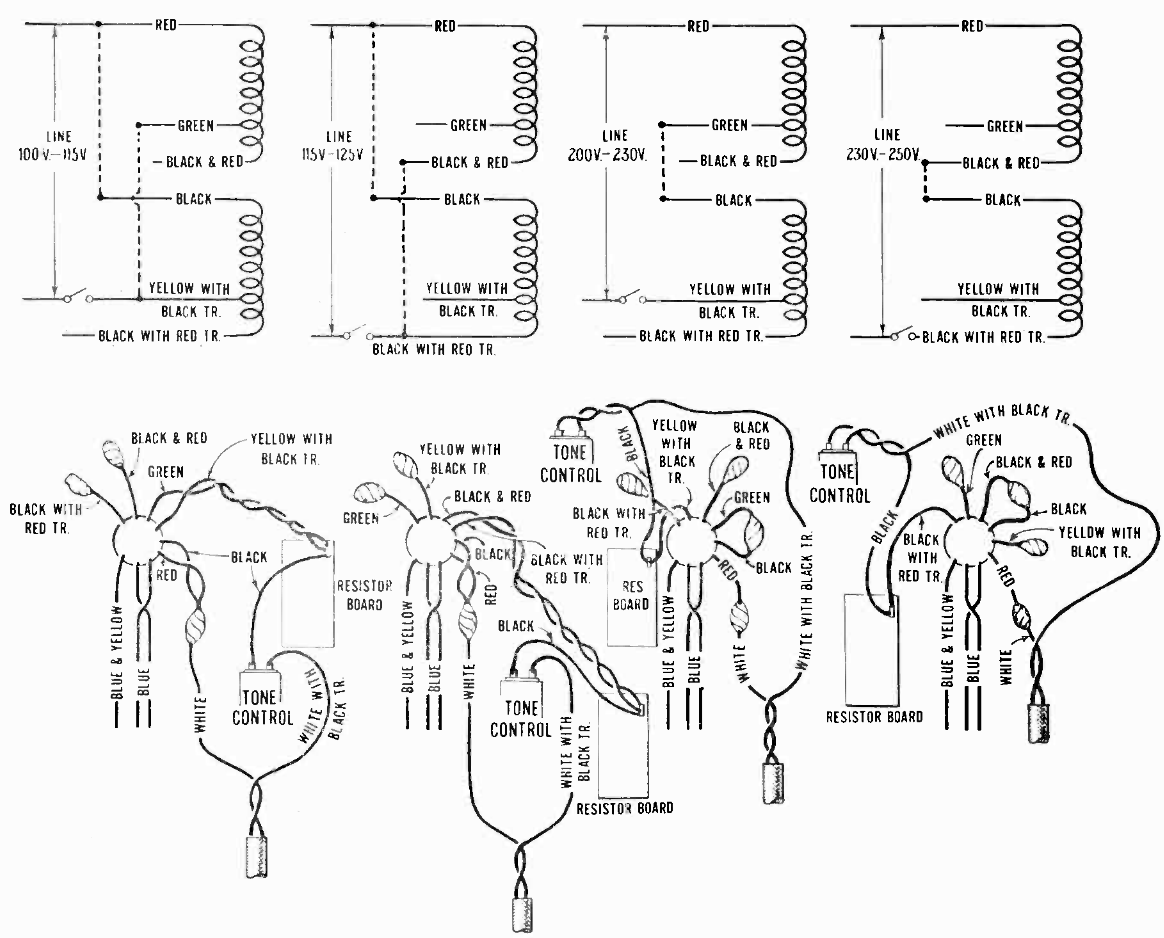


Figure H—Power Transformer Connections (50–60 cycles)

SERVICE DATA ON MAGNETIC PICKUP

The Magnetic Pickup used in this combination instrument is of a new design with an improved frequency range. While in physical appearance, it is similar to that of the older type, details of construction are considerably different. It consists essentially of a chromium steel magnet, two thin pole pieces, a mechanism support and bracket, a coil, and an armature that is damped by means of an anchored damping block.

The use of the anchored damping block eliminates any bad peaks in the frequency range. The frequency-response characteristic is substantially flat from 50 to 5,000 cycles.

Replacing Magnet Coil, Pivot Rubbers, Armature or Damping Block

In order to replace a defective coil or the hardened pivot rubbers (see Figure K), it is necessary to proceed as follows:

(a) Remove the pickup cover by removing the center holding screw and needle screw.

(b) Remove the pickup magnet and the magnet clamp by pulling them forward.

(c) Unsolder the coil leads and remove the mechanism assembly from the back plate by releasing the two mounting screws and the damping block clamping screw.

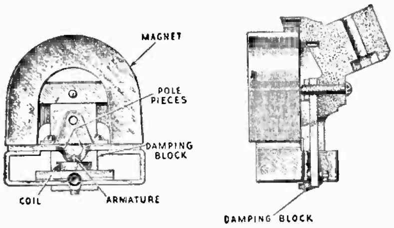


Figure I

(d) Remove screws A and B, Figure J, and then remove the mechanism assembly from the pole pieces.

(e) The coil or the front pivot rubber may now be removed and replaced. If it is desired to replace the rear pivot rubber, then the end of the armature soldered to the mechanism support must be unsoldered and the damping block removed. The rear pivot rubber now may be replaced. After putting the pivot rubbers in place a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block.

(f) The mechanism should now be reassembled, except for the magnet, which must be magnetized. After being magnetized, the mechanism—with the pole pieces upward—should be placed so that the magnet may be slid from the magnetizer onto the pole pieces without breaking physical contact. After placing the pole pieces on the magnet, the entire assembly should be remagnetized thoroughly, being careful not to change the polarity obtained by the initial magnetization.

(g) After assembling to the mechanism, the entire assembly should be fastened to the back plate by means of the screws provided, making sure the damping block is securely clamped. At the same time, the metal dust cover must be placed in position.

(h) After remagnetizing, it is necessary to correctly center the armature. This may be done quite accurately by feeling its play after the needle is inserted. A little practice will quickly show which way an adjustment is necessary to have the armature centered properly. The adjustment is made by loosening screws A and B (Figure J), and sliding the mechanism slightly in relation to the pole pieces.

(i) The cover may be now replaced over the entire assembly, and the pickup returned to the tone arm.

In assembling, it may be desirable to check the armature air gap by means of a small Feeler Gauge. This air gap should be nine mils on each side of the armature. However, a little practice with the needle in place will quickly disclose whether or not the armature is centered.

Replacing the Damping Block

If it is desired to replace the damping block, it may be done in the following manner:

(a) Disassemble the pickup as described under the preceding section.

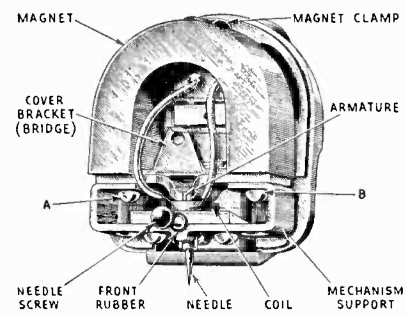


Figure J

(b) Remove the armature entirely by unsoldering it at its joint with the mechanism support.

(c) Remove the damping block from the armature and clean the bushing for holding the damping block with emery paper.

(d) Insert the armature through the new block so that it occupies the same position as that of the old. Also ascertain that the block is in correct vertical alignment with the armature. It will be noted that the hole in the damping block is somewhat smaller than the diameter of the armature. This is done so that a snug fit will be obtained.

(e) After properly locating the damping block, a soldering iron should be applied to the armature so that the block will melt slightly at its point of contact with the armature. A special tip, constructed as shown in Figure K, will prove desirable for fusing the block in place. The iron should be applied long enough to slightly melt the block and cause a small bulge on both side, but should not be applied long enough to cause any bubbling. The pickup should then be reassembled as described in the preceding section.

Only rosin core solder should be used for soldering the coil leads in the pickup. Also rosin core solder should be satisfactory for resoldering the end of the spring in the hole in the mechanism, since both these parts have been previously tinned. In case the parts are not well tinned, it will be necessary to scrape the end of the spring and the hole in the mechanism until bright. These parts may now be tinned by using as a flux a water solution of zinc chloride (commonly called

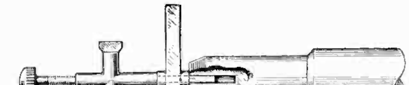


Figure K

acid flux). After tinning, dip the parts in water to wash off the acid flux and thereby prevent serious subsequent corrosion. After making sure that the pivot rubbers and damping block are properly in place, as described under (e) above, the armature may now be soldered in place in the mechanism by using rosin core solder, since the parts are now tinned. Care must be exercised to get the needle hole perfectly square with respect to the mechanism, or otherwise it will be difficult if not impossible to center the armature in the airgap as explained under (h).

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
2747	Contact cap—Package of 5	$0.50
2816	Resistor — 1,000 ohms— Carbon type — ½ watt (R11)—Package of 5	1.00
3056	Shield—Output Radiotron shield—Pkg. of 2	.40
3076	Resistor—1 megohm—Carbon type—½ watt (R19, R22, R23)—Package of 5	1.00
3114	Resistor—50,000 ohms—Carbon type—¼ watt (R9)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R3, R8)—Package of 5	1.00
3435	Resistor—250 ohms—Carbon type—½ watt (R1)—Package of 5	1.00
3470	Resistor—6,500 ohms—Carbon type—1 watt (R6)—Package of 5	1.10
3526	Resistor — 2,000 ohms — Carbon type — ½ watt (R21)—Package of 5	1.00
3527	Resistor—800 ohms—Carbon type—½ watt (R16)—Package of 5	1.00
3529	Socket—Dial lamp socket	.32
3555	Capacitor—0.1 mfd. (C26)	.36
3572	Socket—7-contact Radiotron socket—First detector and oscillator	.38
3594	Resistor—50,000 ohms—Carbon type—½ watt (R17, R18)—Package of 5	1.00
3597	Capacitor—0.25 mfd. (C58)	.40
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R14)—Package of 5	1.00
3616	Capacitor—300 mmfd. (C51)	.34
3622	Shield—Second detector Radiotron shield	.36
3641	Capacitor—0.1 mfd. (C10, C15, C25)	.35
3643	Capacitor—.005 mfd. (C57)	.25
3711	Capacitor—80 mmfd. (C55)	.40
3719	Socket—7-contact Radiotron socket	.30
3771	Resistor—8,500 ohms—Carbon type—3 watt (R5)	.25
3845	Capacitor—2,340 mmfd. (C39)	.50
3846	Capacitor—2,250 mmfd. (C37)	.50
3848	Capacitor—300 mmfd. (C31)	.30
3849	Capacitor—50 mmfd. (C16)	.30
3861	Capacitor—Adjustable trimmer (C29, C32, C35)	.78
3863	Resistor—400 ohms—Carbon type—½ watt (R4, R10, R12)—Package of 5	1.00
3864	Capacitor—300 mmfd. (C46)	.30
3865	Capacitor—160 mmfd. (C47)	.30
3888	Capacitor—.05 mfd. (C6, C22, C23, C52)	.25
3901	Capacitor—.05 mfd. (C48)	.36
3931	Capacitor—45 mmfd. (C27)	.30
3932	Capacitor—.0024 mfd. (C11)	.30
3973	Capacitor—1,000 mmfd. (C64, C65)	.34
4019	Capacitor—1,000 mmfd. (C34)	.34
4030	Bracket—Tone or volume control mounting bracket	.10
4033	Capacitor—20 mmfd. (C61, C62, C63)	.34
4103	Shield—First detector and R. F. Radiotron shield	.20
4104	Shield—I. F. Radiotron shield	.20
4205	Coil—Second detector choke (L41)	.50
4207	Capacitor—0.1 mfd. (C13, C43)	.34
6136	Resistor—3,500 ohms—Carbon type—1 watt (R7)—Package of 5	1.10
6188	Resistor — 2 megohms — Carbon type — ½ watt (R13)—Package of 5	1.00
6300	Socket—4-contact Radiotron socket	.35
6303	Resistor—20,000 ohms—Carbon type—½ watt (R26)—Package of 5	1.00
6512	Capacitor—.005 mfd. (C54)	.28
6603	Condenser—4-gang variable tuning condenser (C7, C14, C24, C40)	3.80
6604	Capacitor—0.5 mfd. (C53)	.50
6605	Transformer—Output transformer (T3)	1.48
6606	Reactor—Filter reactor (L37)	$1.66
6607	Reactor—Tone control reactor (L35)	1.14
6608	Transformer—Audio driver transformer (T2)	2.04
6609	Capacitor—18. mfd. (C59)	1.10
6612	Volume control (R15)	1.20
6613	Drive—Variable condenser drive assembly—Complete	1.00
6626	Capacitor pack—Comprising one 4. mfd., and two 10. mfd. capacitors (C12, C49, C56)	1.86
6628	Capacitor and coil—Antenna coil and capacitor assembly—8,000-18,000 kilocycles—4- or 5-band (L39, L40, C8)	1.50
6629	Switch—5-band selector switch	3.48
6630	Switch—4-band selector switch	3.48
6631	Coil and capacitor assembly—Antenna coil and capacitor—150-410 kilocycles—5-band (L1, L6, C1)	2.16
6632	Coil and capacitor—R. F. coil and capacitor assembly — 150-410 kilocycles — 5-band (L11, L16, C17)	2.10
6633	Coil and capacitor—Oscillator coil and capacitor assembly—150-410 kilocycles—5-band (L21, L26, C28)	1.40
6634	Coil and capacitor—Antenna coil and capacitor assembly—540-1,500 kilocycles—4- or 5-band (L2, L7, C2)	1.86
6635	Coil and capacitor—R. F. coil and capacitor assembly—540-1,500 kilocycles—4- or 5-band (L12, L17, C18)	2.00
6636	Coil and capacitor—Oscillator coil and capacitor assembly—540-1,500 kilocycles—4- or 5-band (L22, L27, C30)	1.40
6637	Coil and capacitor—Antenna coil and capacitor assembly—1,500-4,000 kilocycles—4- or 5-band (L3, L8, C3)	1.56
6638	Coil and capacitor—R. F. coil and capacitor assembly—1,500-4,000 kilocycles—4- or 5-band (L13, L18, C19)	1.66
6639	Coil and capacitor—Oscillator coil and capacitor assembly—1,500-4,000 kilocycles—4- or 5-band (L23, L28, C33)	1.40
6640	Coil and capacitor—Antenna coil and capacitor assembly—4,000-10,000 kilocycles—4- or 5-band (L4, L9, C4)	1.54
6641	Coil and capacitor—R. F. coil and capacitor assembly—4,000-10,000 kilocycles—4- or 5-band (L14, L19, C20)	1.60
6642	Coil and capacitor—Oscillator coil and capacitor assembly—4,000-10,000 kilocycles—4- or 5-band (L24, L29, C36)	1.34
6643	Coil and capacitor—Antenna or R. F. coil and capacitor assembly — 8,000-18,000 kilocycles—4- or 5-band (L5, L10, C5—L15, L20, C21)	1.52
6644	Coil and capacitor—Oscillator coil and capacitor assembly—8,000-18,000 kilocycles—4- or 5-band (L25, L30, C38)	1.54
6675	Shaft—Shaft for condenser drive assembly—Comprising shaft, ball race with retainer and set screw	.35
6679	Wand—Tuning wand for R. F. and oscillator adjustments	.75†
6889	Capacitor—18 mfd. (C60)	1.55
6890	Transformer—First intermediate frequency transformer (L31, L32, C41, C42)	2.40
6891	Transformer—Second intermediate frequency transformer (L33, L34, C44, C45)	2.40
6892	Tone control (R20)	1.50
6955	Shield—Second R. F. Radiotron shield	.25
6956	Shield—Radiotron shield top	.15
7484	Socket—5-contact Radiotron socket	.35

.0889 † Full discount not allowed.

REPLACEMENT PARTS—(Continued)

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
7485	Socket—6-contact Radiotron socket	$0.40
9042	Transformer—Power transformer—105–250 volts—50–60 cycles (T1)	6.84
9046	Transformer—Power transformer—105–125 volts—25–40 cycles	9.22
10194	Ball—Steel ball for condenser drive assembly —Package of 20	.25
	MOTOR ASSEMBLIES	
3398	Motor mounting washer and spring assembly —Comprising 2 cup washers, 4 springs and 1 "C" washer	.48
3817	Stud—Motor mounting stud—Package of 3	.18
8989	Motor—Motor complete 105–125 volts—60 cycle	18.52
8990	Motor—Motor complete 105–125 volts—50 cycle	18.52
8991	Motor—105–125 volts—40 cycle	23.36
8992	Motor—Motor complete 105–125 volts—25 cycle	23.36
8993	Rotor and shaft for 105–125 volts, 60 cycle motor	7.00
8994	Spindle—Turntable spindle with fibre gear for 60 cycle motor	4.75
8995	Rotor and shaft for 105–125 volts, 50 cycle motor	7.00
8996	Spindle—Turntable spindle with fibre gear for 50 cycle motor	4.75
8997	Rotor and shaft for 105–125 volts, 40 cycle motor	8.00
8998	Spindle—Turntable spindle with fibre gear for 40 cycle motor	5.50
8999	Rotor and shaft for 105–125 volts, 25 cycle motor	8.00
9001	Spindle—Turntable spindle with fibre gear for 25 cycle motor	5.50
	PICKUP, PICKUP ARM ASSEMBLIES	
3386	Cover—Pickup cover	.56
3387	Screw assembly—Pickup mounting screw assembly, comprising one screw, one nut and one washer—10 sets	.40
3388	Screw—Pickup needle holding screw—Package of 10	.60
3389	Rod—Automatic brake trip rod with lock nut —Package of 5	.40
3390	Escutcheon—Pickup arm esctucheon complete with mounting rivets	.46
3417	Armature—Pickup armature	.72
3419	Screw—Pickup cover mounting screw—Package of 10	.40
3516	Damper and bushing assembly—Comprising one upper and one lower damper, one upper bushing and one lower bearing—Located in bottom of pickup arm base	.14
3521	Cover—Pickup back cover	.18
3728	Coil—Pickup coil (L41)	.50
6346	Back—Pickup housing back	.45
6601	Pickup—Pickup unit complete	4.54
7706	Arm—Pickup arm complete less escutcheon, pickup, pickup mounting screw, nut and washer	4.30
	TURNTABLE ASSEMBLIES	
3261	Bushing—Rubber bushing—Used on turntable spindle for long-playing records—Package of 5	.40
3338	Ring—Clamp ring assembly—Comprising spring, latch lever and stud	.50
3340	Washer—Thrust washer—Package of 2	.56
3341	Pin—Groov-Pin—Package of 2	.56
3342	Spring—Latch spring—Located on clamping ring—Package of 2	.56
3343	Sleeve—Sleeve complete with ball race	2.86
3344	Cover—Grease retainer cover—Package of 2	$0.70
3346	Bushing—Speed shifter lever bushing—Package of 4	.66
3347	Spring—Speed shifter lever spring—Pkg. of 2	.30
3399	Lever—Speed shifter lever with mounting screws	.50
7084	Cover—Suede cover for turntable	.40
8948	Turntable—Complete	5.50
	MISCELLANEOUS PARTS	
2947	Leather—Friction leather—Package of 20	.50
3055	Cushion—Chassis support cushion—Package of 4	.30
3322	Switch — Automatic brake switch with mounting screws	.75
3391	Suspension spring and washer for motor board—Comprising one bolt, one top spring, one bottom spring, 2 cup washers, one "C" washer and one nut	.50
3430	Box—Needle box with lid—Package of 2	.90
3829	Knob—Radio or phonograph volume or tone control knob—Package of 5	1.10
3830	Knob—Station selector knob—Package of 5	1.08
3831	Knob—Range switch knob—Package of 5	1.08
3876	Cable—3-conductor cable for loudspeaker—4-band	.60
3878	Screws—No. 4–40—3/16" fillister head screw and washer for fastening station selector pointer—Package of 20	.25
3952	Escutcheon—Volume control escutcheon	.10
3953	Escutcheon—Range switch escutcheon—5-band	.10
3992	Escutcheon—Range switch escutcheon—4-band	.10
3994	Cover—Automatic brake switch cover	.26
4053	Cable — 3-conductor cable — From phonograph volume control to resistor boards	.90
4160	Screwdriver—Combination insulated screwdriver and socket wrench for I. F. and R. F. adjustments	1.00
6614	Glass—Station selector dial glass	.30
6615	Ring—Retaining ring for dial glass—Package of 5	.34
6616	Bezel—Metal bezel for station selector dial	.50
6671	Cable—2-conductor shielded for loudspeaker —5-band	.36
6672	Screen—Translucent celluloid screen—For dial lamps—Package of 5	.30
6673	Pointer—Station selector pointer—Pkg. of 5	.64
6677	Dial—Station selector dial—5-band—Pkg. of 5	2.90
6678	Dial—Station selector dial—4-band—Pkg. of 5	2.80
6766	Volume control—Phonograph volume control and switch (R29, S9)	2.28
6767	Transformer—Input transformer—Comprising one 30,000 ohm resistor, one 2,000 ohm resistor, one .12 mfd. capacitor, one compensating reactor and one transformer (T4, R27, R28, C64, L42)	5.62
6768	Cable—3-conductor shielded—From phonograph volume control to input transformer	.40
8837	Support—Metal support for chassis—Pkg. of 4	.48
9050	Oscillator—Test oscillator—90–25,000 K.C.	29.50†
10174	Springs—Automatic brake springs—One set of 4 springs	.50
10184	Plate—Automatic brake latch trip plate with mounting screws—Package of 5	.40
	REPRODUCER ASSEMBLIES	
8969	Cone—Reproducer cone complete (L36)—Package of 5	6.35
9438	Reproducer complete	6.88
9439	Coil assembly—Field coil, magnet and cone support (L38)	5.22

.0890 † Full discount not allowed.

RCA Victor
Model 341 "Duo"

Eight-Tube, Four-Band A. C. Radio-Phonograph

SERVICE NOTES

SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

A RADIO CORPORATION OF AMERICA SUBSIDIARY

REPRESENTATIVES IN PRINCIPAL CITIES

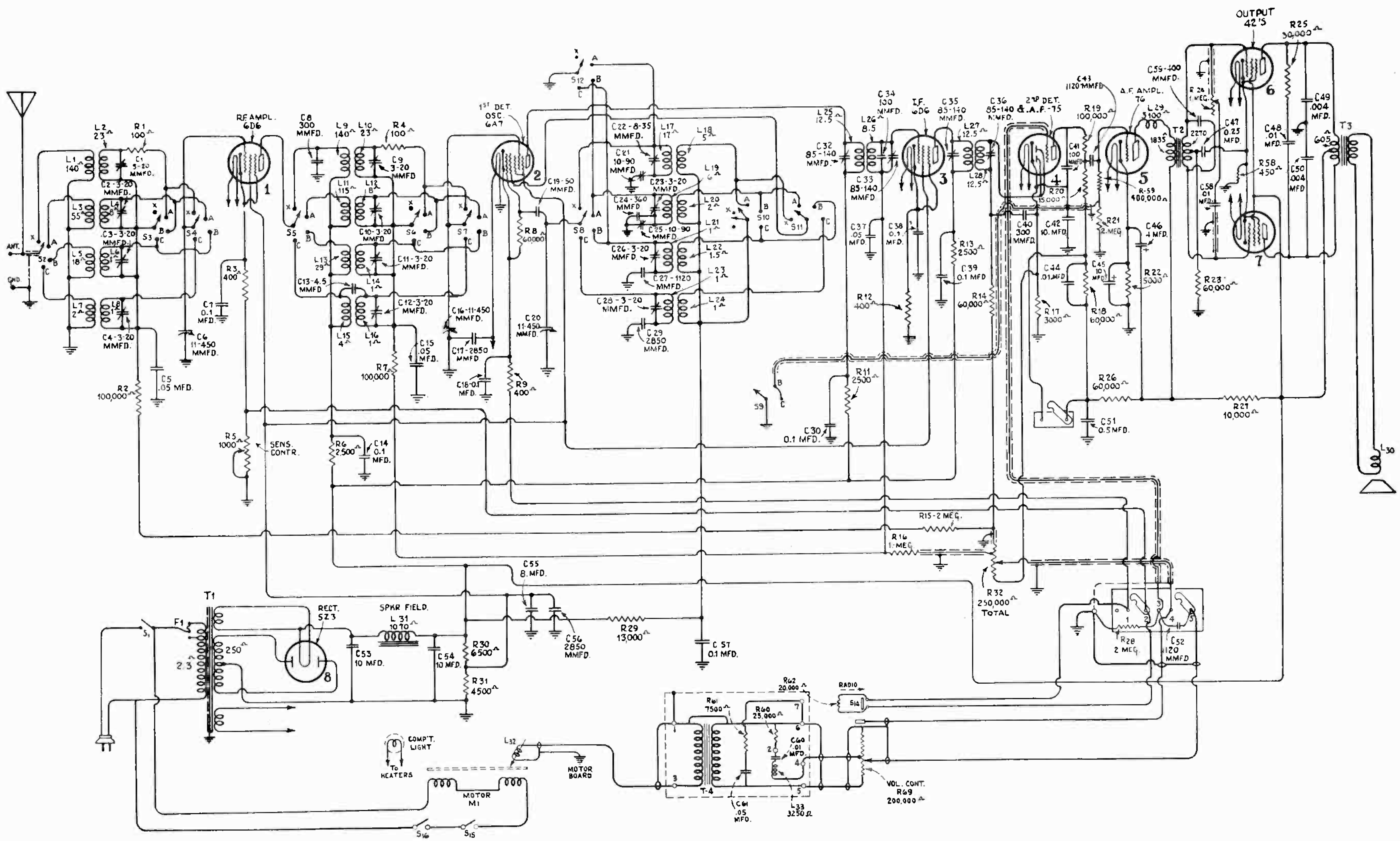


Figure 1—Schematic Circuit Diagram

RCA VICTOR MODEL 341

Eight-tube, Four-band A. C. Radio-Phonograph

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Voltage Rating . . . . . 105–125 Volts and 105–130/200–250 Volts (Double Range)
Frequency Rating . . . . . 25, 30, 50 and 60 Cycles
Power Consumption . . . . . 170 Watts, 60 Cycles
Type and Number of Radiotrons
2 RCA-6D6, 1 RCA-6A7, 1 RCA-75, 1 RCA-76, 2 RCA-42, 1 RCA-5Z3—Total, 8

Tuning Frequency Range . . . . .
- Band X— 140 K. C.– 410 K. C.
- Band A— 540 K. C.– 1720 K. C.
- Band B—1720 K. C.– 5400 K. C.
- Band C—5400 K. C.–18,000 K. C.

Line-up Frequencies . . . . . 175 K. C., 410 K. C., 460 K. C., 600 K. C., 1720 K. C., 5160 K. C., 18,000 K. C.
Maximum Undistorted Output . . . . . 4.0 Watts
Maximum Output . . . . . 5.0 Watts
Type of Magnetic Pickup . . . . . Low Impedance, Viscoloid
Type of Record Changer . . . . . Record Ejector Type
Capacity of Record Changer . . . . . Eight 10" or seven 12" Records
Turntable Speed . . . . . 33⅓ R. P. M. and 78 R. P. M.

PHYSICAL SPECIFICATIONS

Height . . . . . 40 Inches
Width . . . . . 31 3/16 Inches
Depth . . . . . 19 5/16 Inches

This eight-tube, four-band all-wave combination radio-phonograph instrument provides entertainment either from the perfected all-wave radio receiver or from records of all types. Record or radio reproduction is characterized by unusual tone quality. The perfected phonograph enables one to play a number of selections without any attention whatever, due to its automatic record-changing feature.

The eight-tube, four-band Superheterodyne receiver is of the "all-wave" type, having a continuous tuning range extending from 140 K. C. to 18,000 K. C., except for one break between 410 K. C. and 540 K. C. Such a tuning range permits the listener to receive all of the important broadcasting, police, aircraft and amateur call bands throughout the world.

Excellent sensitivity, selectivity and tone quality, together with a high output (4 watts undistorted), Class A amplifier gives the receiver outstanding performance. Operating features include an "airplane" type dial, a double-ratio vernier drive, a visual band indicator, and a special "second hand" on the dial for logging short-wave stations. Other important features include automatic volume control, sensitivity control and a large loudspeaker unit.

DESCRIPTION OF ELECTRICAL CIRCUIT

RADIO

The general circuit arrangement consists of an R. F. stage, a combined oscillator and first detector, an I. F. stage, a combined second detector, A. F. amplifier and automatic volume control, a driver audio stage and a push-pull Pentode output stage. An RCA-5Z3 rectifier, together with a suitable filtering system, provides plate and grid voltages for all tubes and field excitation for the loudspeaker. Figure 1 shows the schematic diagram, Figure 2 the chassis wiring, Figure 3 the loudspeaker wiring and Figure 4 the assembly wiring.

The signal enters the receiver through a shielded antenna lead and is applied to the grid of the R. F. tube through the antenna coupling transformer. The secondary of this transformer is tuned to the signal frequency by means of one unit of the gang capacitor. The output of this stage is transformer coupled to the grid circuit of the first detector, which is also tuned to the signal frequency by a unit of the gang capacitor.

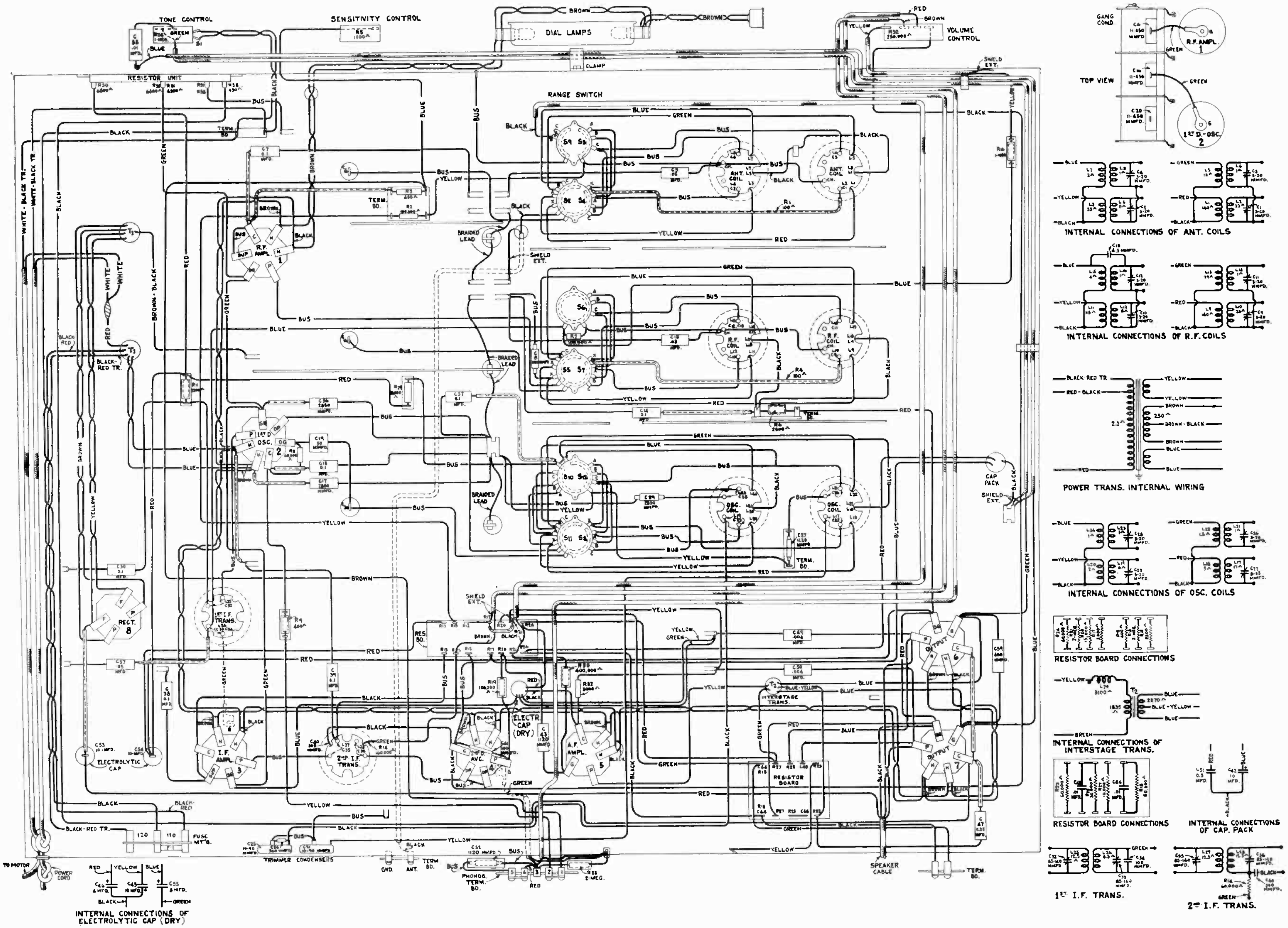


Figure 2—Wiring Diagram

Combined with the signal in the first detector is the local oscillator, which is always at a 460 K. C. frequency difference (higher) from the signal frequency. A separate coil system and the third unit of the gang capacitor are used in this circuit.

In conjunction with these three tuned circuits, it is well to point out that four different groups of tuned circuits are used, one for each tuning band. A four-position selector switch is provided for selecting the band in which the desired signal is located. In addition to selecting the desired coil system, additional groups of contacts are provided for short-circuiting the preceding lower frequency R. F. and detector coils and the two preceding oscillator coils. This is to prevent "dead" spots due to the absorption effects caused by the coils, the natural period of which, with the tuning capacitor disconnected, falls in the next higher frequency band.

The output of the first detector, which is the I. F. signal (460 K. C.), is fed directly through two tuned circuits to the grid of the I. F. amplifier stage. The I. F. stage, which utilizes Radiotron RCA-6D6, uses two transformers, which consist of four tuned circuits, all of which are tuned to 460 K. C.

The output of the I. F. amplifier is then applied to the input electrodes of the RCA-75, which is a combined second detector, A. F. amplifier and automatic volume control. The direct current component of the rectified signal produces a voltage drop across resistor R-32. The full voltage drop constitutes the automatic bias voltage for the R. F. while a tap is provided for the first detector and I. F. voltage. These automatic bias voltages for the R. F., first detector and I. F. give the automatic volume-control action of the receiver. The volume control selects the amount of audio voltage that is applied to the grid of the RCA-75 and thereby regulates the audio output of the entire receiver.

The output of the A. F. section of the RCA-75 is resistance coupled to the grid of the RCA-76, first audio stage, which is transformer coupled to the push-pull output stage.

The output stage uses two RCA-42's, which give a low distortion, high audio output to the loudspeaker.

A high-frequency tone control, which consists of a variable resistor and capacitor, is connected across the grids of the output stage. At the minimum resistance position of the variable resistor, maximum attenuation of the high audio frequencies is obtained.

The plate circuit of the output stage is matched to the cone coil of the reproducer by means of a step-down transformer.

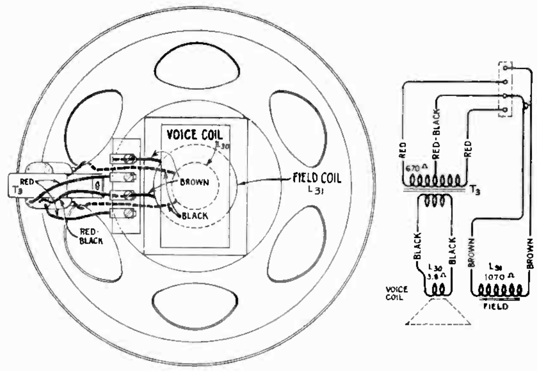


Figure 3—Loudspeaker Wiring

Plate and grid voltages for all tubes are supplied from the output of the rectifier-filter system. An RCA-5Z3 is used as a rectifier and a suitable network of capacitors and resistors gives the necessary filtering and voltages. The loudspeaker field is used as a filter reactor.

PHONOGRAPH

The record reproducing facilities consist of a low impedance magnetic pickup with its associated inertia type tone arm, a compensated volume control, the audio amplifier of the receiver and the loudspeaker of the receiver. The radio receiver is made inoperative by the switch used for changing from radio to record reproduction. The turntable assembly consists of the perfected automatic record changer, which is simple and fool-proof in operation.

SERVICE DATA

(1) LINE-UP PROCEDURE

The line-up procedure of this receiver is somewhat involved and it is important that these instructions be carefully followed when making adjustments. Properly aligned, this receiver has outstanding performance; improperly aligned, it may be impossible to receive signals on all bands.

Equipment

To properly align this receiver, proper test equipment must be used. This consists of a modulated R. F. oscillator having proper frequency range, an output indicator, an alignment tool and a tuning wand. These parts have been developed by the manufacturer of this receiver for use by service men to duplicate the original factory adjustments.

Checking with Tuning Wand

Before making any R. F., oscillator or first detector adjustments, the accuracy of the present adjustments may be checked by means of the tuning wand (Stock No. 6679). The tuning wand consists of a bakelite rod having a brass cylinder at one end and a special finely divided iron insert at the other end. Inserting the cylinder into the center of a coil lowers its inductance, while inserting the iron end increases its

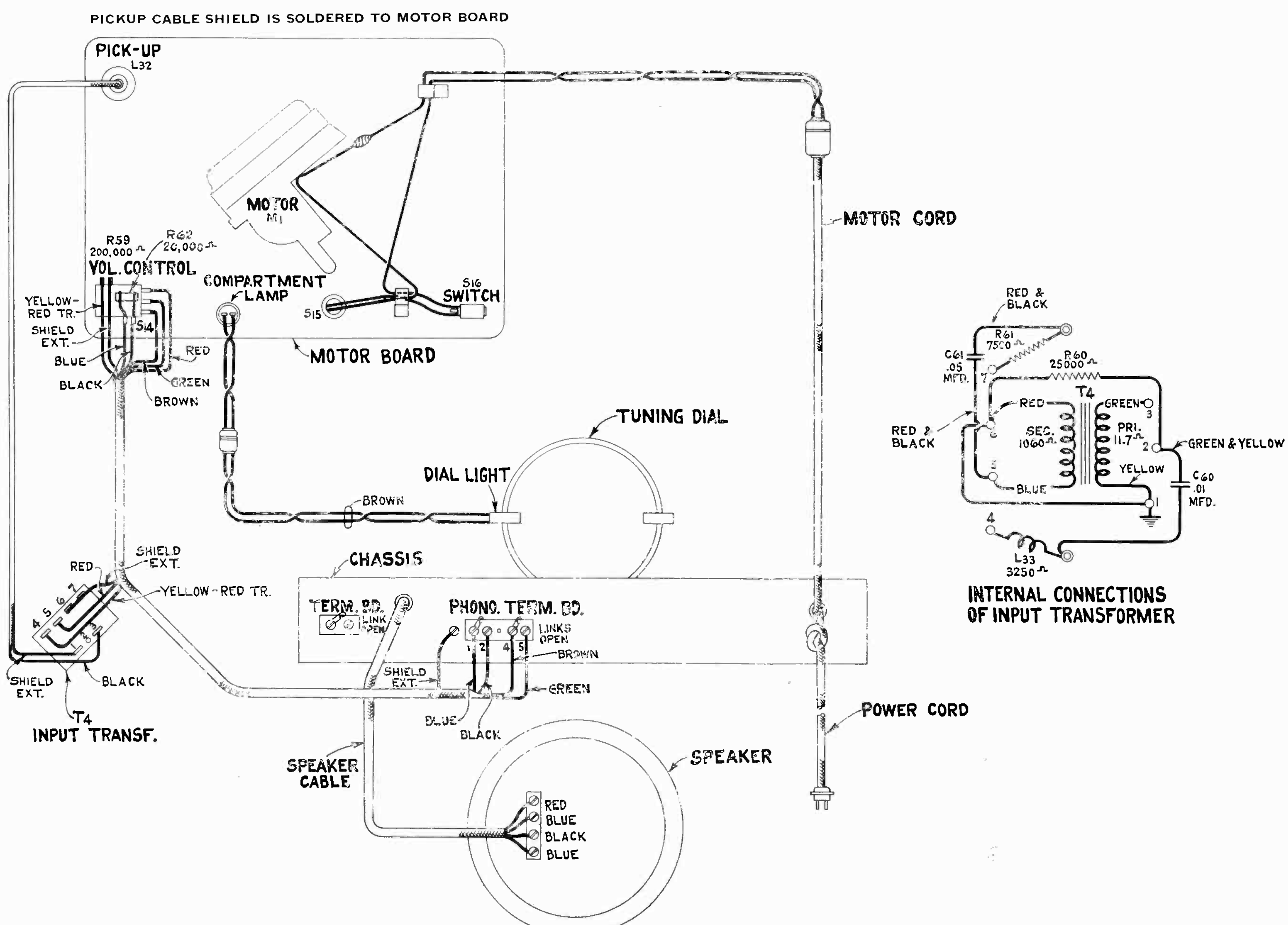


Figure 4—Assembly Wiring

inductance. From this, it is seen that unless the trimmer adjustment for a particular coil is perfect at alignment frequencies, inserting one end of the wand may increase the output of a particular signal. A perfect adjustment is evidenced by a lowering of output when either end of the wand is inserted into a coil.

The shields over the R. F. coil assembly have a hole at their top for entrance of the tuning wand. The location of the various coils inside of the shield is shown in Figure 5. An example of the proper manner of using the tuning wand would be to assume the external oscillator were set at 1720 K. C. and the signal tuned in, and the output indicator connected across the voice coil of the loudspeaker. Then the tuning wand should be inserted, first one end and then the other end, into the top of the three transformers at the left of the R. F. assembly, facing the front of the chassis. A perfect adjustment of the trimmer would be evidenced by a reduction in output when each end of the wand is inserted in each of the three transformers. If one end—for example, the iron end—when inserted in one coil caused an increase in output, then that circuit is low. An increase in the trimmer capacitance would be the proper remedy.

(2) I. F. TUNING CAPACITOR ADJUSTMENTS

This receiver has one I. F. stage with two transformers having four adjustable capacitors that may require adjustment. The transformers are all peaked at 460 K. C.

A detailed procedure for making this adjustment follows:

(a) Connect the output of an external oscillator tuned to 460 K. C. between the first detector grid and ground. Connect the output indicator across the voice coil of the loudspeaker.

(b) Place the oscillator in operation at 460 K. C. Place the receiver in operation and adjust the station selector until a point is reached (Band A) where no signals are heard and turn the volume control to its maximum position. Reduce the oscillator input until a slight indication is obtained in the output indicator.

(c) Refer to Figure 6. Adjust each trimmer of the I. F. transformers until maximum output is obtained. Go over the adjustments a second time.

This completes the I. F. adjustments. However, it is good practice to follow the I. F. adjustments with the R. F. and oscillator adjustments due to to interlocking which always occurs.

(3) R. F. OSCILLATOR AND FIRST DETECTOR ADJUSTMENTS

Four R. F., oscillator and first detector adjustments are required in Bands "A" and "X." Three are required in Bands "B" and "C."

To properly align the various bands, each band must be aligned individually. The preliminary set-up requires the external oscillator to be connected between the antenna and ground terminals of the receiver and the output indicator across the voice coil of the loudspeaker. The volume and sensitivity controls must be at the maximum position and the input from the oscillator at the minimum value

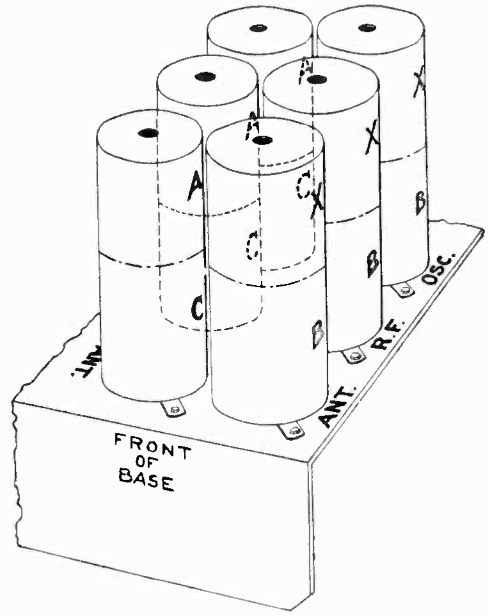


Figure 5—Location of Coils in Shields

possible to get an output indication under these conditions. In the high frequency bands, it may be necessary to disconnect the oscillator from the receiver and place it at a distance in order to get a sufficiently low input to the receiver.

The dial pointer must be properly set before starting any actual adjustments. This is done by turning the variable capacitor until it is at its maximum capacity position. One end of the pointer should point exactly at the horizontal line at the lowest frequency end of Band "A," while the other end should point to within 1/64 inch of the horizontal line at the highest frequency end of Band "A."

Figure 6 shows the location of the trimmers for each band. Care must be exercised to only adjust the trimmers in the band under test.

Band "X"

(a) Set the band switch at "X."

(b) Tune the external oscillator to 410 K. C., set the dial pointer at 410 K. C. and adjust the oscillator, detector and R. F. trimmers for maximum output.

(c) Shift the external oscillator frequency to 175 K. C. Tune in the 175 K. C. signal irrespective of scale calibration and adjust the series trimmer, marked 175 K. C. on Figure 6, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 410 K. C. as described in (b).

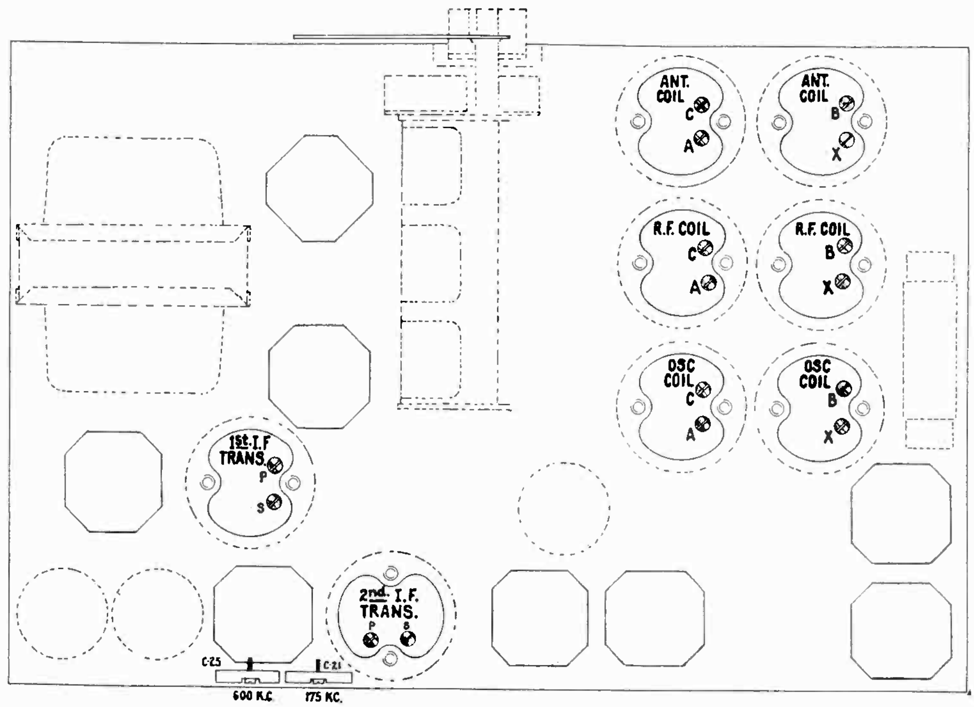


Figure 6—Location of Trimmer Capacitors

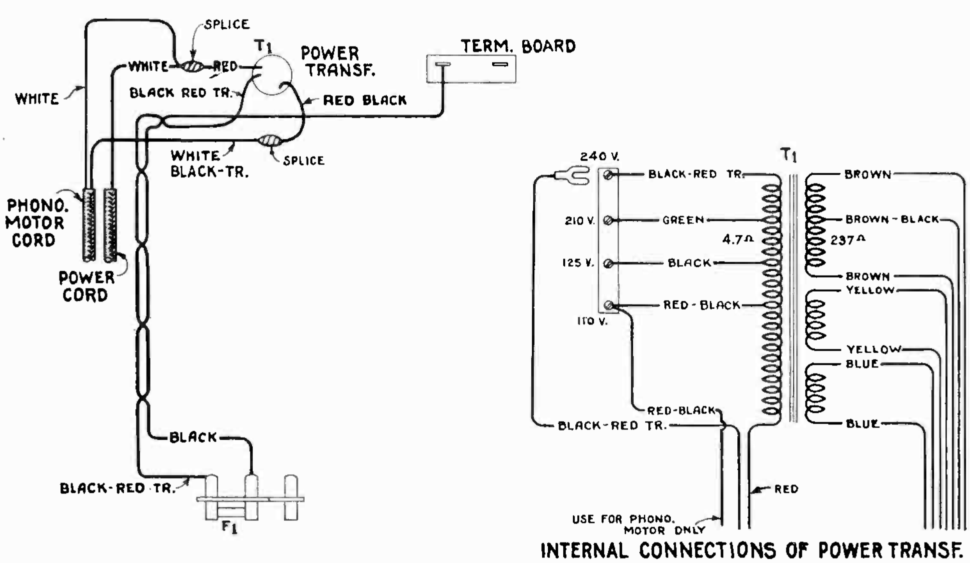


Figure 7—Universal Power Transformer Connections

Band "A"

(a) Set the band switch at "A."

(b) Tune the external oscillator to 1,720 K. C., set the pointer at 1,720 K. C. and adjust the oscillator, detector and R. F. trimmers for maximum output.

(c) Shift the external oscillator frequency to 600 K. C. Tune in the 600 K. C. signal, irrespective of scale calibration, and adjust the series trimmers, marked 600 K. C., Figure 6, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 1,720 K. C. as described in (b).

Band "B"

(a) Set the band switch at "B."

(b) Tune the external oscillator to 5,160 K. C. and set the pointer at 5,160 K. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(c) Check for the image signal, which should be received at approximately 4,240 K. C. on the dial. It will be necessary to increase the external oscillator output for this check.

(d) The antenna and detector trimmers should now be peaked for maximum output.

Band "C"

(a) Set the band switch at "C."

(b) Tune the external oscillator to 18,000 K. C. and set the pointer at 18 M. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

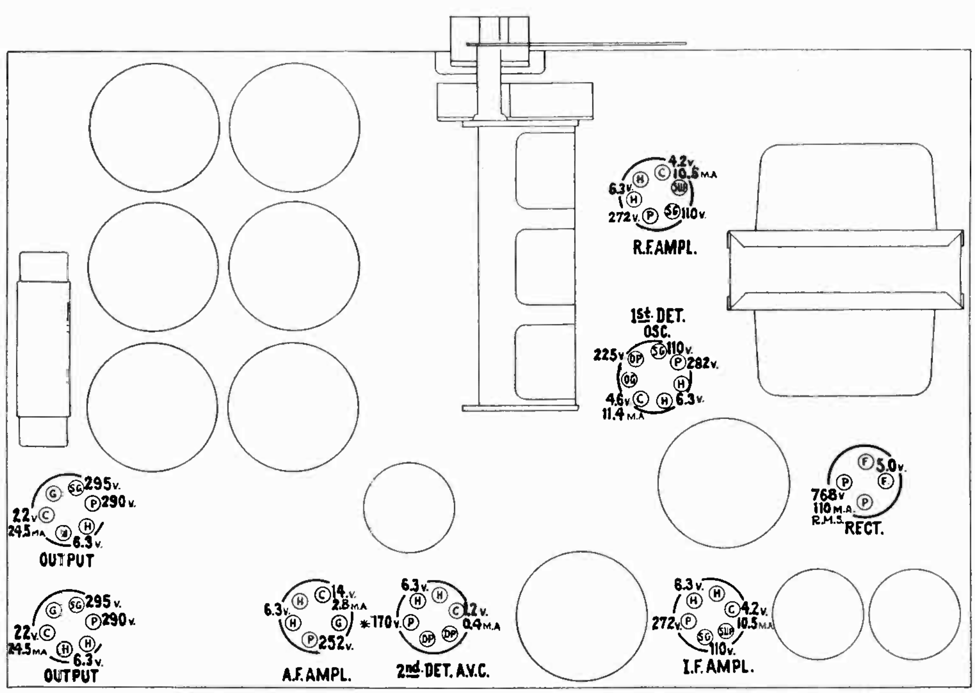
(c) Check for the image signal, which should be received at approximately 17,080 on the dial. It may be necessary to increase the external oscillator output for this check.

(d) Reduce the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal disappears. The first detector circuit is then at the oscillator frequency and the RCA-6A7 tube is blocked. Then increase the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal is peaked for maximum output.

(e) The antenna trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

(4) POWER TRANSFORMER CONNECTIONS

The 220-volt power transformer furnished with some instruments includes taps for operating on 110-volt lines. Figure 7 shows the schematic circuit of the transformer and the proper voltage to be applied to the various taps. The taps are located on the power transformer assembly and are accessible without removing the chassis from the cabinet.



* CANNOT BE MEASURED WITH ORDINARY VOLTMETER

ALL D. C. VOLTAGES ARE TO GROUND

Figure 8—Radiotron Socket Voltages

(5) FIDELITY LINK

It will be noted that a small link is mounted on the rear apron of the chassis which is open. Closing the link reduces the low frequency output of the receiver.

(6) VOLTAGE READINGS

The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if low-resistance meters are used, such allowances must be made. Figure 8 shows the voltages at each individual socket contact.

(7) SERVICE DATA ON MAGNETIC PICKUP

The Magnetic Pickup used in this combination instrument is of a new design with an improved frequency range. While in physical appearance it is similar to that of the older type, details of construction are considerably different. It consists essentially of a chromium steel magnet, two thin pole pieces, a mechanism support and bracket, a coil, and an armature that is damped by means of an anchored damping block.

The use of the anchored damping block eliminates any bad peaks in the frequency range. The frequency-response characteristic is substantially flat from 50 to 5,000 cycles.

(8) REPLACING MAGNET COIL, PIVOT RUBBERS, ARMATURE OR DAMPING BLOCK

In order to replace a defective coil or the hardened pivot rubbers (see Figure 10), it is necessary to proceed as follows:

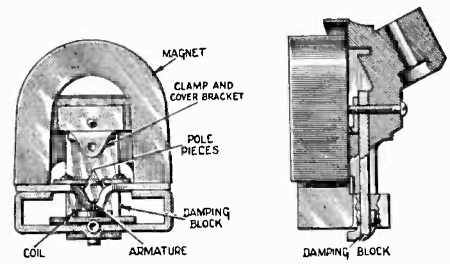


Figure 9—Details of Pickup

(a) Remove the pickup cover by removing the center holding screw and needle screw.

(b) Remove the pickup magnet and the magnet clamp by pulling them forward.

(c) Unsolder the coil leads and remove the mechanism assembly from the back plate by releasing the two mounting screws and the damping block clamping screw.

(d) Remove screws A and B, Figure 10, and then remove the mechanism assembly from the pole pieces.

RADIOTRON SOCKET VOLTAGES

120-Volt A. C. Line—Maximum Volume and Sensitivity—No Signal

Radiotron No.		Cathode to Ground Volts, D. C.	Screen Grid to Ground Volts, D. C.	Plate to Ground Volts, D. C.	Cathode Current, M. A.	Heater Volts, A. C.
RCA-6D6 R. F.		4.2	110	272	10.5	6.3
RCA-6A7	Oscillator	—	—	225	11.4	6.3
	1st Detector	4.6	110	282		
RCA-6D6 I. F.		4.2	110	272	10.5	6.3
RCA-75 2nd Detector		1.2	—	170*	0.4	6.3
RCA-76 A. F.		14.0	—	252	2.8	6.3
RCA-42 Power		22.0	295	290	24.5	6.3
RCA-42 Power		22.0	295	290	24.5	6.3
RCA-5Z3 Rectifier		—	—	768/384 R. M. S.	110.0	5.0

*Cannot be measured with ordinary voltmeter.

(e) The coil or the front pivot rubber may now be removed and replaced. If it is desired to replace the rear pivot rubber, then the end of the armature soldered to the mechanism support must be unsoldered and the damping block removed. The rear pivot rubber now may be replaced. After putting the pivot rubbers in place a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block.

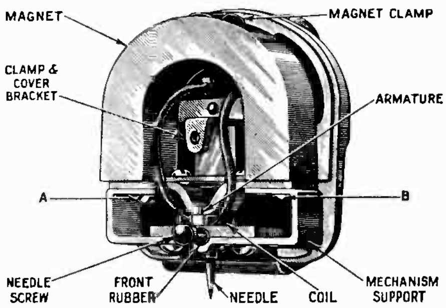


Figure 10—Pickup Nomenclature

(f) The mechanism should now be reassembled, except for the magnet, which must be magnetized. After being magnetized, the mechanism—with the pole pieces upward—should be placed so that the magnet may be slid from the magnetizer onto the pole pieces without breaking physical contact. After placing the pole pieces on the magnet, the entire assembly should be remagnetized thoroughly, being careful not to change the polarity obtained by the initial magnetization. Stock No. 9549 Magnetizer is useful for magnetizing pickups.

(g) After assembling to the mechanism, the entire assembly should be fastened to the back plate by means of the screws provided, making sure the damping block is securely clamped. At the same time, the metal dust cover must be placed in position.

(h) After remagnetizing, it is necessary to correctly center the armature. This may be done quite accurately by feeling its play after the needle is inserted. A little practice will quickly show which way an adjustment is necessary to have the armature centered properly. The adjustment is made by loosening screws A and B (Figure 10), and sliding the mechanism slightly in relation to the pole pieces.

(i) The cover may be now replaced over the entire assembly, and the pickup returned to the tone arm.

In assembling, it may be desirable to check the armature air gap by means of a small Feeler Gauge. This air gap should be .009″ on each side of the armature. However, a little practice with the needle in place will quickly disclose whether or not the armature is centered.

(9) REPLACING THE DAMPING BLOCK

If it is desired to replace the damping block, it may be done in the following manner:

(a) Disassemble the pickup as described under the preceding section.

(b) Remove the armature entirely by unsoldering it at its joint with the mechanism support.

(c) Remove the damping block from the armature and clean the bushing for holding the damping block with emery paper.

(d) Insert the armature through the new block so that it occupies the same position as that of the old. Also ascertain that the block is in correct vertical alignment with the armature. It will be noted that the hole in the damping block is somewhat smaller than the diameter of the armature. This is done so that a snug fit will be obtained.

(e) After properly locating the damping block, a soldering iron should be applied to the armature so that the block will melt slightly at its point of contact with the armature. A special tip, constructed as shown in Figure 11, will prove desirable for fusing the block in place. The iron should be applied long enough to slightly melt the block and cause a small bulge on both sides, but should not be applied long enough to cause any bubbling. The pickup should then be reassembled as described in the preceding section.

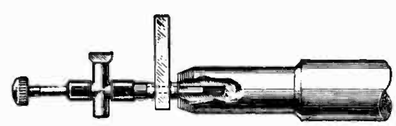


Figure 11—Special Soldering-Iron Tip

Only rosin core solder should be used for soldering the coil leads in the pickup. Also rosin core solder should be satisfactory for resoldering the end of the spring in the hole in the mechanism, since both these parts have been previously tinned. In case the parts are not well tinned, it will be necessary to scrape the end of the spring and the hole in the mechanism until bright. These parts may now be tinned by using as a flux a water solution of zinc chloride (commonly called acid flux). After tinning, dip the parts in water to wash off the acid flux and thereby prevent serious subsequent corrosion. After making sure that the pivot rubbers and damping block are properly in place, as described under (e) above, the armature may now be soldered in place in the mechanism by using rosin core solder, since the parts are now tinned. Care must be exercised to get the needle hole perfectly square with respect to the mechanism, or otherwise it will be difficult if not impossible to center the armature in the air gap as explained under (h), section (8).

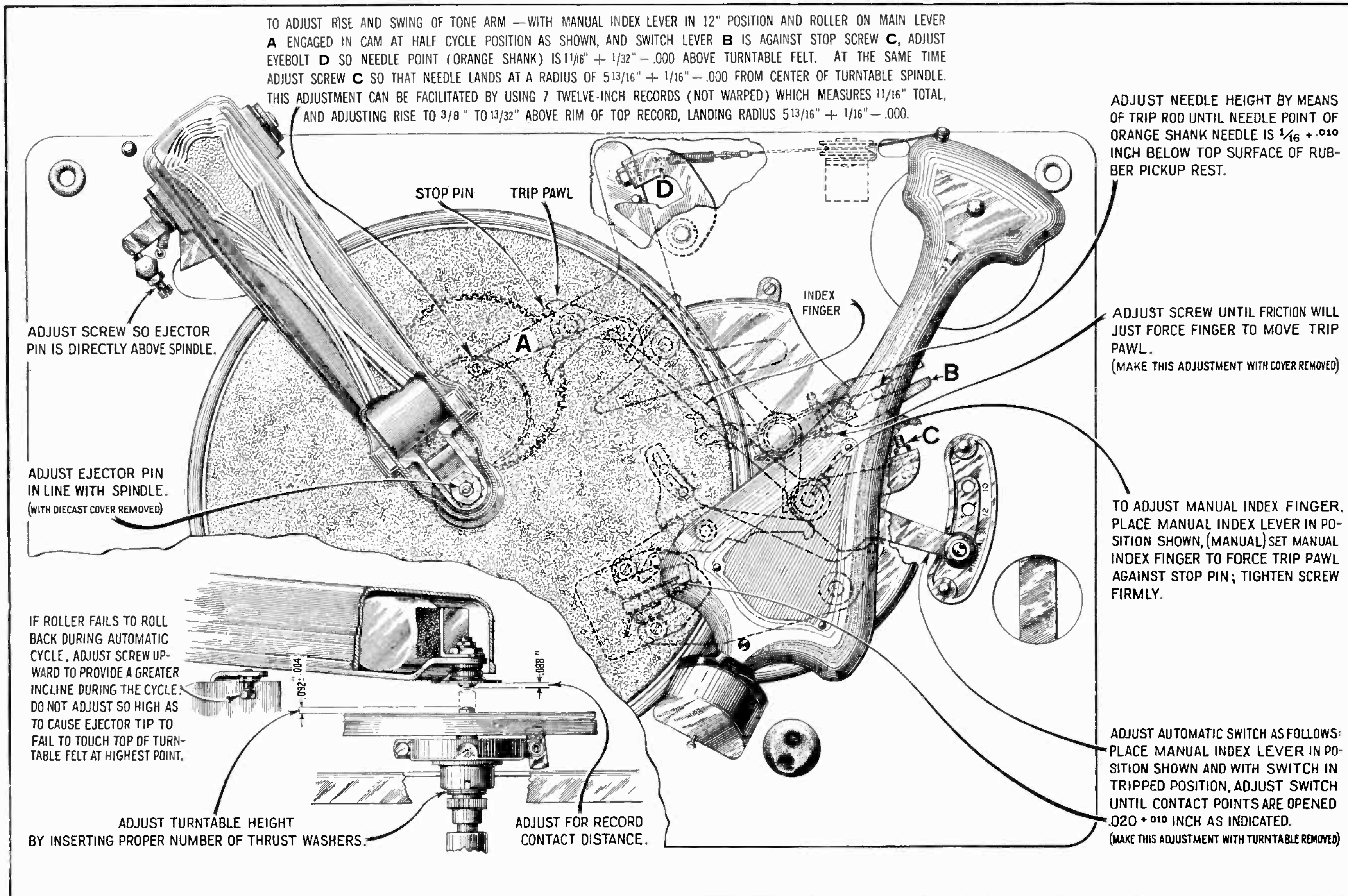


Figure 12—Automatic Record Changer Adjustments

(10) AUTOMATIC RECORD CHANGER

The automatic record changer used in this instrument is of simple design and fool-proof construction. Under normal operating conditions service difficulties should be negligible. However, in event adjustments are required, a reference to Figure 12 will disclose the proper method of making all adjustments.

(11) ADJUSTMENT OF DIAL VERNIER MECHANISM

A small vernier indicator is provided for giving a simple means of band spread. Under normal conditions, adjustment of this mechanism will not be required. However, in event the initial adjustment is not satisfactory or adjustment is required because of replacement, the following procedure should be used:

(a) Remove the chassis from the cabinet to a place convenient for work.

(b) Check the tension on the vernier hand by pushing it in a clockwise direction. There should be considerable tension against such a push. If this tension does not exist, the action of the hand may be erratic and possibly fail to return to the same position for a particular station.

(c) Pull off the long hand with a pair of long-nose pliers.

(d) Straighten the lugs that hold the dial in place. Then remove the dial "vernier" hand and stem gear together.

(e) Then remove the "vernier" hand from the stem gear.

(f) Turn the dial to each extreme and to its center position and check the backlash of the back gear (closest to reflector). There should be definite backlash in each direction at each of these three positions.

(g) If this backlash is not obtained, loosen the nut on the back of the reflector which holds the shaft of these gears and slide the shaft toward the outer edge of the reflector. The hole is elongated to permit this adjustment.

(h) After making sure there is backlash at the three check points mentioned, turn the outside gear in a clockwise direction 1½ turns. Hold it at this position and replace the stem gear.

(i) Turn the dial throughout its range. If the gears become noisy, move the gear further toward the reflector edges described in (g).

(j) Replace the dial scale, making sure the hole clears the spindle.

(k) Replace the vernier hand. It should point at zero when the tuning capacitor is fully meshed.

(l) Replace the large hand. One end of the pointer should point exactly at the horizontal line at the lowest frequency end of Band "A" when the tuning capacitor is fully meshed.

The above covers the proper manner of making adjustments, assuming all parts are in normal condition. Of course, if any part is defective, it must be replaced. The spring gear may be checked by turning it until the spring is tight and unwinding it slowly. It should unwind 4¼ turns.

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4632	Board—Terminal board—Two terminals and link—For changing fidelity	$0.25
4379	Board—Antenna terminal board	.20
4427	Bracket—Volume control, tone control or noise suppressor mounting bracket	.18
4244	Cap—Contact cap—Package of 5	.20
3861	Capacitor — Oscillator trimmer capacitor (C21, C25)	.78
4633	Capacitor—50 mmfd. (C19)	.25
4635	Capacitor—100 mmfd. (C41)	.25
3937	Capacitor—300 mmfd. (C8)	.34
4413	Capacitor—360 mmfd. (C24)	.22
4183	Capacitor—400 mmfd. (C59)	.26
4412	Capacitor—1120 mmfd. (C27)	.25
4409	Capacitor—1120 mmfd. (C43)	.35
4634	Capacitor—1120 mmfd. (C52)	.35
4524	Capacitor—2850 mmfd. (C29)	.35
4615	Capacitor—2850 mmfd. (C17, C56)	.34
4628	Capacitor—0.004 mfd. (C49, C50)	.28
3787	Capacitor—0.01 mfd. (C48)	.30
4212	Capacitor—0.01 mfd. (C44)	.30
4624	Capacitor—0.01 mfd. (C58)	.54
3888	Capacitor—0.05 mfd. (C37)	.25
4417	Capacitor—0.05 mfd. (C5, C15)	.25
3877	Capacitor—0.1 mfd. (C38)	.32
4415	Capacitor—0.1 mfd. (C18)	.30
4645	Capacitor—0.1 mfd. (C7, C14, C30, C39, C57)	.25
3750	Capacitor—0.25 mfd. (C47)	.36
7790	Capacitor—10 mfd. (C53, C54)	1.05
4619	Capacitor pack—Comprising one 0.5 mfd., one 10 mfd. capacitor (C42, C51)	1.44
4626	Capacitor pack—Comprising one 4 mfd., one 10 mfd. and one 8 mfd. capacitor (C45, C46, C55)	2.82
4358	Clamp—Electrolytic capacitor clamp—For capacitor stock No. 7790	.15
4693	Clamp—Electrolytic capacitor clamp—For capacitor stock No. 4626	.15
7810	Coil—Antenna coil "PB-LW" (L1, L2, L5, L6, C1, C3)	2.10
7803	Coil—Antenna coil "B.S.W." (L3, L4, L7, L8, C2, C4)	1.82
7808	Coil—Detector coil "P.B.-L.W." (L9, L10, L13, L14, C9, C11)	2.05
7805	Coil—Detector coil "B.-S.W." (L11, L12, L15, L16, C10, C12, C13)	2.15
7807	Coil—Oscillator coil "B.S.W." (L19, L20, L23, L24, C23, C28)	1.62
7809	Coil—Oscillator coil "P.B.-L.W." (L17, L18, L21, L22, C22, C26)	1.70
7801	Condenser—3-gang variable tuning condenser (C6, C16, C20)	4.42
4371	Cover—Fuse mount cover	.15
4631	Cover—Terminal strip cover	.15
10907	Fuse—3-ampere—Package of 5	.40
3376	Mount — Fuse mount — 105–125-volt instrument	$0.40
4604	Mount—Fuse mount for 200–250-volt instrument	.35
4625	Resistor—Wire wound resistor—Comprising one 6500-ohm–4500-ohm and 450 section (R30, R31, R58)	.70
3704	Resistor—400 ohms—Carbon type—¼ watt (R9, R3, R12)—Package of 5	1.00
4338	Resistor — 2500 ohms — Carbon type — ¼ watt (R6, R11, R13)—Package of 10	2.00
4242	Resistor — 3000 ohms — Carbon type — ¼ watt (R17)—Package of 5	1.00
4436	Resistor — 5000 ohms — Carbon type — ¼ watt (R22)—Package of 10	2.00
3998	Resistor—15,000 ohms—Carbon type—¼ watt (R20)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R8, R18, R23, R26)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R2, R7, R19)—Package of 5	1.00
3619	Resistor—400,000 ohms—Carbon type—¼ watt (R59)—Package of 5	1.00
3033	Resistor — 1 megohm — Carbon type — ¼ watt (R16)—Package of 5	1.00
6242	Resistor — 2 megohms — Carbon type — ¼ watt (R15, R21, R28)—Package of 5	1.00
3078	Resistor—10,000 ohms—Carbon type—½ watt (R27)—Package of 5	1.00
4623	Resistor—13,000 ohms—Carbon type—½ watt (R29)—Package of 10	2.00
2240	Resistor—30,000 ohms—Carbon type—1 watt (R25)	.22
4418	Resistor—100 ohms—Flexible type (R1, R4)—Package of 10	1.50
4618	Rheostat—Sensitivity control (R5)	1.25
7800	Shield—Antenna, detector or oscillator coil shield	.45
4627	Shield—First detector—Oscillator Radiotron shield	.36
7488	Shield—First detector—Oscillator Radiotron shield top	.20
4452	Shield—I. F. amplifier Radiotron shield	.35
4629	Shield—I. F. amplifier Radiotron shield top	.15
4663	Shield—Oscillator coil wiring shield—Shields oscillator coil wiring from R. F. coil—Complete with terminal board, clamp and resistor	.32
4664	Shield—Oscillator wiring shield—Shields oscillator coil wiring from R. F. coil—Complete with terminal strip and resistor	.36
4630	Shield—R. F. amplifier—Radiotron shield	.36
4665	Shield—R. F. coil wiring shield with two resistors and terminal board	.50
3529	Socket—Dial lamp socket	.32
3859	Socket—4-contact Radiotron socket	.30
7484	Socket—5-contact Radiotron socket	.35

REPLACEMENT PARTS—(Continued)

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
7485	Socket—6-contact Radiotron socket	$0.40
3572	Socket—7-contact Radiotron socket	.38
4617	Switch—Range switch (S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12)	3.32
4616	Tone control (R24, S1)	1.28
4431	Transformer—First intermediate frequency transformer (L25, L26, C32, C33, C34)	2.28
9505	Transformer—Power transformer—105–125 volts—50–60 cycles (T1)	6.35
9506	Transformer—Power transformer—105–125 volts—25–40 cycles	8.90
9507	Transformer—Power transformer—105–250 volts—40–60 cycles	6.40
4433	Transformer—Second intermediate frequency transformer (L27, L28, C35, C36, C40, R14)	2.15
4620	Transformer and reactor—Interstage transformer and reactor (T2, L29)	2.98
4519	Volume control (R32)	1.25
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	.28
10194	Ball—Steel ball for variable condenser drive assembly—Package of 20	.25
4422	Clutch—Tuning condenser drive clutch assembly—Comprising drive shaft, balls, ring, spring and washers assembled	.88
4621	Dial—Station selector dial	.65
7799	Drive—Variable tuning condenser drive complete	2.45
4364	Gear—Spring gear assembly complete with hub, pinion, gear, cover and spring	.96
4704	Indicator—Band indicator—Celluloid	.12
4367	Indicator—Station selector vernier pointer—Small	.15
4520	Indicator—Station selector main pointer—Large	.18
3943	Screen—Translucent screen for dial light—Package of 2	.18
3993	Screw—No. 6–32–5/32″ square head set screw for band indicator operating arm or condenser drive—Package of 10	.25
4377	Spring — Band indicator and arm tension spring—Package of 5	.25
4360	Stem—Station selector pointer stem	.35
4378	Stud—Band indicator operating arm stud—Package of 5	.25
	EJECT ARM ASSEMBLIES	
4713	Arm—Eject arm complete	7.74
3658	Ball—Steel ball bearing—Package of 20	.30
3656	Bearing—Ejector tip bearing	.48
4054	Bracket—Eject arm bracket assembly	1.35
4058	Collar—Eject arm shaft collar and set screw	.18
4714	Cover—Eject arm cover	1.38
3930	Cushion—Counter balance cushion and bracket—Located inside of eject arm	.18
3662	Plate—Ejector plate—Package of 5	.95

Stock No.	Description	List Price
4055	Post—Vertical adjustment post—Located on eject arm bracket	$0 30
3655	Retainer—Ball retainer with three balls	.45
3729	Roller—Counterbalance roller — Located inside of eject arm	.45
3665	Screw—Eject arm horizontal adjustment screw and nut—Package of 5	.25
4057	Shaft and collar—For eject arm	.24
4067	Spring—Eject arm bracket spring—Package of 10	.30
4125	Spring—Eject arm horizontal action tension spring—60-cycle operation—Package of 10	.42
4126	Spring—Eject arm—Horizontal action tension spring—For 25-cycle operation—Package of 10	.60
3657	Tip—Ejector tip	.30
4056	Yoke—Eject arm yoke assembly	1.04
	MOTOR ASSEMBLIES	
9011	Motor—105–125 volts—60 cycles	19.72
9014	Motor—105–125 volts—50 cycles	19.72
9012	Motor—105–125 volts—25 cycles	24.16
4562	Motor mounting spring, washer and stud assembly—Comprising six springs, six cup washers, three spring washers and three studs	.58
	MOTOR BOARD ASSEMBLIES	
4060	Escutcheon — Index escutcheon engraved "Manual 12-10"	.28
3764	Nut—Cap nut for motor board—Package of 4	.40
3672	Pin—Manual index pin	.42
4066	Rest—Pickup rest	14
3654	Roller—Pickup arm guide roller assembly—Comprising bracket and guide pin	.34
3763	Suspension spring, washer and bolt assembly for motor board—Comprising one bolt, two cup washers, two springs, one "C" washer and one cap nut	.42
	OPERATING MECHANISM ASSEMBLIES	
6502	Cam—Cam and gear assembly	1.18
6808	Clutch—Trip lever friction clutch	.30
4719	Cover—Metal cover for trip lever and friction finger assembly	.28
3670	Finger—Friction finger assembly	.32
6809	Finger—Manual index lever finger assembly	.25
6846	Lever—Main lever and link assembly	1.45
6810	Lever—Main spring lever	.44
6806	Lever—Manual control index lever—Less pin	.55
3677	Lever—Pickup arm cable lever assembly complete—Comprising lever with cable screw spring and nut	.40
6807	Lever—Trip lever and friction clutch assembly	1.16
6503	Pawl—Trip pawl assembly	.40
4124	Plate—Eject arm actuating plate assembly	.50
4563	Screw—Cable lever cable screw and nut—Package of 10	.60

REPLACEMENT PARTS—(Continued)

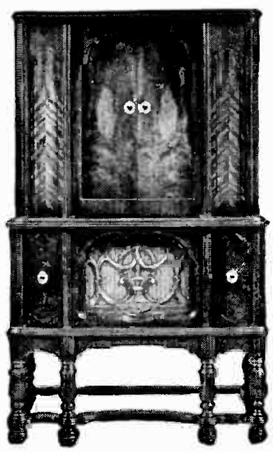
Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
4564	Screw—Manual index lever finger set screw—Package of 10	$0.20
4567	Screw—Manual index lever assembly—Adjustment screw and nut—Package of 10	.32
4566	Screw—Special screw used to fasten main lever and link assembly bushing—Package of 10	.30
4059	Screw—Trip lever clutch tension adjustment screw—Package of 10	.22
4127	Spring—Actuating plate tension spring—Package of 10	.24
3666	Spring—Cable lever tension spring—Package of 10	.44
3676	Spring—Cam and gear, pawl carrier tension spring—Package of 10	.52
4061	Spring—Main spring	.38
4565	Spring—Manual index lever finger tension spring—Package of 10	.30
2893	Spring—Trip lever latch plate tension spring—Package of 10	.30
2917	Washer—Spring washer "U" type—Package of 10	.25
	PICKUP AND ARM ASSEMBLIES	
7839	Arm—Pickup arm complete less escutcheon and pickup unit	4.90
3417	Armature—Pickup armature	.72
6813	Back—Pickup housing back	.68
4064	Cable—Pickup arm cable—Package of 5	1.00
4676	Coil—Pickup coil (L32)	.65
4711	Cover—Pickup cover	.34
4709	Cover—Pickup back cover with two mounting screws	.34
3737	Damper—Pickup damper—Package of 5	.65
6815	Escutcheon—Pickup arm escutcheon	.64
4675	Pickup unit complete	5.22
4062	Rod—Automatic brake trip rod	.20
4063	Screw assembly—Pickup mounting screw assembly—Comprising one screw, one washer and one nut—Package of 10	.54
3388	Screw—Needle holding screw—Package of 10	.60
3419	Screw—Pickup cover holding screw—Package of 10	.40
	SWITCH ASSEMBLIES	
3994	Cover—Motor switch cover	.26
10184	Plate—Automatic brake latch plate—Package of 5	.40
10174	Springs—Automatic brake springs—Package of 4	.50
6805	Switch assembly—Automatic switch complete	1.90
3322	Switch—Motor switch (S15)	.75
	TURNTABLE ASSEMBLIES	
4065	Bushing—Speed shifter lever bushing—Package of 4	.82
3344	Cover—Grease retainer cover—Package of 2	.70
6818	Lever—Speed shifter lever	.38
3341	Pin—Groov pin—Package of 2	.56
6816	Ring—Clamp ring assembly—Comprising spring, latch lever and stud	$0.42
4708	Turntable complete	5.10
6817	Sleeve—Sleeve complete with ball race	2.25
3342	Spring—Latch spring—Located on clamping ring—Package of 2	.56
3347	Spring—Speed shifter lever spring—Package of 2	.30
3340	Washer—Thrust washer—Package of 2	.56
	REPRODUCER ASSEMBLY	
4636	Cable—4-conductor—Reproducer cable	.50
9537	Coil—Field coil magnet and cone support (L31)	3.85
8969	Cone—Reproducer cone—Package of 5 (L30)	6.35
9536	Reproducer complete	8.40
4637	Transformer—Output transformer (T3)	1.50
	MISCELLANEOUS ASSEMBLY	
4556	Base—Phonograph compartment lamp base	.55
4677	Bezel—Station selector (escutcheon) bezel	.56
4555	Box—Needle box complete with lid	.40
4673	Cable—From volume control to transformer pack and terminal board	1.90
4573	Connector—2-contact female section of motor connecting plug	.30
4577	Connector—2-prong male section of connector plug—Motor plug	.30
4674	Connector—2-prong male section of connector plug	.25
4696	Cord—Motor power cord—2-conductor with female section of connector	.95
6614	Glass—Station selector dial glass	.30
4449	Knob—Station selector, sensitivity, volume control, tone control, range switch or phonograph volume control knob—Package of 5	.60
4340	Lamp—Phonograph compartment lamp—Package of 5	.60
4710	Receptacle—Needle receptacle	.35
6303	Resistor—20,000 ohms—Carbon type—½ watt (R62)—Package of 5	1.00
4678	Ring—Dial retaining ring—Package of 5	.34
4613	Screw—8-32-7/16" headless set screw for knob	.25
4557	Shade—Phonograph compartment lamp shade	.35
4671	Switch—Toggle type—Motor starting switch (S16)	.72
4672	Transformer—Input transformer pack comprising one transformer, one reactor, one 0.01 mfd., one 0.05 mfd. capacitor, one 7500-ohm and one 25,000-ohm resistor (T4, L33, C60, C61, R60, R61)	5.42
6766	Volume control—Phonograph volume control (R69, S14)	2.28

RCA Victor Duo 380

Twelve-Tube Superheterodyne Receiver
with
Automatic Phonograph

INSTRUCTIONS



RCA Victor Company, Inc.

CAMDEN, N. J., U. S. A.

INTRODUCTION

This distinctive radio-phonograph combination embodies the latest developments and improvements in home entertainment from broadcasts and recordings. Splendid voice and musical reproduction with abundant reserve volume from either radio programs or phonograph records is realized through the use of aural (automatic tone) compensation, Class B power amplification, and a large electro-dynamic loudspeaker. The latter member is contained in a specially-designed internal compartment which renders the cabinet acoustically correct, preventing sound distortion from resonance effects commonly known as "boominess."

In addition to a refined superheterodyne circuit using twelve tubes, the radio receiver incorporates the following features: (1) secondary tuning range for reception of police calls, amateur and other phone communications between 1500 and 2800 kilocycles as a diversion from the accustomed broadcasts, (2) "automatic volume control" to minimize fading and prevent blasting, (3) "silent-tuning control" to permit adjustment for quiet tuning between station settings, and (4) "dual tone control" to afford alteration of the bass or treble response independently as desired. Colored illuminated indicators on the front panel of the cabinet show at a glance just where the volume, silent-tuning and tone controls are set. An illuminated tuning meter is mounted directly above the station selector dial to facilitate *exact* adjustments of that dial and thus insure most pleasing reproduction.

The electrical phonograph is fully automatic, capable of playing in sequence without attention one side of several ten- or twelve-inch records of the standard-speed (78 R. P. M.—revolutions per minute) or long-playing (33⅓ R. P. M.) variety. In addition, the mechanism may be quickly converted to function as an ordinary non-automatic phonograph, thus permitting individual playing at either speed records of any diameter up to 12 inches. It is sturdily constructed and simple to operate, all controls being accessible from the front of the instrument. Record changing is accomplished in a minimum interval of four seconds. Two enclosed compartments are provided at the bottom of the cabinet for the storage of records.

INSTALLATION

Preliminary—After withdrawing the instrument from its shipping container and removing the packing framework bolted to the underside of the cabinet, extract the interior wooden brace fastened by screws to the radio chassis shelf and one of the motor-board mounting rails. Also remove the two red hex-head bolts which pass through the mounting rails and withdraw the two wooden blocks from between those rails and the motor-board, which should then float freely on its spring suspension.

Tubes—This instrument is equipped and tested at the factory with RCA Radiotrons and is shipped with these tubes installed. Remove the packing material inserted to protect the tubes against damage in transit, then refer to the chassis diagram printed on the license label inside the cabinet and *make certain:*

(a) That all tubes are in the proper sockets and pressed down firmly. *Never apply power to the instrument unless all tubes are in place.*

(b) That the shields are rigidly in place over those tubes represented by double circles on the diagram.

(c) That the spring connectors of the short flexible (grid) leads, shown on the diagram, are securely attached to the dome terminals of the proper tubes. It is important that the adjacent green and black leads shall be connected as indicated—that is, not reversed.

NOTE—The grid lead for the RCA-55 must be enclosed by the cylindrical tube shield. A slot is provided at the bottom of this shield for entrance of the lead.

(d) That the lids are securely in place on the shields of the two tubes designated by a heavy outer circle on the diagram.

Phonograph Compartment—Open the large doors on the front of the cabinet and remove all packing material from the playing compartment. Withdraw the turntable, used-needle cup, compartment lamp and associated lamp shade from the Outfit Package. Referring to Figure 2, lift the record ejector to its upright position (see paragraph 3 (c) under "Procedure—Automatic Operation—Phonograph") and, with the speed shifter set in the outward or 78 R. P. M. position, mount the turntable on the motor spindle. Make certain that the spindle drive key engages the slot in the turntable hub.

Insert the used-needle cup in the opening provided in the motor-board and install the compartment lamp and lamp shade. The socket for this lamp is located at the top of the compartment directly above the front doors, which doors conceal and actuate the lamp switch.

Location—The instrument should be located close to the antenna lead-in and ground connections and near an electrical outlet. To insure proper operation of the automatic mechanism, the instrument must be level. If the floor is uneven at the location selected, therefore, one or more of the cabinet legs should be blocked up to attain the required level position. This is very important; for further details, see note 2 of paragraph 8 under "Procedure—Automatic Operation—Phonograph."

Antenna and Ground—A well-insulated outdoor antenna having a length of from 50 to 100 feet including the lead-in wire is recommended. It should be erected as high as conveniently possible and sufficiently remote from power lines and street railways to prevent excessive local interference. If the instrument is installed in a building of non-metallic construction, an indoor antenna ordinarily will afford satisfactory reception and may be considered the most practical. Buildings in which the roof or framework is of metal, however, form an effective shield which greatly impedes the passage of radio waves; to insure best results in such installations, therefore, an outdoor antenna is essential.

A *good* ground connection also is essential for best performance. The ground lead should be as short as possible and attached preferably to a cold-water pipe. An approved ground clamp should be used to insure a tight and permanent connection.

A terminal board containing three terminals is provided on the receiver chassis at the rear to facilitate connection to the antenna and ground. Connect the antenna lead to the middle terminal (marked "2") and the ground lead to the right-hand terminal (marked "3"). Tighten the terminals with a screw driver to insure permanent electrical connections.

NOTE—The left-hand terminal (marked "1") is provided for use only with *shielded lead-in* equipment (designed especially for this receiver) which can be purchased from and installed by the dealer who sold this instrument. Such an installation is effective in eliminating or greatly reducing noise interference caused by local electrical disturbances ("man-made static").

Power Supply—Connect the power cord to an electrical outlet supplying alternating current at the voltage and frequency (cycles) specified on the license label. During the subsequent Operating Test, the most satisfactory position for the connector plug in the outlet (that which provides least hum on record reproduction) should be determined.

FUSE—This instrument is protected by a fuse located at the rear of the chassis, under the metal cover marked "Caution: Remove Power Supply Before Removing Cover." If the fuse burns out, check the power supply connections and rating, and have all tubes tested by your dealer before installing a new fuse. This is a special fuse—obtain replacement fuses from your dealer —*do not use any substitute for this fuse.*

In districts where the line voltage is always below 115 volts (225 volts for 200–250 volt models), the fuse should be set in the "110" position ("213" position for 200–250 volt models). Always disconnect the power cord from the a-c outlet before removing the fuse cover.

Operating Test—At installation, a thorough trial operation—both radio and phonograph—should be made in accordance with the instructions which follow. The instrument was, of course, in perfect operating condition when shipped from the factory. After transit, however, minor adjustments sometimes may be necessary, particularly on the automatic record-changing mechanism. It is the dealer's responsibility to make sure that the instrument functions perfectly when installed.

A diagrammatic chart giving complete instructions for ordinary adjustments of the automatic mechanism is included in the Service Data section of this booklet. Whenever possible, these adjustments should be made by the dealer from whom the instrument was purchased.

OPERATION—RADIO

All of the radio operating controls are located on the front panel as shown in Figure 1. Proceed as follows:

1. Set the Transfer Switch clockwise (for radio reception) and the Frequency Range Switch as indicated below for reception in either band:

(a) *Counter-clockwise*—540–1500 kilocycles (broadcast band). Using the large numerals, the dial scale reads directly in kilocycles for this band.

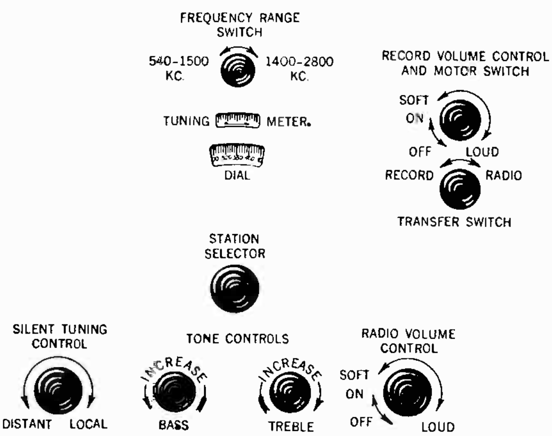


Figure 1

(b) *Clockwise*—1400–2800 kilocycles. Frequencies in this band are indicated approximately by the positions of the small numerals at the bottom of the dial (add two ciphers to obtain kilocycles). Available services therein include the following:

(1) **Police Calls**—Stations operating at 1574 and 1712 kilocycles and between 2400 and 2500 kilocycles.

(2) **Amateur Radio "Phone"**—Assigned band 1800–2000 kilocycles.

(3) **Aviation Communications "Phone"**—Between 2500 and 2800 kilocycles.

NOTE—The majority of stations in this range do not offer continuous programs. Police calls are usually intermittent, at regular or irregular intervals. Strong local stations in the broadcast band may be audible (sometimes at more than one point on the dial) when the Frequency Range Switch is set for 1400–2800 kilocycles.

2. Apply power by turning the Radio Volume Control knob clockwise from the "off" position. Set this control near the middle of its range by observing the illuminated colored indicator associated with its control knob. Wait a few seconds for the tubes to heat before attempting further operation.

3. With the Silent-Tuning Control set in the extreme counter-clockwise position, turn the Station Selector to a point, near the middle of the dial range, at which no station is heard within several scale divisions. Then turn the Silent-Tuning Control clockwise until the background noise (static) just disappears.

NOTE—The adjustment just described provides quiet tuning (that is, *suppression of background noise between station settings*) and permits reception of all stations whose signals are above the existing noise level.

4. Tune the receiver by rotating the Station Selector either at random until a desirable program is heard or in an endeavor to locate any particular station whose assigned frequency is known. In the latter case, turn the selector slowly throughout a

narrow range on each side of that dial setting corresponding to the station frequency.

NOTE—In the event that any particular station cannot be reached in this manner, its signal intensity probably is below the prevailing level of background noise. If especially desired, however, weak signals often may be received by turning the Silent-Tuning Control gradually counter-clockwise, thus calling upon the reserve sensitivity of the instrument. Under such conditions, background noise reproduction naturally will be appreciably greater.

5. After locating a station, turn the Radio Volume Control counter-clockwise (if necessary), until the sound level is fairly low and then adjust the Station Selector accurately to that position at which the indicator of the tuning meter travels furthest to the right (as designated by the arrow on the meter scale). At this setting only will the fine quality of reproduction provided in this instrument be realized and least background noise interference be obtained.

NOTE—When receiving a powerful local station, the Station Selector dial should be set at the *center* of the scale *range* for which the meter deflection is maximum (this range may be narrowed somewhat by turning the Silent-Tuning Control clockwise.

6. Set the Radio Volume Control for the desired sound level.

7. Adjust the two Tone Controls to obtain the tone shading preferred. The full range of musical reproduction is obtained with the right-hand knob turned fully clockwise and the left-hand knob turned to its counter-clockwise extremity, being represented by full illumination of the tone color indicator which extends between the two knobs. Modifications of the tone range may be obtained as follows:

(a) To reduce the high-frequency (treble) response, or to decrease the background noise (static) interference on *station settings*, turn the right-hand tone control knob counter-clockwise. The extent of high-frequency cut-off thus obtained is indicated by shading of the *yellow* illumination at the right-hand side of the tone color indicator.

(b) To reduce the low-frequency (bass) response, or to decrease low-pitched hum present on the signals of some stations, turn the left-hand tone control knob clockwise. The extent of low-frequency cut-off thus obtained is indicated by shading of the *blue* illumination at the left-hand side of the tone color indicator.

(c) The *red* illumination at the center of the tone color indicator represents the middle range of musical response. This illumination is not cut off by rotation of either of the tone control knobs as described in the preceding paragraphs (a) and (b).

8. When through operating, turn the Radio Volume Control fully counter-clockwise, thus switching the power "off."

OPERATION—PHONOGRAPH

Automatic Operation

Important Precautions—The following precautions must be observed during operation:

1. In loading the turntable, make certain that the first record inserted (last to be played) is flat—that is, essentially free from warpage.

2. Before starting the turntable, make certain that the reject pocket (at the left of the phonograph compartment) is either empty or sufficiently clear to permit proper disposal of records by the automatic mechanism.

3. Never restrain by force the normal motion of any part of the automatic mechanism while it is changing records.

Procedure—The phonograph operating controls are located on the front panel and in the playing compartment as shown in Figures 1 and 2. Proceed as follows:

1. Set the Transfer Switch counter-clockwise for record reproduction.

2. Apply power by turning the Radio Volume Control clockwise from the "off" position. Set the two Tone Controls for full-range reproduction (see paragraph 7 under "Operation—Radio").

3. With the Motor Switch in the "off" position (Record Volume Control fully counter-clockwise), load the turntable with records, as follows:

(a) Set the Index Lever at "Manual." *Always do this before loading or unloading records.*

(b) Place the electric pickup on the rubber rest

(c) Raise the Record Ejector arm (*very slowly*, at first, until the internal weight has rolled to the rear of the arm, then as rapidly as desired) to its upper position of rest. *Always raise the ejector arm in this manner.*

(d) Select the records to be played. *All records for one loading must be of the same diameter (either ten or twelve inches), close to standard thickness and operable at the same speed (either 78 or 33⅓ R. P. M.).*

CAUTION—*Do not use thin flexible-type records for automatic operation.*

(e) Place the records, one at a time, on the turntable (see paragraph 1 under "Important Precautions"). The spindle should resume its normal height after each record is added. The turntable is fully loaded when the top surface of the uppermost record is nearly flush with the top of the spindle. (It should not be possible to slide off the top record without lifting its edge or depressing the spindle.)

(f) Lower the Record Ejector arm gently onto the spindle.

4. Insert a *new* needle in the pickup as far as it will go and tighten the needle screw. For long-playing (33⅓ R. P. M.) records, use *only* the *orange Chromium* needle. For standard (78 R. P. M.) records, use the latter needle or, if preferred, either the *green Chromium* or the full volume (full tone)

Tungstone needle. Transparent-faced (illustrated) records, however, should not be reproduced with *Tungstone* needles.

NOTE—With care, the orange Chromium needle should play 75, the green Chromium 100, and the Tungstone 100 to 150 records. *Never re-insert in the pickup a Chromium needle which has been used (however slightly) as damage to the record grooves would result.*

5. Place the pickup needle on the smooth outer rim of the record, near the first groove. Then move the Index Lever to the position (12 or 10) corresponding to the diameter (inches) of the records on the turntable. Be careful not to move the lever *beyond* the proper index hole. Push the index pin firmly into the hole.

CAUTION—***Never attempt to move the Index Lever from the Manual position when the pickup is on the rubber rest.***

6. Start the turntable by turning the Motor Switch clockwise; then set the Speed Shifter for the

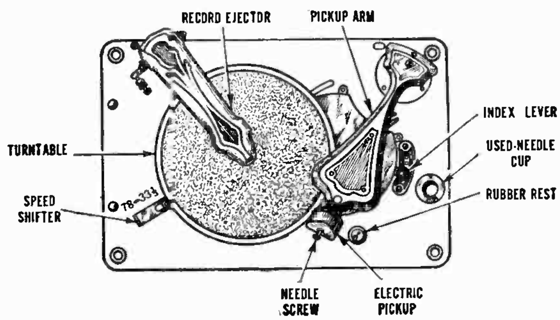


Figure 2

speed (78 or 33⅓ R. P. M.) corresponding to the records on the turntable.

NOTE—The speed shifter should not be moved inward (from the 78 to the 33⅓ R. P. M. position) while the turntable is at rest.

7. Adjust the Record Volume Control to obtain the desired volume.

8. Close the cabinet doors to extinguish the compartment lamp and to render less prominent the mechanical noises incident to record playing and changing. If needle scratch reproduction (particularly noticeable with old records) is considered excessive, turn the *treble* Tone Control slightly counter-clockwise. For most faithful reproduction, however, both Tone Controls should be left in the positions which provide full illumination of the tone color indicator.

NOTE 1—When a record has been played, the ejector arm slides it off into the record pocket and the pickup moves to the outside of the next record. The records on the turntable are thus played consecutively until only one record remains on the turntable. This record will be played repeatedly until the motor is stopped by means of the Motor Switch.

NOTE 2—After a record has been played and changed, the needle is lowered automatically onto the smooth rim of the next record and is fed by gravity into the starting groove. After the instrument has been leveled with reference to the top of the cabinet, further slight compensation may be necessary, thus: (1) If the needle fails to enter the playing groove, the right-hand side of the instrument must be raised by inserting thin blocks under the front and rear legs on that side; or (2) If the needle slides over several grooves, thus failing to reproduce the beginning of the selection, the left-hand side of the instrument must be similarly raised.

9. To reject a record while playing, lift the pickup arm and move it to the extreme left. Hold the pickup lightly until it is moved by the mechanism.

10. Before reloading or when through operating, turn the Motor Switch to the "off" position, set the index lever at "Manual" and place the pickup on the rubber rest. Never leave the pickup resting on a record (or on the turntable) when not in use. Turn the power switch "off" and close the cabinet doors when discontinuing operation of the instrument.

Manual Operation

Records may be played individually as follows:

1. Set the Transfer Switch counter-clockwise and apply the power with the Radio Volume Control as directed for automatic operation. Adjust the two Tone Controls for full-range reproduction.

2. Make sure that the Index Lever is at "Manual," the pickup is on the rubber rest, and the Motor Switch is in the "off" position.

3. Raise the Record Ejector arm to the upper rest position (see paragraph 3 (c) under "Automatic Operation").

4. Place a record on the turntable and insert a needle in the electric pickup. For needle information, see paragraph 4 under "Automatic Operation."

NOTE—Ordinary steel needles (full volume or full tone) can be used with standard (78 R. P. M.) records, provided a new needle is inserted for each selection. Do not use *Tungstone* needles with either thin flexible type or transparent-faced (illustrated) records.

5. Start the turntable by turning the Motor Switch clockwise, then set the Speed Shifter for the speed corresponding to the record on the turntable. Lower the needle gently onto the smooth outer rim of the record.

6. Adjust the Record Volume Control and close the cabinet doors (see paragraph 8 under "Automatic Operation").

7. At the completion of the record, lift the pickup arm and move it toward the right to stop the motor (motor stops automatically at the end of a record having the *eccentric* final groove). Turn the Motor Switch to the "off" position and place the pickup on the rubber rest.

8. When through operating, turn the power "off" and close the cabinet doors.

Maintenance

With normal use and handling, trouble-free service is to be expected. The automatic phonograph mechanism and associated parts, however, should be kept clean and well-lubricated. To insure continued efficient operation, it is recommended that the entire instrument be thoroughly inspected and adjusted by an experienced service man once each year.

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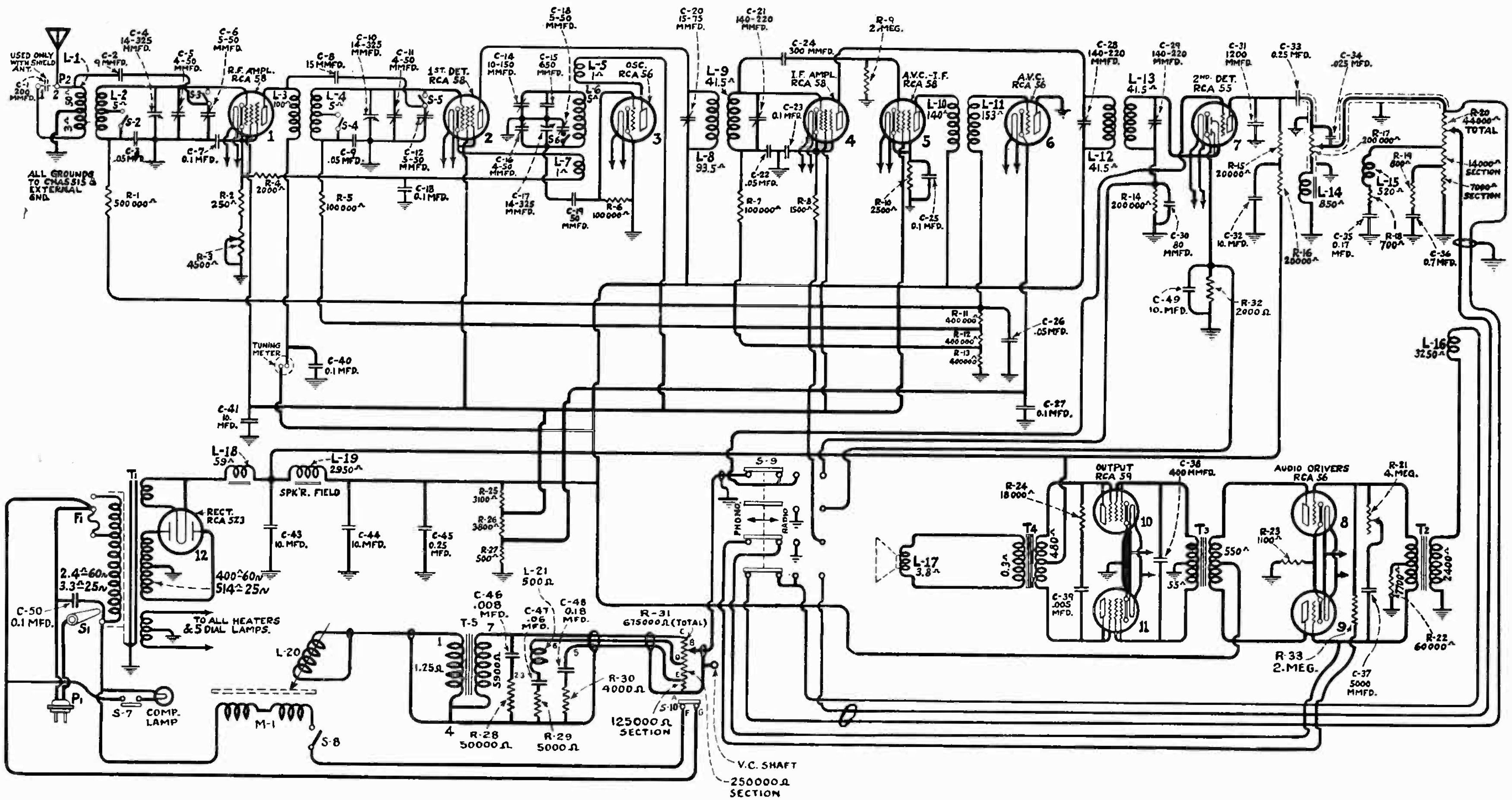

Figure A—Schematic Circuit Diagram

SERVICE DATA

Electrical Specifications

Voltage Rating..........................105-125 Volts
Power Consumption (60 Cycle)................175 Watts
Type and Number of Radiotrons.....4 RCA-56, 4 RCA-58, 1 RCA-55, 2 RCA-59, 1 RCA-5Z3—Total 12
Frequency Range.540 K.C.-1500 K.C.—1400 K.C.-2800 K.C.
Undistorted Output..........................10.0 Watts

This combination instrument utilizes the new perfected automatic record changing mechanism and the twelve-tube Deluxe Super-Heterodyne receiver. Excellent fidelity on both radio and record reproduction is an inherent feature of this instrument. Other features include double tuning range (540 K. C.-1500 K. C. and 1400 K. C.-2800 K. C.), high and low frequency tone control, compensated volume control and the inherent sensitivity, selectivity and tone quality of the Super-Heterodyne.

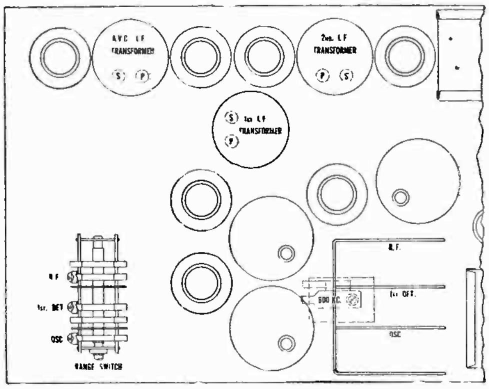

Figure B—Location of Line-up Capacitors

Figure A shows the schematic circuit, Figure B the location of the adjustable capacitors, Figure C the chassis wiring, and Figure D the assembly wiring diagram. The Radiotron socket voltages, the line-up procedure and the replacement parts are given on the following pages.

R. F. and Oscillator Line-up Capacitor Adjustments

Four adjustable capacitors are provided for aligning the R. F. circuits and adjusting the oscillator frequency so that the oscillator will maintain a constant frequency—175 K. C. —difference from that of the incoming signal. Poor quality, insensitivity, poor A. V. C. action and possible inoperation of the receiver may be caused by these capacitors being out of adjustment.

If the other adjustments have not been tampered with—the intermediate transformer tuning capacitors—the following procedure may be used for aligning these capacitors.

(a) Procure an R. F. Oscillator, such as Stock No. 9050, giving a modulated signal at 600 K. C., 1400 K. C., and 2440 K. C. Also procure a non-metallic screw driver such as Stock No. 7065.
(b) An output meter is necessary. This should be a 0-10 milliammeter connected in series with the plate supply to the second detector.
(c) A dummy Radiotron RCA-56 is necessary to substitute for the one normally used in the A. V. C. socket. This should be a tube that is otherwise normal in all respects, but having one heater prong removed. Insert this tube in the A. V. C. socket.
(d) First check the chassis and carefully ascertain that the dial pointer reads exactly at the first line on the scale when the tuning capacitor rotor plates are fully meshed with the stator plates.
(e) Place the oscillator in operation at exactly 1400 K. C. and couple its output to the antenna. Set the Range Switch counter-clockwise and the dial scale at exactly 1400. Connect the output meter to the set and place the volume control and suppressor control, if noise level will permit, at its maximum position. Adjust the oscillator input so that only a slight reduction in current is obtained in the output meter.
(f) With a suitable socket wrench—the nuts are at ground potential—adjust the oscillator, first detector and R. F. line-up capacitors, until a minimum deflection is obtained in the output meter.
(g) The high frequency band is adjusted at 2440 K. C. This is done in a similar manner to the R. F. adjustments except that the oscillator is set at 2440 K. C., the dial at 1200 and the Range Switch in the clockwise position. The line-up capacitors on the Range Switch are adjusted for minimum output at this frequency.
(h) Set the oscillator at 600 K. C. Tune in the signal with the receiver until a slight deflection is obtained in the output meter. Now adjust the 600 K. C. series capacitor, Figure B, until a minimum deflection is obtained in the output meter. Rock the tuning capacitor back and forth while making this adjustment. as the tuning capacitor and oscillator series capacitor adjustments interlock.
(i) Change the frequency of the oscillator to 1400 K. C. and set the dial at 1400. Again make the adjustments given under (f), (g), and then (h).

So adjusted, the R. F. circuits are properly aligned and the oscillator will maintain a constant frequency difference from the incoming R. F. signal.

I. F. Tuning Capacitor Adjustments

Although this receiver has two I. F. stages, one for the second detector and one for the A. V. C., only two of the three I. F. transformers are tuned by adjustable capacitors and require adjustment. The stage used for the A. V. C. is broadly tuned and does not require any adjustment.

The transformers are all tuned to 175 K. C. and the circuits broadly peaked.

A detailed procedure for making this adjustment follows:

(a) Procure a modulated R. F. Oscillator, such as Stock No. 9050, that gives a modulated 175 K. C. signal. Also procure a non-metallic screw driver such as Stock No. 7065.
(b) An output meter is necessary. This should be a 0-10 milliammeter connected in series with the plate supply to the second detector.
(c) A dummy Radiotron RCA-56 is necessary to substitute for the one normally used in the A. V. C. socket.
(d) Remove the oscillator tube and make a good ground connection to the chassis. Place the oscillator in operation and couple its output from the control grid of the first detector to ground. Adjust the oscillator output, with the receiver volume control at maximum, until a slightly reduced deflection is obtained in the output meter.
(e) Refer to Figure B. Adjust the secondary and primary of the second and then the first I. F. transformer until a minimum deflection is obtained in the output meter. Go through these adjustments a second time, as a slight readjustment may be necessary

When the adjustments are made the set should perform at its maximum efficiency. However, due to the interlocking of adjustments, it is good practice to follow the I. F. adjustments with the R. F. and oscillator line-up capacitor adjustments. The correct method of doing this is given in the preceding section.

Antenna Connections—It will be noted that three antenna terminals are provided at the rear of the receiver chassis. Two of these will normally be used for the usual antenna and ground connections, while the third one is for use in connection with a shielded antenna system. The tap eliminates the need of the transformer usually used for coupling the shielded line to the radio receiver.

Stock No. 7717 shield kit, which comprises a lightning arrester, transformer assembly, a 200 mmfd. capacitor, and 100 feet of shielded wire, is recommended. When such an antenna system is used, it is necessary to connect the 200 mmfd. capacitor between terminals 1 and 2. This prevents the first R. F. circuit from being detuned and results in maximum gain from the antenna. This capacitor is included with the Stock No. 7717 Kit.

Automatic Record Changer—The automatic record changer used in this instrument is of simple design and excellent construction. The various adjustments that may be required are shown in Figure E. A point to remember with this instrument is that it must always be level, otherwise proper operation will not be obtained.

RADIOTRON SOCKET VOLTAGES (RADIO OPERATION)

120 Volt A. C. Line—Volume Control and Sensitivity Control at Maximum—No signal being received

Radiotron No.	Cathode to Control Grid, Volts	Cathode to Screen Grid, Volts	Cathode to Plate, Volts	Plate Current, M. A.	Heater Volts
RCA-58 R. F.	3.1	97	212	7.5	2.5
RCA-56 Osc.	—	—	100	6.0	2.5
RCA-58 1st Det.	9.5	91	206	2.8	2.5
RCA-58 I. F.	7.5	93	208	4.0	2.5
RCA-58 A. V. C.-I. F.	8.5	92	207	3.0	2.5
RCA-56 A. V. C.	12.0	—	—	0	2.5
RCA-55 2nd Det.	0	—	74	8.0	2.5
RCA-56 A. F. Driver	11.0	—	205	5.0	2.5
RCA-56 A. F. Driver	11.0	—	205	5.0	2.5
RCA-59 Power	0	—	394	13.0	2.5
RCA-59 Power	0	—	394	13.0	2.5
RCA-5Z3 Rect.	990-495 R. M. S.			92 Total	5.0

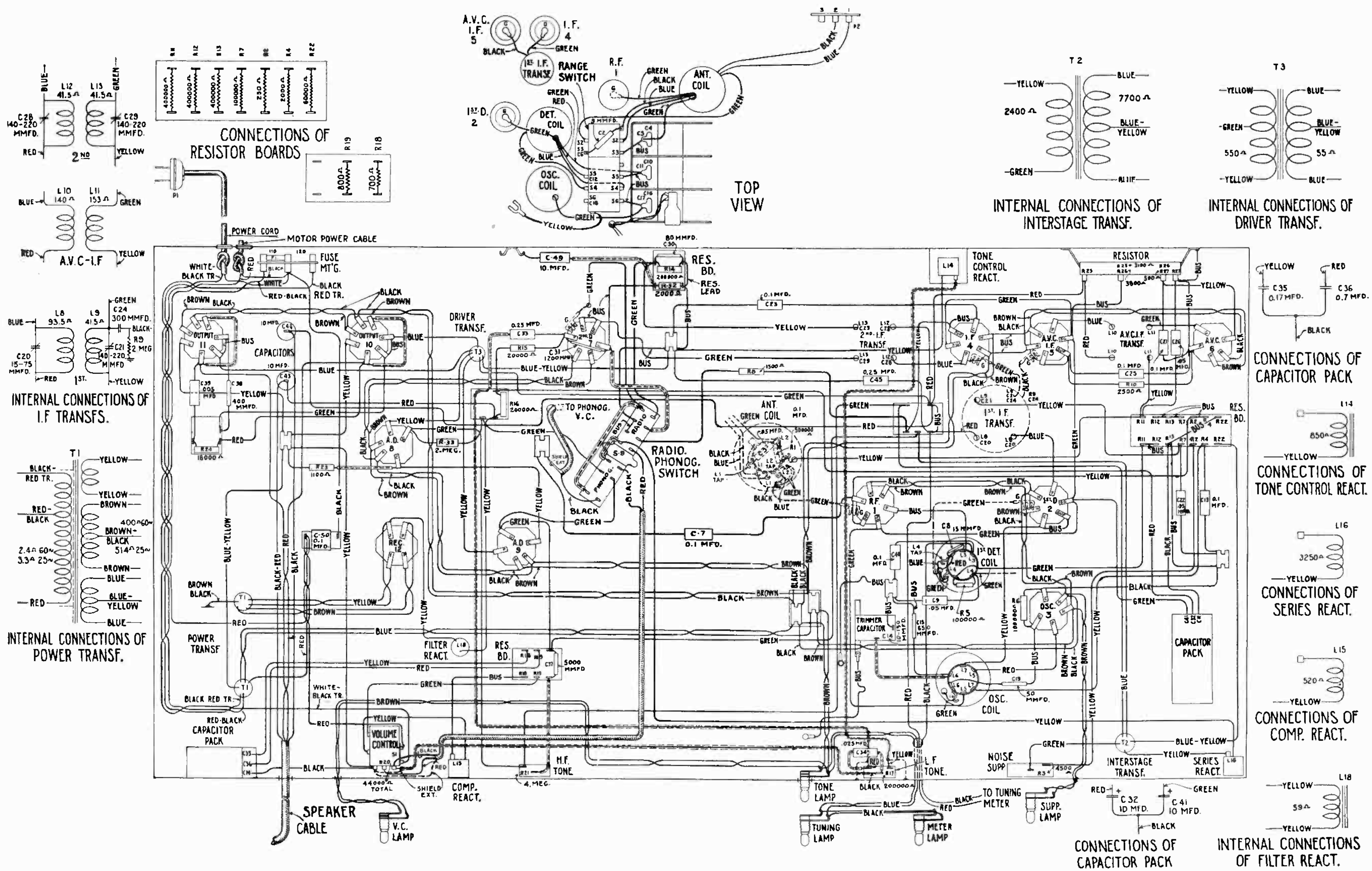

Figure C—Chassis Wiring Diagram

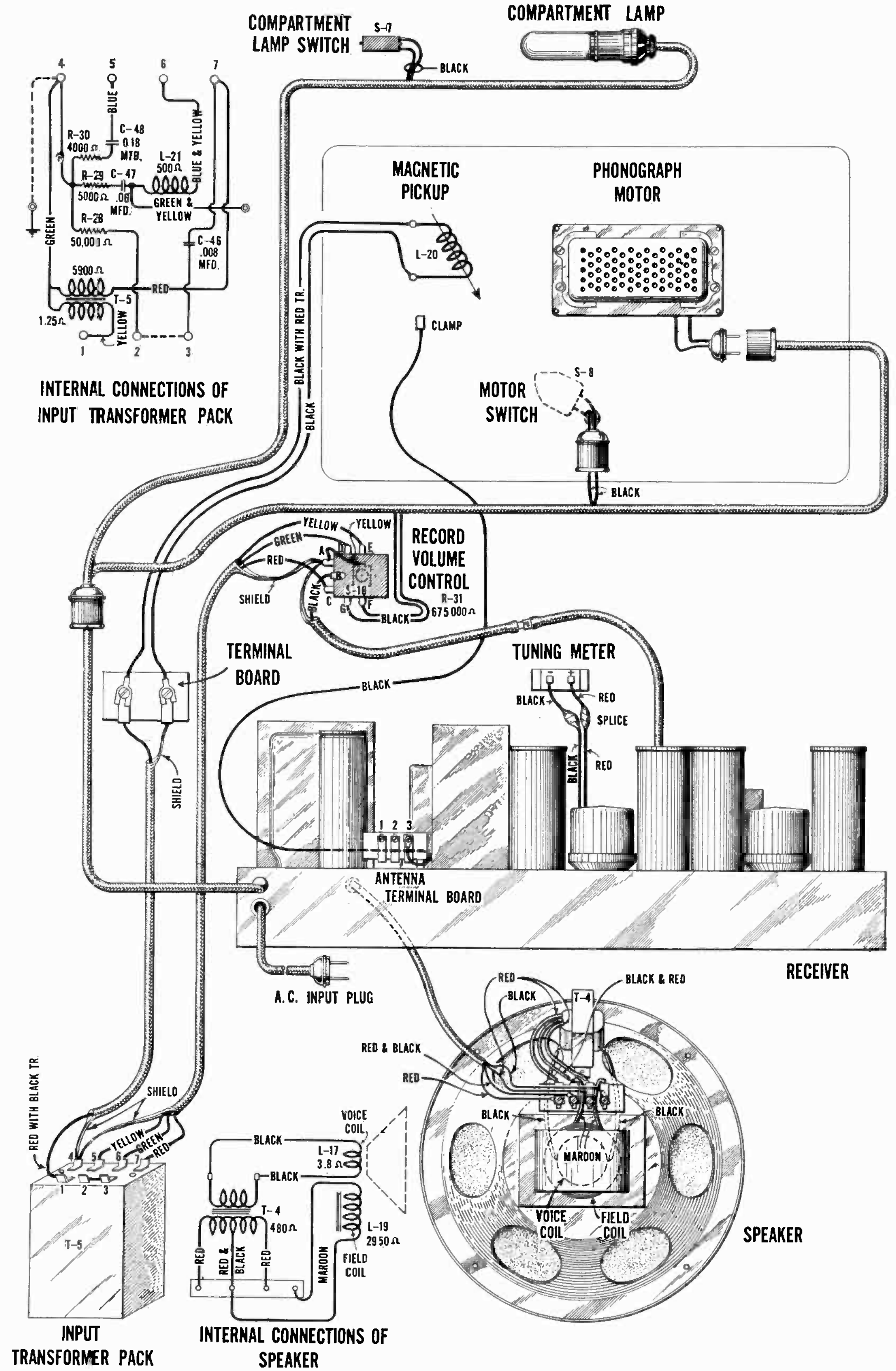

Figure D—Assembly Wiring Diagram

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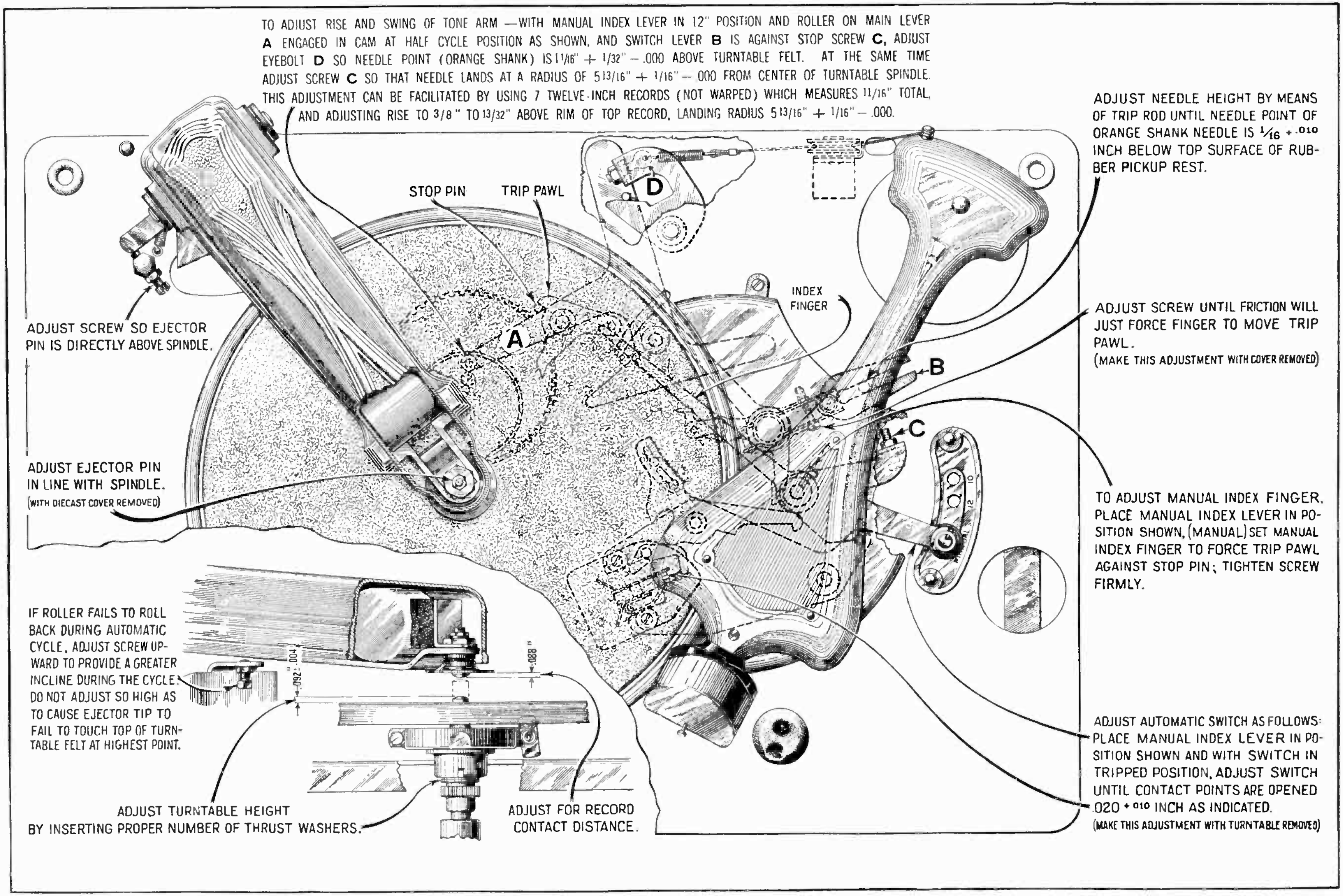

Figure E—Automatic Record Changer Adjustments

SERVICE DATA FOR MAGNETIC PICKUP

The Magnetic Pickup used in this combination instrument is of a new design with an improved frequency range. While in physical appearance it is similar to that of the older type, details of construction are considerably different. It consists essentially of a chromium steel magnet, two thin pole pieces, a mechanism support and bracket, a coil, and an armature that is damped by means of an anchored damping block.

The use of the anchored damping block eliminates any bad peaks in the frequency range. The frequency response characteristic is substantially flat from 50 to 5,000 cycles.

Replacing Magnet Coil, Pivot Rubbers, Armature or Damping Block

In order to replace a defective coil or the hardened pivot rubbers (see Figure G), it is necessary to proceed as follows:

(a) Remove the pickup cover by removing the center holding screw and needle screw.

(b) Remove the pickup magnet and the magnet clamp by pulling them forward.

(c) Unsolder the coil leads and remove the mechanism assembly from the back plate by releasing the two mounting screws and the damping block clamping screw.

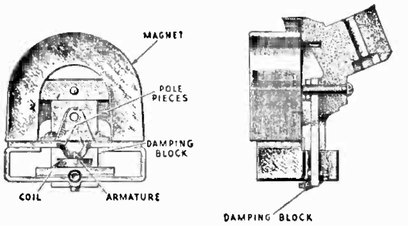

Figure F

(d) Remove screws A and B, Figure G, and then remove the mechanism assembly from the pole pieces.

(e) The coil or the front pivot rubber may now be removed and replaced. If it is desired to replace the rear pivot rubber, then the end of the armature soldered to the mechanism support must be unsoldered and the damping block removed. The rear pivot rubber now may be replaced. After putting the pivot rubbers in place a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block.

(f) The mechanism should now be reassembled, except for the magnet, which must be magnetized. After being magnetized, the mechanism—with the pole pieces upward—should be placed so that the magnet may be slid from the magnetizer onto the pole pieces without breaking physical contact. After placing the pole pieces on the magnet, the entire assembly should be remagnetized thoroughly, being careful not to change the polarity obtained by the initial magnetization.

(g) After assembling to the mechanism, the entire assembly should be fastened to the back plate by means of the screws provided, making sure the damping block is securely clamped. At the same time, the metal dust cover must be placed in position.

(h) After remagnetizing, it is necessary to correctly center the armature. This may be done quite accurately by feeling its play after the needle is inserted. A little practice will quickly show which way an adjustment is necessary to have the armature centered properly. The adjustment is made by loosening screws A and B (Figure G), and sliding the mechanism slightly in relation to the pole pieces.

(i) The cover may be now replaced over the entire assembly, and the pickup returned to the tone arm.

In assembling, it may be desirable to check the armature air gap by means of a small Feeler Gauge. This air gap should be nine mils on each side of the armature. However, a little practice with the needle in place will quickly disclose whether or not the armature is centered.

Replacing the Damping Block

If it is desired to replace the damping block, it may be done in the following manner:

(a) Disassemble the pickup as described under the preceding section.

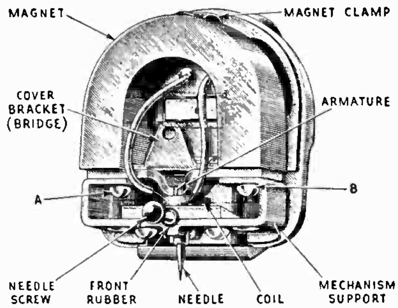

Figure G

(b) Remove the armature entirely by unsoldering it at its joint with the mechanism support.

(c) Remove the damping block from the armature and clean the bushing for holding the damping block with emery paper.

(d) Insert the armature through the new block so that it occupies the same position as that of the old. Also ascertain that the block is in correct vertical alignment with the armature. It will be noted that the hole in the damping block is somewhat smaller than the diameter of the armature. This is done so that a snug fit will be obtained.

(e) After properly locating the damping block, a soldering iron should be applied to the armature so that the block will melt slightly at its point of contact with the armature. A special tip, constructed as shown in Figure H, will prove desirable for fusing the block in place. The iron should be applied long enough to slightly melt the block and cause a small bulge on both sides, but should not be applied long enough to cause any bubbling. The pickup should then be reassembled as described in the preceding section.

Only rosin core solder should be used for soldering the coil leads in the pickup. Also rosin core solder should be satisfactory for resoldering the end of the spring in the hole in the mechanism, since both these parts have been previously tinned. In case the parts are not well tinned, it will be necessary to scrape the end of the spring and the hole in the mechanism until bright. These parts may now be tinned by using as a flux a water solution of zinc chloride (commonly called

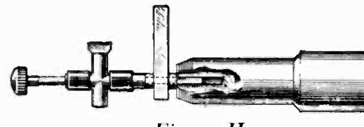

Figure H

acid flux). After tinning, dip the parts in water to wash off the acid flux and thereby prevent serious subsequent corrosion. After making sure that the pivot rubbers and damping block are properly in place, as described under (e) above, the armature may now be soldered in place in the mechanism by using rosin core solder, since the parts are now tinned. Care must be exercised to get the needle hole perfectly square with respect to the mechanism, or otherwise it will be difficult if not impossible to center the armature in the air gap as explained under (h).

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
2730	Resistor—18,000 ohms—Carbon type—1 watt (R24)—Package of 5	$1.10
2747	Cap—Contact cap—Package of 5	.50
3024	Capacitor—9 mmfd. (C2)—Package of 2	.50
3047	Resistor—1,500 ohms—Carbon type—½ watt (R8)—Package of 5	1.00
3085	Capacitor—400 mmfd. (C38)	.30
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R5)—Package of 5	1.00
3252	Resistor—100,000 ohms—Carbon type—½ watt (R6, R7)—Package of 5	1.00
3376	Mount—Fuse mount	.40
3435	Resistor—250 ohms—Carbon type—½ watt (R2)—Package of 5	1.00
3460	Capacitor—1,200 mmfd. (C31)	.30
3526	Resistor—2,000 ohms—Carbon type—½ watt (R4, R32)—Package of 5	1.00
3527	Resistor—800 ohms—Carbon type—½ watt (R19)—Package of 5	1.00
3528	Bracket—Noise suppressor or volume control lamp bracket	.18
3529	Socket—Noise suppressor or volume control lamp socket	.32
3533	Shutter—High frequency tone control shutter	.50
3534	Shutter—Low frequency tone control shutter	.50
3535	Socket—High or low frequency tone control lamp socket	.32
3556	Capacitor—0.05 mfd.—Located on antenna coil (C3)	.34
3558	Capacitor—50 mmfd. (C19)	.36
3564	Bracket—Station selector dial lamp—Mounting bracket	.25
3565	Socket—Station selector dial lamp socket	.50
3597	Capacitor—0.25 mfd. (C33, C45)	.40
3640	Capacitor—0.05 mfd. (C9, C22, C26)	.25
3641	Capacitor—0.1 mfd. (C7, C13, C23, C25, C27)	.35
3643	Capacitor—0.005 mfd. (C39)	.25
3652	Screw—No. 10-32-¼ set screw for bracket and bushing assembly—Package of 10	.32
3719	Socket—7-contact Radiotron socket	.30
3726	Arm—Range switch operating arm assembly—Comprising arm, link, studs and set screws	.45
3727	Shaft—Shaft and bushing assembly for range switch operating arm—Comprising two washers, shaft, bushing and nut.	.30
3747	Capacitor—15 mmfd. (C8)	.36
3749	Capacitor—0.1 mfd. (C40)	.30
3765	Capacitor—0.025 mfd. (C34)	.34
3774	Resistor—7,400 ohms—Tapped at 3,800 and 500 ohms (R25, R26, R27)	.80
3797	Reactor—Volume control compensating reactor (L15)	.64
3798	Resistor—700 ohms—Carbon type—½ watt (R18)—Package of 5	1.00
3799	Capacitor—80 mmfd. (C30)	.70
3883	Fuse—2-ampere (F1)—Package of 5	.40
4035	Switch—Radio-Phonograph switch (S9)	2.10
4036	Shield—Low or high frequency tone control light shield	.30
4037	Shield—Antenna, detector or oscillator shield	.55
4038	Shield—Radiotron shield	.30
4039	Shield—Radiotron shield—Second detector shield	.30
4040	Shield—Radiotron tube shield top	.25
4041	Cover—Fuse cover	.25
4042	Reactor—Volume control series reactor (L16)	1.20
4046	Resistor—2-megohm—Carbon type—½ watt (R33)—Package of 5	1.00
4129	Bracket—Bracket and bushing assembly for radio-phonograph switch shaft—Located on receiver chassis	.28
4130	Shield—R. F. Radiotron shield	.30
5817	Resistor—20,000 ohms—Carbon type—3 watt (R15, R16)	.25
6186	Resistor—500,000 ohms—Carbon type—¼ watt—Located on antenna coil (R1)—Package of 5	1.00
6192	Spring—3-gang tuning condenser drive cord tension spring—Package of 10	.30
6228	Resistor—200,000 ohms—Carbon type—½ watt (R14)—Package of 5	1.00
6277	Capacitor—0.1 mfd.—Located on rectifier socket shield (C50)	.35
6280	Resistor—400,000 ohms—Carbon type—½ watt (R11, R12, R13)—Package of 5	1.00
6281	Resistor—1,100 ohms—Carbon type—½ watt (R23)—Package of 5	1.00

Stock No.	DESCRIPTION	List Price
6282	Resistor—60,000 ohms—Carbon type—½ watt (R22)—Package of 5	$1.00
6298	Cord—3-gang tuning condenser drive cord—Package of 5	.60
6300	Socket—4-contact Radiotron socket	.35
6312	Capacitor—650 mmfd. (C15)—Package of 5	1.50
6316	Resistor—2,500 ohms—Carbon type—½ watt (R10)—Package of 5	1.00
6437	Coil—Oscillator coil (L5, L6, L7)	1.24
6447	Volume control (R20, S1)	1.92
6448	Tone control—Low frequency (R17)	1.04
6449	Tone control—High frequency (R21)	1.06
6450	Rheostat—Noise suppressor rheostat (R3)	1.24
6512	Capacitor—0.005 mfd. (C37)	.28
6537	Switch—Range switch	1.30
6539	Coil—Detector coil (L3, L4)	1.44
6541	Dial—Tuning condenser dial and scale	.75
6561	Coil—Antenna coil (L1, L2, R1, C3)	1.65
6562	Transformer—Audio driver transformer (T3)	3.04
6564	Transformer—First intermediate frequency transformer (L8, L9, C20, C21, C24)	2.30
6565	Transformer—A. V. C. intermediate frequency transformer (L12, L13, C28, C29)	2.10
6566	Transformer—Second intermediate frequency transformer (L10, L11)	1.72
6567	Capacitor pack—Comprising one 0.17 mfd., and one 0.7 mfd. capacitors (C35, C36)	.95
6568	Transformer—Interstage audio transformer (T2)	3.10
6571	Capacitor—10 mfd. (C43, C44)	1.20
6572	Reactor—Tone control reactor (L14)	.90
6574	Capacitor pack—Comprising two 10.0 mfd. capacitors (C32, C41)	1.80
6578	Reactor—Filter reactor (L18)	3.22
6797	Capacitor—10.0 mfd. (C49)	1.04
6847	Shield—Rectifier socket shield and capacitor	.65
7062	Capacitor—Adjustable capacitor (C14)	.50
7439	Drum—Dial drum with set screw and three dial mounting nuts	.35
7484	Socket—5-contact Radiotron socket	.35
7485	Socket—6-contact Radiotron socket	.40
7700	Condenser—3-gang variable tuning condenser (C4, C5, C6, C10, C11, C12, C16, C17, C18, S2, S3, S4, S5, S6)	7.44
9468	Transformer—Power transformer—105-125 volts—50-60 cycles (T1)	7.75
9469	Transformer—Power transformer—105-125 volts—25-40 cycles	11.75
	CABLE ASSEMBLIES	
6793	Cable—2-conductor shielded—From radio volume control to Radio-Phonograph switch	.30
6794	Cable—Single conductor shielded—From Radio-Phonograph switch to Phonograph volume control (R31)	.38
6795	Cable—Phonograph motor cable—3-conductor with female section of connector plug	1.10
6796	Cable—2-conductor—Compartment lamp cable	.80
6798	Cable—Compartment lamp and switch cable	2.85
6848	Cable—Tapped cable with two connectors—From Phonograph Motor connector to motor starting switch plug and Phonograph volume control	2.12
6849	Cable—Single-conductor shielded cable with male section of connector—From Phonograph volume control to receiver chassis	.38
6850	Cable—Single-conductor shielded cable—From input transformer to terminal board	.50
	MOTOR BOARD ASSEMBLIES	
2893	Spring—Trip lever latch tension spring—Package of 10	.30
2917	Washer—Spring washer, "U" type—Package of 10	.25
3654	Roller—Guide roller assembly—Comprising bracket roller and guide pin	.34

REPLACEMENT PARTS (Continued)

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
3666	Spring—Cable lever tension spring—Package of 10	$0.44
3670	Finger—Friction finger	.32
3672	Pin—Manual index lever pin	.42
3673	Screw—Manual index lever adjustment screw and nut—Package of 5	.20
3676	Spring—Cam and gear pawl carrier tension spring—Package of 10	.52
3677	Lever—Cable lever assembly	.40
4059	Screw—Trip lever clutch tension adjustment screw—Package of 10	.22
4060	Escutcheon—Manual—12–10	.28
4061	Spring—Main spring—Package of 10	.38
4124	Plate—Actuating plate assembly	.50
4127	Spring—Actuating plate spring—Package of 10	.24
6502	Cam—Cam and gear assembly	1.18
6503	Pawl—Trip pawl assembly	.40
6806	Lever—Manual index lever—Less pin	.55
6807	Lever—Trip lever assembly	1.16
6808	Clutch—Trip lever friction clutch	.30
6809	Finger—Manual index finger assembly	.25
6810	Lever—Main spring lever	.44
6846	Lever—Main lever and link assembly	1.45
7710	Cover—Metal cover for trip lever and friction finger assemblies	.28
	MOTOR ASSEMBLIES	
3777	Motor mounting spring washers and stud assembly—Comprising three upper and three lower springs, six cup washers, three spring washers, and three studs	.62
9011	Motor—Motor complete—105–125 volts—60 cycles	19.72
9012	Motor—Motor complete—105–125 volts—25 cycles	24.16
9013	Motor—Motor complete—105–125 volts—40 cycles	24.16
9014	Motor—Motor complete—105–125 volts—50 cycles	19.72
	EJECT ARM ASSEMBLIES	
3655	Retainer—Ball retainer with three ball bearings	.45
3656	Bearing—Ejector tip bearing	.48
3657	Tip—Ejector tip	.30
3658	Ball—Ball bearing—Package of 20	.30
3662	Plate—Ejector plate—Package of 5	.95
3665	Screw—Eject arm horizontal adjustment screw and nut—Package of 5	.25
3729	Roller—Counter balance roller—Located inside of eject arm	.45
3930	Cushion—Counter balance cushion and bracket—Located inside of eject arm	.18
4054	Bracket—Eject arm bracket assembly	1.35
4055	Post—Vertical adjustment post—Located on eject arm	.30
4056	Yoke—Eject arm yoke assembly	1.04
4057	Shaft and collar—For eject arm	.24
4058	Collar—Eject arm shaft collar	.18
4067	Spring—Eject arm bracket spring—Package of 10	.30
4125	Spring—Eject arm horizontal action tension spring—60 cycle operation—Package of 10	.42
4126	Spring—Eject arm horizontal action tension spring—For 25 cycle operation—Package of 10	.60
7708	Arm—Eject arm complete	7.74
7709	Cover—Eject arm cover	1.38
	SWITCH ASSEMBLIES	
3322	Switch—Motor switch (S8)	.75
6805	Switch assembly—Automatic switch complete	1.90
10174	Springs—Automatic brake springs—Package of 4	.50
10184	Plate—Automatic brake latch plate—Package of 5	.40

Stock No.	DESCRIPTION	List Price
	PICKUP AND ARM ASSEMBLIES	
3388	Screw—Pickup needle holding screw—Package of 10	$0.60
3728	Coil—Pickup coil (L20)	.50
3737	Damper—Package of 5	.65
4062	Rod—Automatic brake trip rod	.20
4063	Screw—Pickup mounting screw assembly—Comprising one screw, one nut, and one washer—Package of 10	.54
4064	Cable—Pickup arm cable—Package of 5	1.00
4128	Armature—Pickup armature	.96
6811	Pickup—Pickup unit complete	4.30
6812	Cover—Pickup cover	.34
6813	Back—Pickup housing back	.68
6814	Cover—Pickup back cover	.34
6815	Escutcheon—Pickup arm escutcheon with mounting rivets	.64
7707	Arm—Pickup arm complete, less escutcheon, pickup, pickup mounting screw, nut and washer	4.12
	TURNTABLE ASSEMBLIES	
3340	Washer—Thrust washer—Package of 2	.56
3341	Pin—Groov-pin—Package of 2	.56
3342	Spring—Latch spring—Located on clamping ring—Package of 2	.56
3344	Cover—Grease retainer cover—Package of 2	.70
3347	Spring—Speed shifter lever spring—Package of 2	.30
4065	Bushing—Speed shifter lever bushing—Package of 4	.82
6816	Ring—Clamp ring assembly—Comprising spring, latch lever, and stud	.42
6817	Sleeve—Sleeve complete with ball race	2.25
6818	Lever—Speed shifter lever	.38
7711	Turntable—Complete	5.10
	MISCELLANEOUS PARTS	
3638	Scale—Tuning meter scale—Package of 5	.60
3763	Motor mounting board spring, washer and stud assembly—Comprising one bolt, two "C" washers, one bottom spring, one top spring, two cup washers, one shakeproof washer, and one nut	.42
3780	Shutter—Noise suppressor shutter	.30
3781	Shutter—Volume control shutter	.30
4043	Switch—Operating switch (S7)	.80
4044	Socket—Compartment lamp socket	1.28
4045	Shade—Compartment lamp shade	.50
4047	Receptacle—Needle receptacle	.55
4066	Rest—Pickup rest	.14
4080	Knob—Range switch knob—Package of 5	.75
4081	Knob—Station selector, volume control or noise suppressor knob—Package of 5	1.08
4082	Knob—High or low frequency tone control, radio-phonograph switch or phonograph volume control knob—Package of 5	1.08
6456	Escutcheon—Volume control escutcheon and color screen	.50
6457	Escutcheon—Noise suppressor escutcheon and color screen	.50
6458	Escutcheon—High and low frequency escutcheon and color screen	.92
6461	Meter—Tuning meter	2.14
6517	Bezel—Tuning meter bezel	.45
6799	Volume control—Phonograph volume control (R31, S10)	3.00
6800	Transformer—Phonograph input transformer—Comprising one transformer, one .008 mfd., one 0.06 mfd., and one 0.18 mfd. capacitors, one 50,000 ohm, one 4,000 ohm, and one 5,000 ohm resistors, and one choke coil (R28, R29, R30, C46, C47, C48, L21, T5)	6.30
6801	Shaft—Flexible drive shaft for Radio-Phonograph switch	1.15
6802	Bearing and plate assembly—For Radio-Phonograph switch shaft—Located on cabinet	.34
	REPRODUCER ASSEMBLIES	
4131	Mounting assembly for reproducer—Comprising two plates, two bolts, two nuts, and two lockwashers	.44
6569	Transformer—Output transformer (T4)	1.95
6618	Cable—4-conductor—Reproducer cable	.54
8969	Cone—Reproducer cone (L17)—Package of 5	6.35
9031	Coil—Field coil magnet and cone support (L19)	4.90
9472	Reproducer complete	8.50

RCA Victor Duo 380-HR

Twelve-Tube Superheterodyne Receiver with Automatic Phonograph

Equipped for Home Recording

INSTRUCTIONS

RCA Victor Company, Inc.

CAMDEN, N. J., U. S. A.

INTRODUCTION

This distinctive radio-phonograph combination embodies the latest developments and improvements in home entertainment from broadcasts and recordings. Splendid voice and musical reproduction with abundant reserve volume from either radio programs or phonograph records is realized through the use of aural (automatic tone) compensation, Class B power amplification, and a large electro-dynamic loudspeaker. The latter member is contained in a specially-designed internal compartment which renders the cabinet acoustically correct, preventing sound distortion from resonance effects commonly known as "boominess."

In addition to a refined superheterodyne circuit using twelve tubes, the radio receiver incorporates the following features: (1) "secondary tuning range" for reception of police calls, amateur and other phone communications between 1500 and 2800 kilocycles as a diversion from the accustomed broadcasts, (2) "automatic volume control" to minimize fading and prevent blasting, (3) "silent-tuning control" to permit adjustment for quiet tuning between station settings, and (4) "dual tone control" to afford alteration of the bass or treble response independently as desired. Colored illuminated indicators on the front panel of the cabinet show at a glance just where the volume, silent-tuning and tone controls are set. An illuminated tuning meter is mounted directly above the station selector dial to facilitate *exact* adjustments of that dial and thus insure most pleasing reproduction.

The electrical phonograph is fully automatic, capable of playing in sequence without attention one side of several ten- or twelve-inch records of the standard-speed (78 R. P. M.—revolutions per minute) or long-playing (33⅓ R. P. M.) variety. In addition, the mechanism may be quickly converted to function as an ordinary non-automatic phonograph, thus permitting individual playing at either speed, records of any diameter up to 12 inches. It is sturdily constructed and simple to operate, all controls being accessible from the front of the instrument. Record changing is accomplished in a minimum interval of four seconds. Two enclosed compartments are provided at the bottom of the cabinet for the storage of records.

Facilities for recording of either radio broadcasts or voice and musical entertainment originating in the home are contained in this instrument. Such recordings, however, must be made on special grooved blank records using special blunt-pointed needles, a few samples of these accessories being provided for the first trial operations. The microphone supplied is necessary when recording other than radio programs and is of the double-button carbon type, insuring excellent results under normal operation. The correct radio volume setting or microphone distance from the sound source may be quickly pre-determined by merely observing the flashing action of two small neon-lamp indicators located at the front of the playing compartment.

INSTALLATION

Preliminary—After withdrawing the instrument from its shipping container and removing the packing framework bolted to the underside of the cabinet, extract the interior wooden brace fastened by screws to the radio chassis shelf and to the lower edge of the back-panel rail. Also remove the two red hex-head bolts which pass through the mounting rails and withdraw the two wooden blocks from between those rails and the motor-board, which should then float freely on its spring suspension.

Tubes—This instrument is equipped and tested at the factory with RCA Radiotrons and is shipped with these tubes installed. Remove the packing material inserted to protect the tubes against damage in transit, then refer to the chassis diagram printed on the license label inside the cabinet and *make certain:*

(a) That all tubes are in the proper sockets and pressed down firmly. *Never apply power to the instrument unless all tubes are in place.*

(b) That the shields are rigidly in place over those tubes represented by double circles on the diagram.

(c) That the spring connectors of the short flexible (grid) leads, shown on the diagram, are securely attached to the dome terminals of the proper tubes. It is important that the adjacent green and black leads shall be connected as indicated—that is, not reversed.

NOTE—The grid lead for the RCA-55 must be enclosed by the cylindrical tube shield. A slot is provided at the bottom of this shield for entrance of the lead.

(d) That the lids are securely in place on the shields of the two tubes designated by a heavy outer circle on the diagram.

Phonograph Compartment—Open the large doors on the front of the cabinet and remove all packing material from the playing compartment. Withdraw the turntable, microphone, used-needle cup, record and needle kits, recording weight, recording pad, compartment lamp and associated lamp shade from the Outfit Package. Referring to Figure 2, lift the record ejector to its upright position (see paragraph 3 (c) under "Procedure—Automatic Operation—Phonograph") and, with the speed shifter set in the outward or 78 R. P. M. position, mount the turntable on the motor spindle. Make certain that the spindle drive key engages the slot in the turntable hub.

Hang the microphone on the hook located at the upper left-hand rear corner of the playing compartment and push its connector plug into the receptacle directly above the rear edge of the record eject pocket. Do not permit any part of the cord to dangle in the eject pocket; wind all excess length of this cord around the microphone pedestal. Insert the used-needle cup in the opening provided in the motor-board and install the compartment lamp and lamp shade. The socket for this lamp is located at the top of the compartment directly above the front doors, which doors conceal and actuate the lamp switch. The shade should be turned to a position which does not afford direct illumination of the recording indicators.

Location—The instrument should be located close to the antenna lead-in and ground connections and near an electrical outlet. To insure proper operation of the automatic mechanism, the instrument must be level. If the floor is uneven at the location selected, therefore, one or more of the cabinet legs should be blocked up to attain the required level position. This is very important; for further details, see note 2 of paragraph 8 under "Procedure—Automatic Operation—Phonograph."

Antenna and Ground—A well-insulated outdoor antenna having a length of from 50 to 100 feet including the lead-in wire is recommended. It should be erected as high as conveniently possible and sufficiently remote from power lines and street railways to prevent excessive local interference. If the instrument is installed in a building of non-metallic construction, an indoor antenna ordinarily will afford satisfactory reception and may be considered the most practical. Buildings in which the roof or framework is of metal, however, form an effective shield which greatly impedes the passage of radio waves; to insure best results in such installations, therefore, an outdoor antenna is essential.

A *good* ground connection also is essential for best performance. The ground lead should be as short as possible and attached preferably to a cold-water pipe. An approved ground clamp should be used to insure a tight and permanent connection.

A terminal board containing three terminals is provided on the receiver chassis at the rear to facilitate connection to the antenna and ground. Connect the antenna lead to the middle terminal (marked "2") and the ground lead to the right-hand terminal (marked "3"). Tighten the terminals with a screw driver to insure permanent electrical connections.

NOTE—The left-hand terminal (marked "1") is provided for use only with *shielded lead-in* equipment (designed especially for this receiver) which can be purchased from and installed by the dealer who sold this instrument. Such an installation is effective in eliminating or greatly reducing noise interference caused by local electrical disturbances ("man-made static").

Power Supply—Connect the power cord to an electrical outlet supplying alternating current at the voltage and frequency (cycles) specified on the license label (see remarks pertaining to instrument fuse under concluding section "General"). During the subsequent Operating Test, the most satisfactory position for the connector plug in the outlet (that which provides least hum on record reproduction) should be determined.

Operating Test—At installation, a thorough trial operation—both radio and phonograph—should be made in accordance with the instructions which follow The instrument was, of course, in perfect operating condition when shipped from the factory. After transit, however, minor adjustments sometimes may be necessary, particularly on the automatic record-changing mechanism. It is the dealer's responsibility to make sure that the instrument functions perfectly when installed.

A diagrammatic chart giving complete instructions for ordinary adjustments of the automatic mechanism is included in the Service Data section of this booklet. Whenever possible, these adjustments should be made by the dealer from whom the instrument was purchased.

OPERATION—RADIO

All of the radio operating controls are located on the front panel as shown in Figure 1. Proceed as follows:

1. Set the Transfer Switch for "Radio Reception" and the Frequency Range Switch as indicated below for reception in either band:

(a) *Counter-clockwise* — 540–1500 kilocycles (broadcast band). Using the large numerals, the dial scale reads directly in kilocycles for this band.

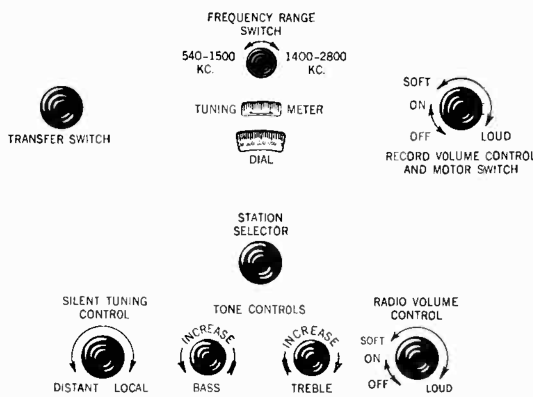

Figure 1

(b) *Clockwise*—1400–2800 kilocycles. Frequencies in this band are indicated approximately by the positions of the small numerals at the bottom of the dial (add two ciphers to obtain kilocycles). Available services therein include the following:

(1) **Police Calls**—Stations operating at 1574 and 1712 kilocycles and between 2400 and 2500 kilocycles.

(2) **Amateur Radio "Phone"**—Assigned band 1800–2000 kilocycles.

(3) **Aviation Communications "Phone"** — Between 2500 and 2800 kilocycles.

NOTE—The majority of stations in this range do not offer continuous programs. Police calls are usually intermittent, at regular or irregular intervals. Strong local stations in the broadcast band may be audible (sometimes at more than one point on the dial) when the Frequency Range Switch is set for 1400–2800 kilocycles.

2. Apply power by turning the Radio Volume Control knob clockwise from the "off" position. Set this control near the middle of its range by observing the illuminated colored indicator associated with its control knob. Wait a few seconds for the tubes to heat before attempting further operation.

3. With the Silent-Tuning Control set in the extreme counter-clockwise position, turn the Station Selector to a point, near the middle of the dial range, at which no station is heard within several scale divisions. Then turn the Silent-Tuning Control clockwise until the background noise (static) disappears.

NOTE—The adjustment just described provides quiet tuning (that is, *suppression of background noise between station settings*) and permits reception of all stations whose signals are above the existing noise level.

4. Tune the receiver by rotating the Station Selector either at random until a desirable program is heard or in an endeavor to locate any particular station whose assigned frequency is known. In the latter case, turn the selector slowly throughout a narrow range on each side of that dial setting corresponding to the station frequency.

NOTE—In the event that any particular station cannot be reached in this manner, its signal intensity probably is below the prevailing level of background noise. If especially desired, however, weak signals often may be received by turning the Silent-Tuning Control gradually counter-clockwise, thus calling upon the reserve sensitivity of the instrument. Under such conditions, background noise reproduction naturally will be appreciably greater.

5. After locating a station, turn the Radio Volume Control counter-clockwise (if necessary) until the sound level is fairly low and then adjust the Station Selector accurately to that position at which the indicator of the tuning meter travels furthest to the right (as designated by the arrow on the meter scale). At this setting only will the fine quality of reproduction provided in this instrument be realized and least background noise interference be obtained.

NOTE—When receiving a powerful local station, the Station Selector dial should be set at the *center* of the scale *range* for which the meter deflection is maximum (this range may be narrowed somewhat by turning the Silent-Tuning Control clockwise).

6. Set the Radio Volume Control for the desired sound level.

7. Adjust the two Tone Controls to obtain the tone shading preferred. The full range of musical reproduction is obtained with the right-hand knob turned fully clockwise and the left-hand knob turned to its counter-clockwise extremity, being represented by full illumination of the tone color indicator which extends between the two knobs. Modifications of the tone range may be obtained as follows:

(a) To reduce the high-frequency (treble) response, or to decrease the background noise (static) interference on *station settings*, turn the right-hand tone control knob counter-clockwise. The extent of high-frequency cut-off thus obtained is indicated by shading of the *yellow* illumination at the right-hand side of the tone color indicator.

(b) To reduce the low-frequency (bass) response, or to decrease low-pitched hum present on the signals of some stations, turn the left-hand tone control knob clockwise. The extent of low-frequency cut-off thus obtained is indicated by shading of the *blue* illumination at the left-hand side of the tone color indicator.

(c) The *red* illumination at the center of the tone color indicator represents the middle range of musical response. This illumination is not cut off by rotation of either of the tone control knobs as described in the preceding paragraphs (a) and (b).

8. When through operating, turn the Radio Volume Control fully counter-clockwise, thus switching the power "off."

OPERATION—PHONOGRAPH

Automatic Operation

Important Precautions—The following precautions must be observed during operation:

1. In loading the turntable, make certain that the first record inserted (last to be played) is flat—that is, essentially free from warpage.

2. Before starting the turntable, make certain that the reject pocket (at the left of the phonograph compartment) is either empty or sufficiently clear to permit proper disposal of records by the automatic mechanism.

3. Never restrain by force the normal motion of any part of the automatic mechanism while it is changing records.

Procedure—The phonograph operating controls are located on the front panel and in the playing compartment as shown in Figures 1 and 2. Proceed as follows:

1. Set the Transfer Switch for "Record Reproduction."

2. Apply power by turning the Radio Volume Control clockwise from the "off" position. Set the two Tone Controls for full-range reproduction (see paragraph 7 under "Operation—Radio").

3. With the Motor Switch in the "off" position (Record Volume Control fully counter-clockwise), load the turntable with records, as follows:

(a) Set the Index Lever at "Manual." *Always do this before loading or unloading records.*

(b) Place the electric pickup on the rubber rest.

(c) Raise the Record Ejector arm (*very slowly*, at first, until the internal weight has rolled to the rear of the arm, then as rapidly as desired) to its upper position of rest. *Always raise the ejector arm in this manner.*

(d) Select the records to be played. *All records for one loading must be of the same diameter (either ten or twelve inches), close to standard thickness and operable at the same speed (either 78 or 33⅓ R. P. M.).*

CAUTION—Do not use thin flexible-type records for automatic operation.

(e) Place the records, one at a time, on the turntable (see paragraph 1 under "Important Precautions"). The spindle should resume its normal height after each record is added. The turntable is fully loaded when the top surface of the uppermost record is nearly flush with the top of the spindle. (It should not be possible to slide off the top record without lifting its edge or depressing the spindle.)

(f) Lower the Record Ejector arm gently onto the spindle.

4. Insert a *new* needle in the pickup as far as it will go and tighten the needle screw. For long-playing (33⅓ R. P. M.) records, use *only* the *orange Chromium* needle. For standard (78 R. P. M.) records, use the latter needle or, if preferred, either the *green Chromium* or the full volume (full tone) *Tungstone* needle. Transparent-faced (illustrated) records, however, should not be reproduced with *Tungstone* needles.

NOTE—With care, the orange Chromium needle should play 75, the green Chromium 100, and the Tungstone 100 to 150 records. *Never re-insert in the pickup a Chromium needle which has been used (however slightly) as damage to the record grooves would result.*

5. Place the pickup needle on the smooth outer rim of the record, near the first groove. Then move the Index Lever to the position (12 or 10) corresponding to the diameter (inches) of the records on the turntable. Be careful not to move the lever *beyond* the proper index hole. Push the index pin firmly into the hole.

CAUTION—Never attempt to move the Index Lever from the Manual position when the pickup is on the rubber rest.

6. Start the turntable by turning the Motor Switch clockwise; then set the Speed Shifter for the speed (78 or 33⅓ R. P. M.) corresponding to the records on the turntable.

NOTE—The speed shifter should not be moved inward (from the 78 to the 33⅓ R. P. M. position) while the turntable is at rest.

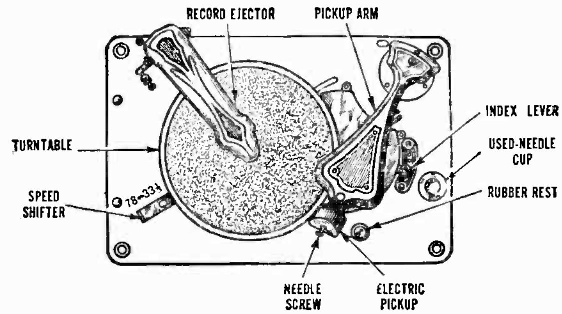

Figure 2

7. Adjust the Record Volume Control to obtain the desired volume.

8. Close the cabinet doors to extinguish the compartment lamp and to render less prominent the mechanical noises incident to record playing and changing. If needle scratch reproduction (particularly noticeable with old records) is considered excessive, turn the *treble* Tone Control slightly counter-clockwise. For most faithful reproduction, however, both Tone Controls should be left in the positions which provide full illumination of the tone color indicator.

NOTE 1—When a record has been played, the ejector arm slides it off into the record pocket and the pickup moves to the outside of the next record . The records on the turntable are thus played consecutively until only one record remains on the turntable. This record will be played repeatedly until the motor is stopped by means of the Motor Switch.

NOTE 2—After a record has been played and changed, the needle is lowered automatically onto the smooth rim of the next record and is fed by gravity into the starting groove. After the instrument has been leveled with reference to the top of the cabinet, further slight compensation may be necessary, thus: (1) If the needle fails to enter the playing groove, the right-hand side of the instrument must be raised by inserting thin blocks under the front and rear legs on that side: or (2) If the needle slides over several grooves, thus failing to reproduce the beginning of the selection, the left-hand side of the instrument must be similarly raised.

9. To reject a record while playing, lift the pickup arm and move it to the extreme left. Hold the pickup lightly until it is moved by the mechanism.

10. Before reloading or when through operating, turn the Motor Switch to the "off" position, set the Index Lever at "Manual" and place the pickup on the rubber rest. Never leave the pickup resting on a record (or on the turntable) when not in use. Turn the power switch "off" and close the cabinet doors when discontinuing operation of the instrument.

Manual Operation

Records may be played individually as follows:

1. Set the Transfer Switch for "Record Reproduction" and apply the power with the Radio Volume Control as directed for automatic operation. Adjust the two Tone Controls for full-range reproduction.

2. Make sure that the Index Lever is at "Manual," that the electric pickup is on its rubber rest, and that the Motor Switch is in the "off" position.

3. Raise the Record Ejector arm to the upper rest position (see paragraph 3 (c) under "Automatic Operation").

4. Place the record on the turntable and insert a needle in the pickup. For needle information, see paragraph 4 under "Automatic Operation."

NOTE—Ordinary steel needles (full volume or full tone) can be used with standard (78 R. P. M.) records, provided a new needle is inserted for each selection. Do not use *Tungstone* needles with either thin flexible type or transparent-faced (illustrated)records.

5. Start the turntable by turning the Motor Switch clockwise, then set the Speed Shifter for the speed corresponding to the record on the turntable. Lower the needle gently onto the smooth outer rim of the record.

6. Adjust the Record Volume Control and close the cabinet doors (see paragraph 8 under "Automatic Operation").

7. After the record has been played, stop the turntable by turning the Motor Switch to the "off" position (motor stops automatically at the end of any record having the *eccentric* final groove). Lift the electric pickup from the record and place it on the rubber rest.

8. When through operating, turn the power "off" and close the cabinet doors.

OPERATION—RECORDING

Recording Precautions

When using the home-recording facilities of this instrument, the following precautions must be observed:

1. Always place a flat (unwarped) 10- or 12-inch record of the commercial variety beneath the home-recording record when recording.

2. To prevent surface slippage, always record with the cork recording pad inserted between the home-recording and standard records. This pad need not be removed for "playing-back" purposes but must never be left on the turntable when automatic operation is intended.

3. Use only the special *home-recording* needle (identified by its yellow shank and blunt-point) for both recording and reproducing. Such needles, however, must not be used for playing other than home-recorded records.

4. For *recording*, the needle pressure on the record must be increased by placing the recording weight on the electric pickup. This weight must be removed for *reproducing* either the home-recorded or any other record.

Radio Recording

To record radio programs, refer to Figures 1 and 2, and proceed as follows:

1. Tune the receiver for the desired radio program as described under "Operation—Radio." Make sure that the Index Lever is at "Manual," that the electric pickup is on its rubber rest, and that the Motor Switch is in the "off" position.

2. Raise the Record Ejector arm to its upper position of rest (see paragraph 3 (c) under "Procedure—Automatic Operation—Phonograph").

3. Place a blank home-recording record on the turntable (see paragraphs 1 and 2 of preceding section "Recording Precautions") and lower the Record Ejector arm.

4. Insert a *home-recording* needle in the electric pickup and place the recording weight on the pickup head.

5. Set the Transfer Switch for "Radio Recording." In this position, the radio program should be heard at reduced volume.

6. Adjust the Radio Volume Control to obtain the correct recording volume as determined by observing the flashing of the two neon-lamp indicators located at the front of the playing compartment. The setting is correct when the left-hand lamp is at or near fixed illumination and the right-hand lamp is either "off" or flashing only at intervals. When both lamps are "off," the volume is too low and when both are flashing continuously, the volume is too high.

7. Start the turntable by turning the Motor Switch "on," then set the Speed Shifter for the desired turntable speed.

NOTE—For best results, always record at 78 R. P. M. If a record of longer duration is desired, recording may be done at 33⅓ R. P. M. Such records should be so marked, and must of course be reproduced at the same speed.

8. Place the needle in the outer groove of the blank record and recording will proceed automatically. During this process, however, watch the volume indicators and adjust the Radio Volume Control (if necessary) to compensate for changes in the program level.

9. Recording may be interrupted at any time by simply lifting the pickup from the record. It may be resumed on the same record if desired, provided care is taken to enter the needle in a *new* groove—that is, one slightly nearer the center than the last recorded groove.

10. Upon completing a recording, lift the electric pickup from the record, turn the Motor Switch "off" and place the pickup on the rubber rest.

Microphone Recording

To record voice or musical entertainment originating in the home, the procedure is essentially the same as for the recording of radio programs except that the microphone is employed. Remove this unit from the cabinet (leaving the cord connected) and place it in an *upright* position on a table or any other horizontal surface conveniently near the sound source.

For best results, special attention must be given to the location and arrangement of the person or persons presenting the program. All sounds to be recorded must be directed toward the *front* of the microphone, never toward the *rear* which is designated by the word "BACK" cast on the pedestal. Further, the microphone should be located at a height approximately the same distance from the floor as the sound source. Such conditions may be fulfilled easily in the case of the average adult (speaker or singer) by placing the microphone on the top of the cabinet.

When recording speech, the microphone should be spaced from three to six inches from the speaker's mouth; the speaker should talk in a normal even tone and enunciate clearly. The microphone should be at a somewhat greater distance (one to two feet) when recording musical vocal selections, the proper spacing naturally being dependent upon the number of singers present. For instrumental music, the most desirable distance between the artists and the microphone will depend upon the type (wind or string), as well as the number of instruments and may be from three to ten feet. In the case of a small orchestra, it would be preferable to group the members in a semi-circle with the stringed instruments nearest the microphone and the horns at the rear.

Adjustment of Recording Volume—Before the actual recording is undertaken, it will be advisable to test for the proper volume as follows:

1. Set the Transfer Switch for "Home Recording."

2. Turn the power "on" (Radio Volume Control rotated slightly clockwise). As for radio recording, make certain that the Index Lever is at "Manual," that the electric pickup is on its rubber rest and that the Motor Switch is "off."

3. Raise the Record Ejector arm and load the turntable with a blank home-recording record, first inserting a standard record and the cork recording pad, then lower the Record Ejector arm.

4. Set the Record Volume Control fully clockwise (turntable now should be rotating) and commence the program which is to be recorded.

5. Regulate the distance between the sound source and the microphone, while observing the flashing action of the neon-lamp indicators at the front of the playing compartment, until both lamps are illuminated continuously or at approximately the same intervals.

6. Turn the Record Volume Control counter-clockwise until the right-hand lamp is either "off" or flashing infrequently; however, do not reduce the setting sufficiently to change the action of the left-hand lamp. The instrument is now properly adjusted and the test program may be discontinued while making final preparations for recording.

Procedure—After the recording volume is adjusted, leave the Record Volume Control setting intact permitting the turntable to remain in rotation, and proceed as follows:

1. Insert a *home-recording* needle in the electric pickup and place the recording weight on the pickup head.

2. Set the Speed-Shifter for the desired turntable speed (see note in paragraph 7 under "Radio Recording").

3. Place the needle in the outer groove of the blank record and commence without delay the program to be recorded.

4. When the recording is complete (see paragraph 9 under "Radio Recording"), lift the electric pickup from the record, turn the Motor Switch "off" and place the pickup on its rubber rest.

Reproduction of Home Recordings

Home-recorded records (either radio or microphone recordings) may be reproduced in the manner described for manual operation of standard records under "Operation—Phonograph." Such records, however, must not be employed with the automatic record changer and always must be reproduced with the special *home-recording* needle. Always make certain to remove the recording weight from the electric pickup when "playing-back" recordings.

GENERAL

Fuse—This instrument is protected by a fuse located at the rear of the chassis, under the metal cover marked "Caution: Remove Power Supply Before Removing Cover." If the fuse burns out, check the power supply connections and rating, and have all tubes tested by your dealer before installing a new fuse. This is a special fuse—obtain replacement fuses from your dealer—*do not use any substitute for this fuse.*

In districts where the line voltage is always below 115 (225 for 200–250 volt models), the fuse should be set in the "110" position ("213" position for 200–250 volt models). Always disconnect the power cord from the a-c outlet before removing the fuse cover.

Maintenance—With normal use and handling, trouble-free service is to be expected. The automatic phonograph mechanism and associated parts, however, should be kept clean and well-lubricated. To insure continued efficient operation, it is recommended that the entire instrument be thoroughly inspected and adjusted by an experienced service man once each year.

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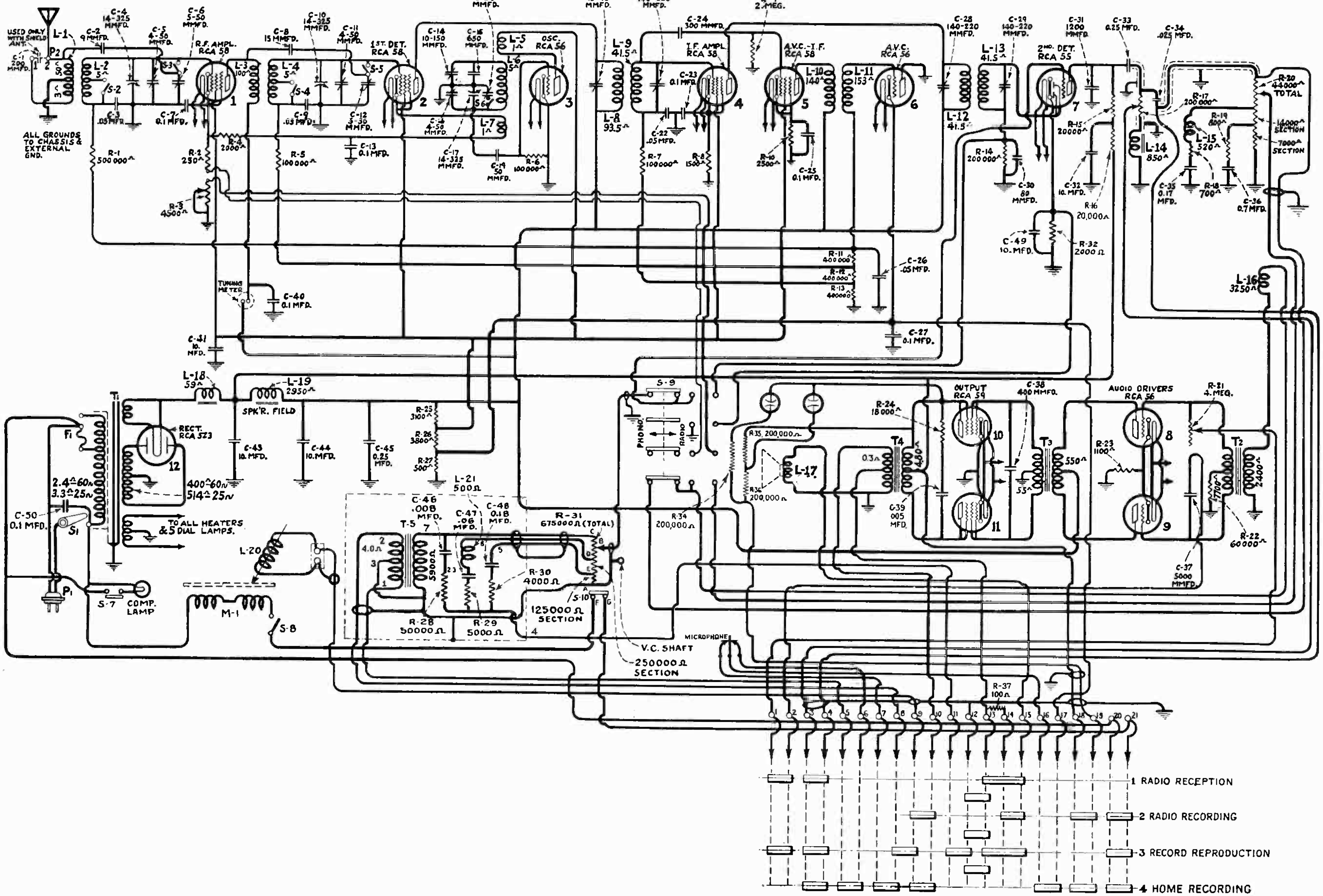

Figure A—Schematic Circuit Diagram

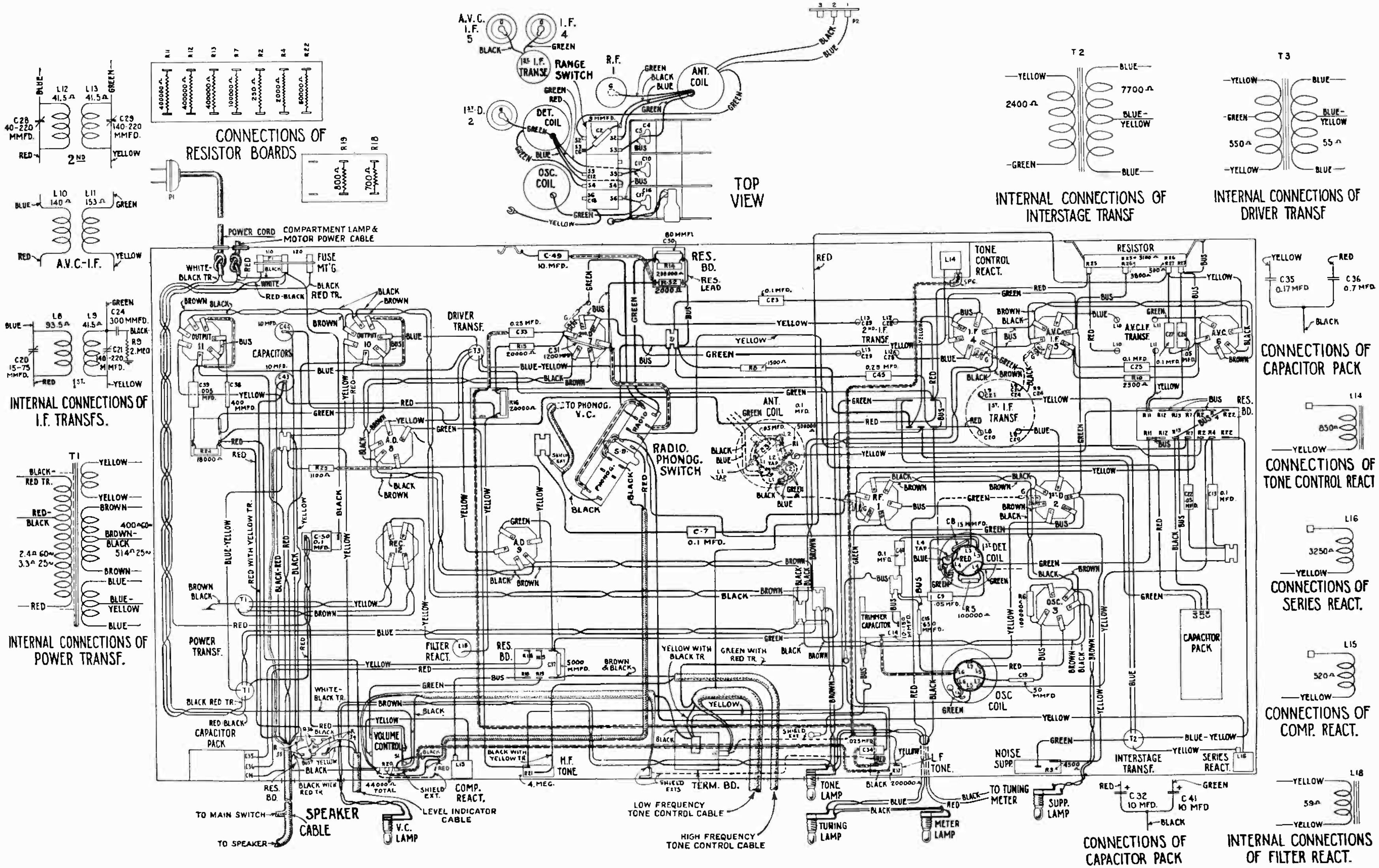

Figure B—Chassis Wiring Diagram

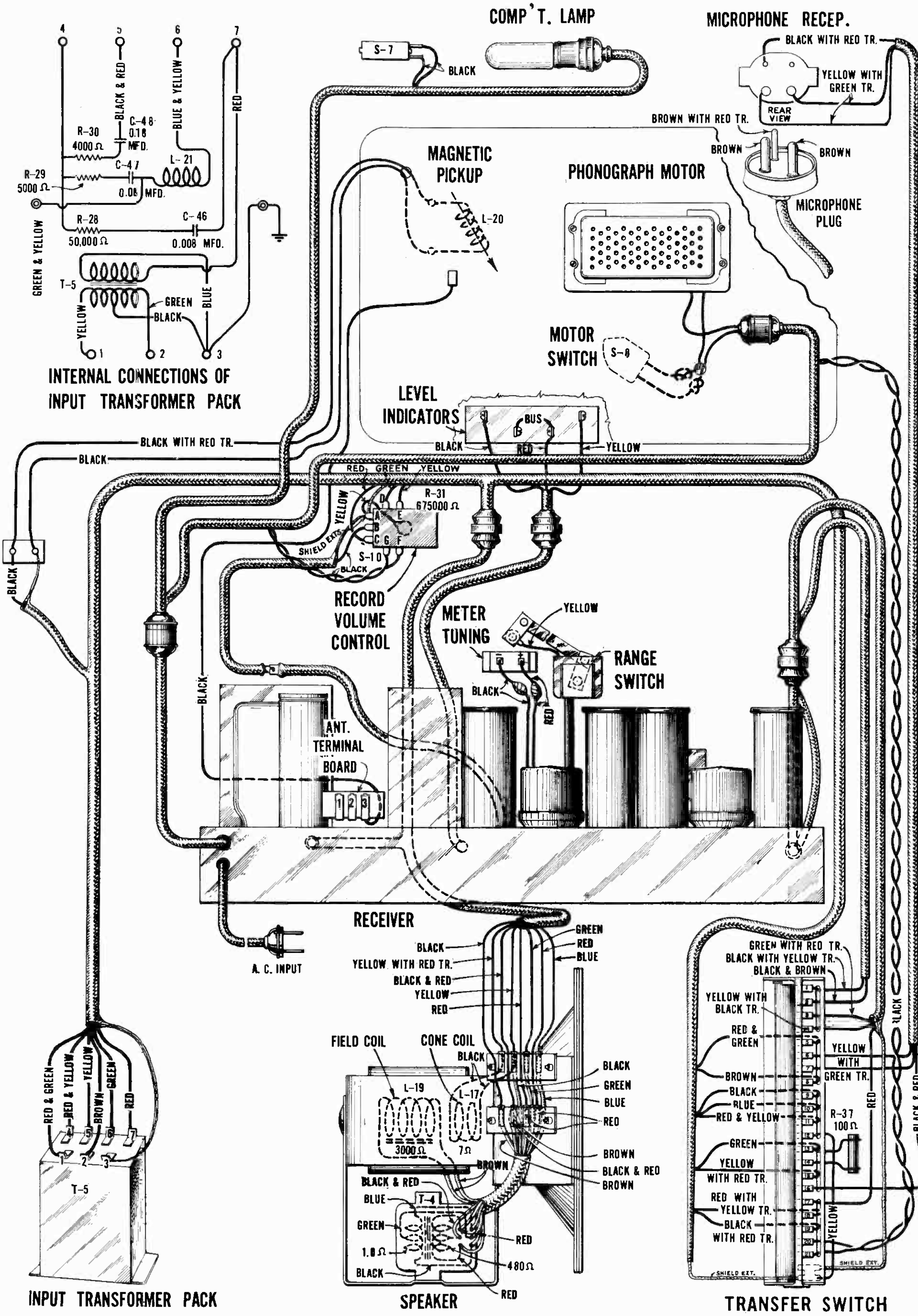

Figure C—Assembly Wiring Diagram

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SERVICE DATA

Electrical Specifications

Voltage Rating............................105–125 Volts
Power Consumption (60 Cycle)................175 Watts
Type and Number of Radiotrons.....4 RCA-56, 4 RCA-58, 1 RCA-55, 2 RCA-59, 1 RCA-5Z3—Total 12
Frequency Range. 540 K.C.-1500 K.C.—1400 K.C.-2800 K.C.
Undistorted Output..........................10.0 Watts

This combination home recording instrument utilizes the new perfected automatic record changing mechanism and the twelve-tube Deluxe Super-Heterodyne receiver. Excellent fidelity on both radio and record reproduction, together with facilities for recording either programs or voice are inherent features of this instrument. Other features include double tuning range (540 K. C.–1500 K. C. and 1400 K. C.–2800 K. C.), high and low frequency tone control, compensated volume control and the inherent sensitivity, selectivity and tone quality of the Super-Heterodyne.

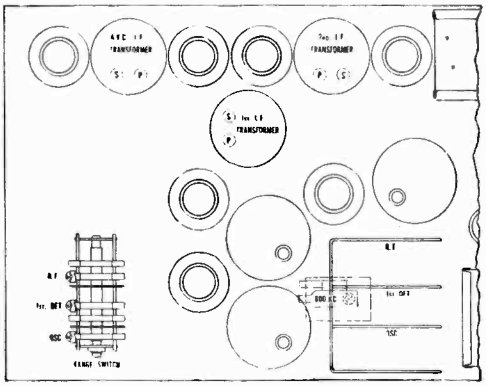


Figure D—Location of Line-Up Capacitors

Figure A shows the schematic circuit, Figure B the chassis wiring, and Figure C the assembly wiring diagram. The Radiotron socket voltages, the line-up procedure, special service hints and the replacement parts are given on the following pages.

R. F. and Oscillator Line-up Capacitor Adjustments

Four adjustable capacitors are provided for aligning the R. F. circuits and adjusting the oscillator frequency so that the oscillator will maintain a constant frequency—175 K. C. —difference from that of the incoming signal. Poor quality, insensitivity, poor A. V. C. action and possible inoperation of the receiver may be caused by these capacitors being out of adjustment.

If the other adjustments have not been tampered with—the intermediate transformer tuning capacitors—the following procedure may be used for aligning these capacitors:

(a) Procure an R. F. Oscillator, such as Stock No. 9050, giving a modulated signal at 600 K. C., 1400 K. C., and 2440 K. C. Also procure a non-metallic screw driver such as Stock No. 7065.
(b) An output meter is necessary. This should be a 0-10 milliammeter connected in series with the plate supply to the second detector.
(c) A dummy Radiotron RCA-56 is necessary to substitute for the one normally used in the A. V. C. socket. This should be a tube that is otherwise normal in all respects, but having one heater prong removed. Insert this tube in the A. V. C. socket.
(d) First check the chassis and carefully ascertain that the dial pointer reads exactly at the first line on the scale when the tuning capacitor rotor plates are fully meshed with the stator plates.
(e) Place the oscillator in operation at exactly 1400 K. C. and couple its output to the antenna. Set the Range Switch counter-clockwise and the dial scale at exactly 1400. Connect the output meter to the set and place the volume control and suppressor control, if noise level will permit, at its maximum position. Adjust the oscillator input so that only a slight reduction in current is obtained in the output meter.
(f) With a suitable socket wrench—the nuts are at ground potential—adjust the oscillator, first detector and R. F. line-up capacitors, until a minimum deflection is obtained in the output meter.
(g) The high frequency band is adjusted at 2440 K. C. This is done in a similar manner to the R. F. adjustments except that the oscillator is set at 2440 K. C., the dial at 1250 and the Range Switch in the clockwise position. The line-up capacitors on the Range Switch are adjusted for minimum output at this frequency.
(h) Set the oscillator at 600 K. C. Tune in the signal with the receiver until a slight deflection is obtained in the output meter. Now adjust the 600 K. C. series capacitor, Figure D, until a minimum deflection is obtained in the output meter. Rock the tuning capacitor back and forth while making this adjustment, as the tuning capacitor and oscillator series capacitor adjustments interlock.
(i) Change the frequency of the oscillator to 1400 K. C. and set the dial at 1400. Again make the adjustments given under (f), (g), and then (h).

So adjusted, the R. F. circuits are properly aligned and the oscillator will maintain a constant frequency difference from the incoming R. F. signal.

I. F. Tuning Capacitor Adjustments

Although this receiver has two I. F. stages, one for the second detector and one for the A. V. C., only two of the three I. F. transformers are tuned by adjustable capacitors and require adjustment. The stage used for the A. V. C. is broadly tuned and does not require any adjustment.

The transformers are all tuned to 175 K. C. and the circuits broadly peaked.

A detailed procedure for making this adjustment follows:

(a) Procure a modulated R. F. Oscillator, such as Stock No. 9050, that gives a modulated 175 K. C. signal. Also procure a non-metallic screw driver such as Stock No. 7065.
(b) An output meter is necessary. This should be a 0-10 milliammeter connected in series with the plate supply to the second detector.
(c) A dummy Radiotron RCA-56 is necessary to substitute for the one normally used in the A. V. C. socket.
(d) Remove the oscillator tube and make a good ground connection to the chassis. Place the oscillator in operation and couple its output from the control grid of the first detector to ground. Adjust the oscillator output, with the receiver volume control at maximum, until a slightly reduced deflection is obtained in the output meter.
(e) Refer to Figure D. Adjust the secondary and primary of the second and then the first I. F. transformer until a minimum deflection is obtained in the output meter. Go through these adjustments a second time, as a slight readjustment may be necessary.

When these adjustments are made, the set should perform at its maximum efficiency. However, due to the interlocking of adjustments, it is good practice to repeat the R. F. and oscillator line-up capacitor adjustments after completing alignment of the I. F. system. The correct method of doing this is given in the preceding section.

Antenna Connections—It will be noted that three antenna terminals are provided at the rear of the receiver chassis. Two of these are used for the normal antenna and ground connections, while the third one is for use in connection with a shielded antenna system. The tap eliminates the need for the transformer usually used for coupling the shielded line to the radio receiver.

Stock No. 7717 shield kit, which comprises a lightning arrester, transformer assembly, a 200 mmfd. capacitor, and 100 feet of shielded wire, is recommended. When such an antenna system is used, it is necessary to connect the 200 mmfd. capacitor between terminals 1 and 2. This prevents the first R. F. circuit from being detuned and results in maximum gain from the antenna. This capacitor is included with the Stock No. 7717 Kit.

Automatic Record Changer—The automatic record changer used in this instrument is of simple design and excellent construction. The various adjustments that may be required are shown in Figure G. A point to remember with this instrument is that it must always be level, otherwise proper operation will not be obtained.

RADIOTRON SOCKET VOLTAGES (RADIO OPERATION)

120 Volt A. C. Line—Volume Control and Sensitivity Control at Maximum—No signal being received

Radiotron No.	Cathode to Control Grid, Volts	Cathode to Screen Grid, Volts	Cathode to Plate, Volts	Plate Current, M. A.	Heater Volts
RCA-58 R. F.	3.1	97	212	7.5	2.5
RCA-56 Osc.	—	—	100	6.0	2.5
RCA-58 1st Det.	9.5	91	206	2.8	2.5
RCA-58 I. F.	7.5	93	208	4.0	2.5
RCA-58 A. V. C.–I. F.	8.5	92	207	3.0	2.5
RCA-56 A. V. C.	12.0	—	—	0	2.5
RCA-55 2nd Det.	0	—	74	8.0	2.5
RCA-56 A. F. Driver	11.0	—	205	5.0	2.5
RCA-56 A. F. Driver	11.0	—	205	5.0	2.5
RCA-59 Power	0	—	394	13.0	2.5
RCA-59 Power	0	—	394	13.0	2.5
RCA-5Z3 Rect.	990–495 R. M. S.			92 Total	5.0

Testing Neon Level Indicating Lamps

Two Neon Level Indicating Lamps are provided so that a visual indication of the recording level may be obtained at all times. These lamps normally give long service without attention. However, if failure occurs, and all circuits have been checked and eliminated as possible source of failure, the lamps may be easily checked as indicated in the circuit shown in Figure E. The method for checking involves testing for lighting between certain voltages. The lamps must not light before 52 volts have been applied and must not require a voltage greater than 64 volts to cause them to light. Lamps requiring different voltages from these are defective and must not be used.

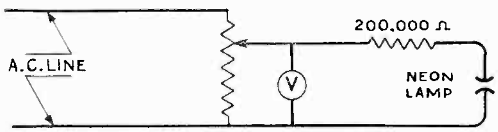


Figure E—Testing Circuit

Transfer Switch Mechanism

The transfer switch used in this model is a special four-position rotory switch located on the front panel and operated in conjunction with a two-position switch located in the chassis. The switches are coupled mechanically by means of a flexible shaft and operate as a single unit.

In event that any part of the switching system is removed, in order to replace or reconnect the assembly, the following procedure should be observed. Refer to Figure F.

(a) Set the two-position switch located in the chassis to its extreme clockwise position, and attach the transfer switch to front panel of the cabinet in proper position as shown. Set the transfer switch at position 1.

(b) Assemble the transfer switch end of the flexible shaft into the switch bracket. Place the "V" link loosely on end of shaft and tighten the pilot screw into its groove.

(c) Assemble the other end of the flexible shaft to the two-position switch (on chassis) so that one set screw points directly back, when facing the chassis from the rear, and the other to the left. Then tighten one set screw.

(d) Set the "V" link, at rear of large switch, so that the lower corner is approximately flush with the lower side of the switch. Tighten one set screw.

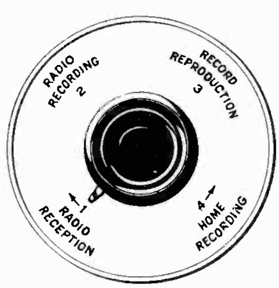
(e) Note the position of the pin as it approaches the "V" link when turning transfer switch clockwise toward position 2 and also when the pin approaches the "V" link when turning the transfer switch counter clockwise toward position 3 from position 4. In these positions the pin must contact the "V" at approximately the same points.

(f) Tighten all remaining set screws at each end of the shaft.

It will now be found that the transfer switch turns with maximum smoothness and the two-position chassis switch operates midway between positions 2 and 3 in either direction.

Audio Circuits

Figure G shows the schematic diagrams of the audio circuits that occur at each position of the transfer switch. A reference to these diagrams will enable the serviceman to quickly diagnose trouble in these circuits.



TRANSFER SWITCH
(FRONT VIEW)

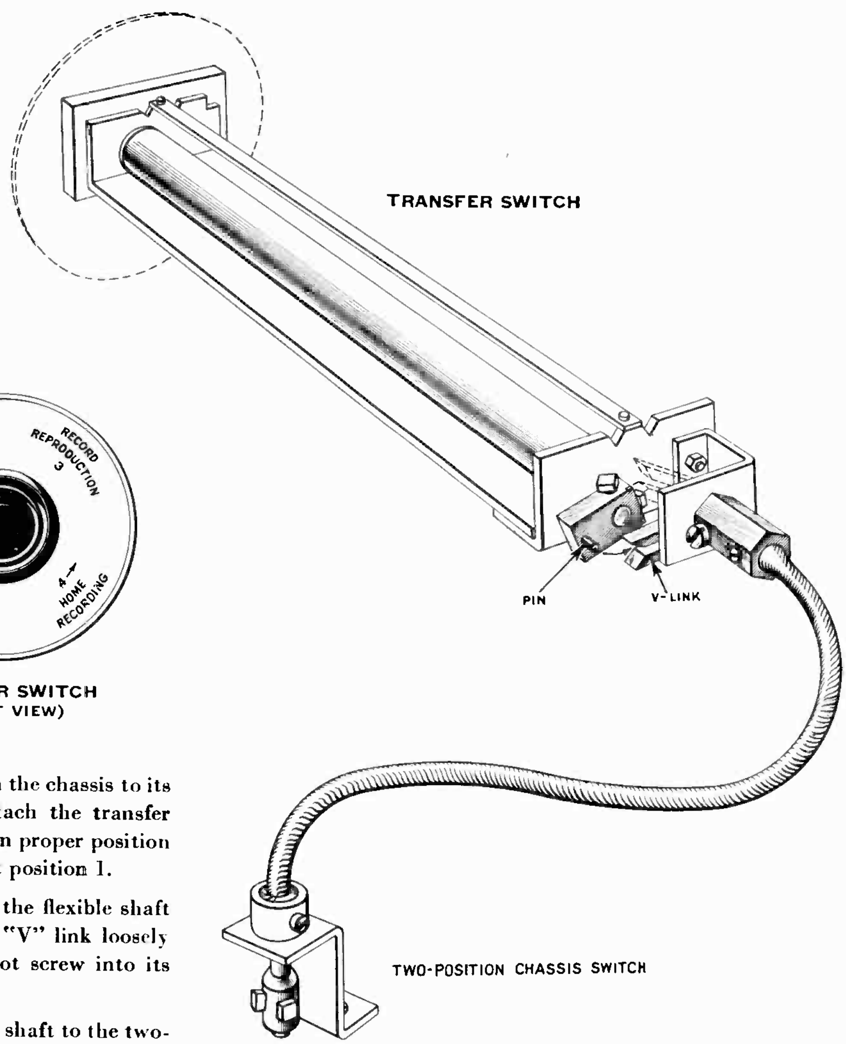
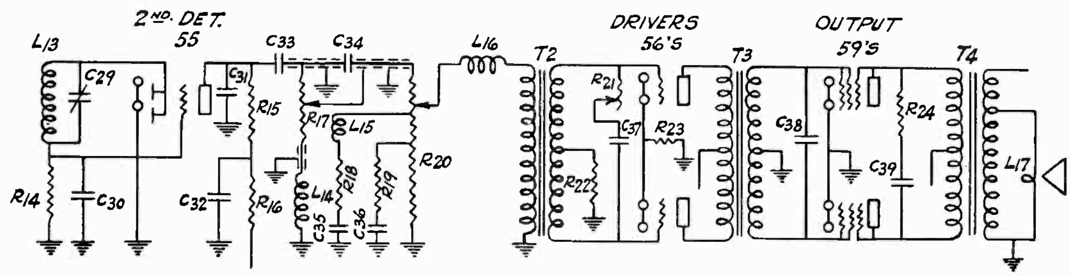
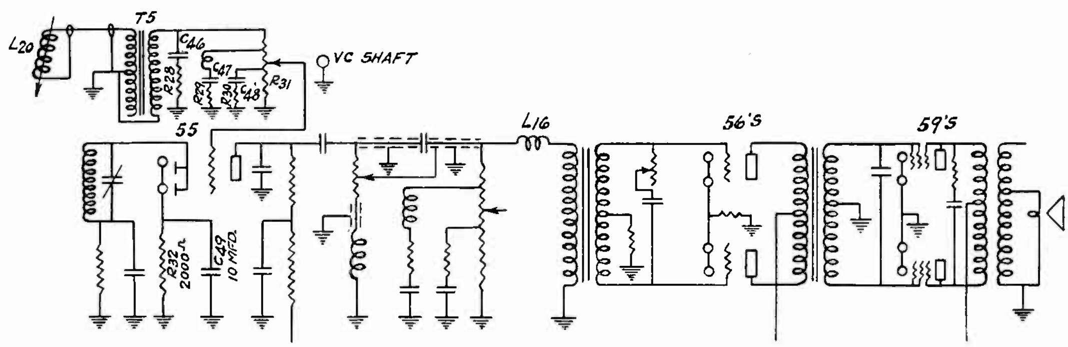


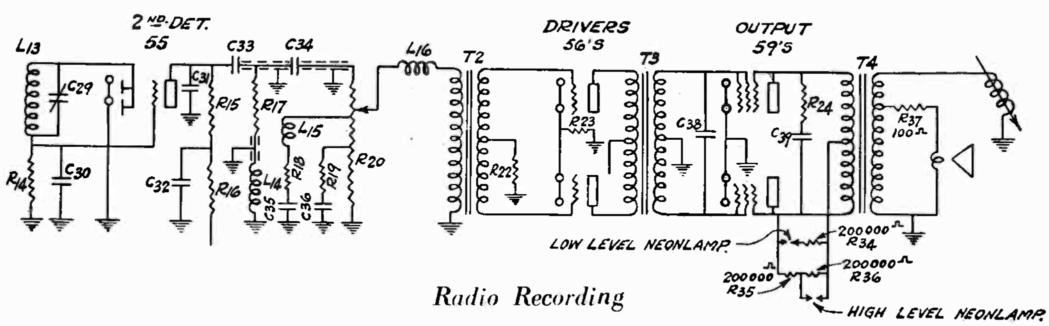
Figure F—Transfer Switch Mechanism



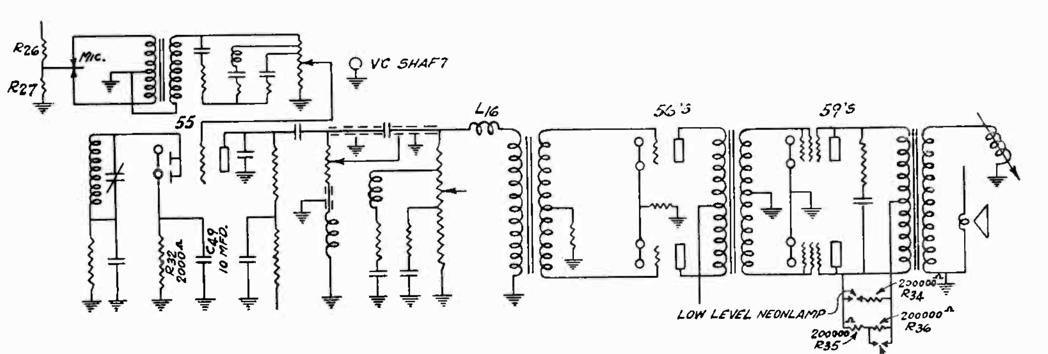
Radio Reproduction



Record Reproduction



Radio Recording



Home Recording

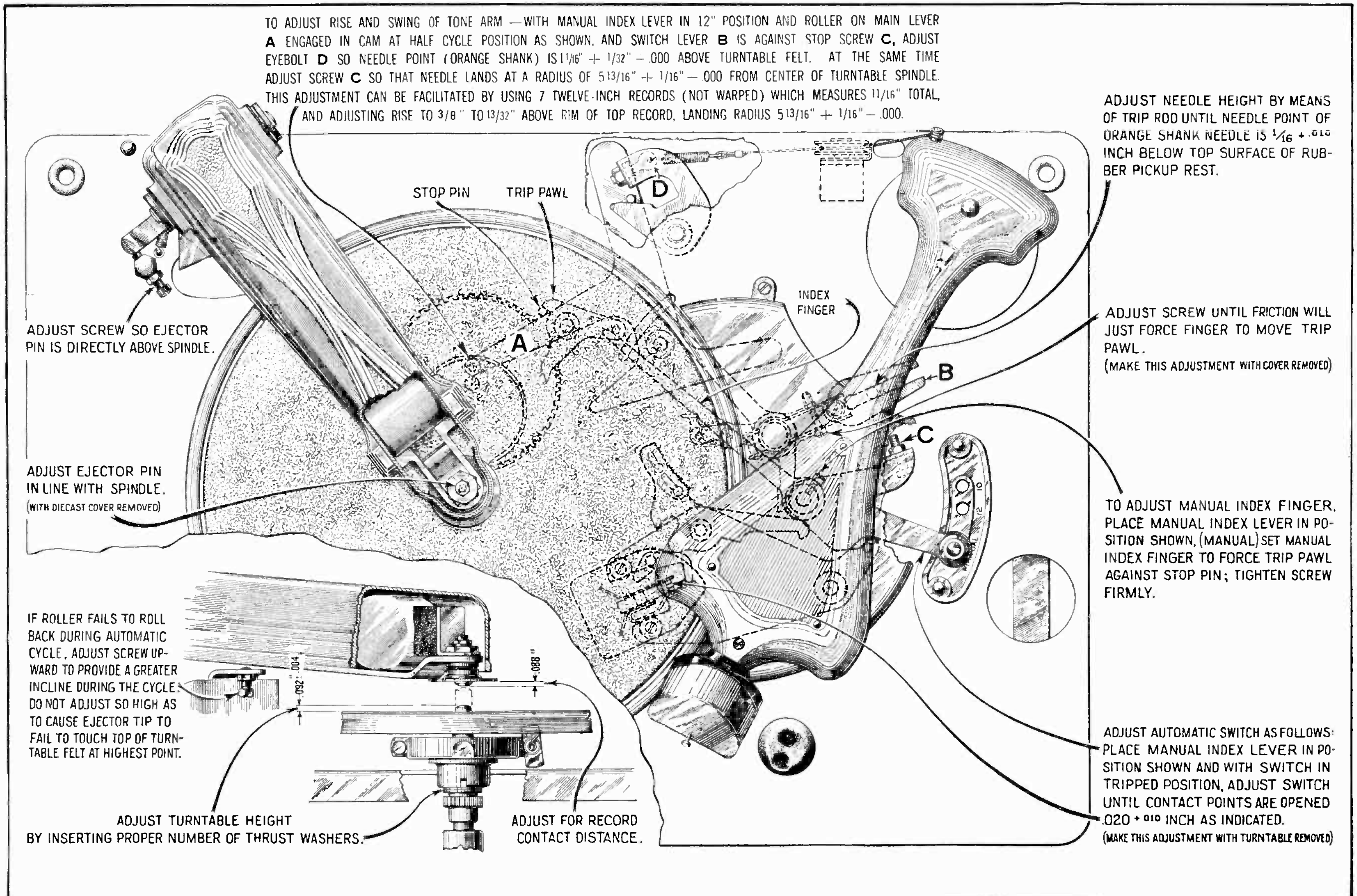


Figure H—Automatic Record Changer Adjustments

SERVICE DATA ON MAGNETIC PICKUP

The Magnetic Pickup used in this combination instrument is of a new design with an improved frequency range. While in physical appearance it is similar to that of the older type, details of construction are considerably different. It consists essentially of a chromium steel magnet, two thin pole pieces, a mechanism support and bracket, a coil, and an armature that is damped by means of an anchored damping block.

The use of the anchored damping block eliminates any bad peaks in the frequency range. The frequency-response characteristic is substantially flat from 50 to 5,000 cycles.

Replacing Magnet Coil, Pivot Rubbers, Armature or Damping Block

In order to replace a defective coil or the hardened pivot rubbers (see Figure *J*), it is necessary to proceed as follows:

(a) Remove the pickup cover by removing the center holding screw and needle screw.

(b) Remove the pickup magnet and the magnet clamp by pulling them forward.

(c) Unsolder the coil leads and remove the mechanism assembly from the back plate by releasing the two mounting screws and the damping block clamping screw.

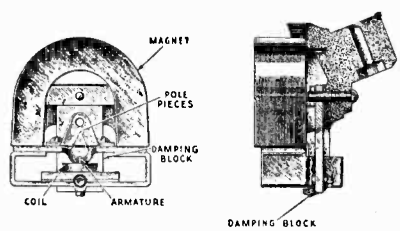


Figure I

(d) Remove screws A and B, Figure *J*, and then remove the mechanism assembly from the pole pieces.

(e) The coil or the front pivot rubber may now be removed and replaced. If it is desired to replace the rear pivot rubber, then the end of the armature soldered to the mechanism support must be unsoldered and the damping block removed. The rear pivot rubber now may be replaced. After putting the pivot rubbers in place a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block.

(f) The mechanism should now be reassembled, except for the magnet, which must be magnetized. After being magnetized, the mechanism—with the pole pieces upward—should be placed so that the magnet may be slid from the magnetizer onto the pole pieces without breaking physical contact. After placing the pole pieces on the magnet, the entire assembly should be remagnetized thoroughly, being careful not to change the polarity obtained by the initial magnetization.

(g) After assembling to the mechanism, the entire assembly should be fastened to the back plate by means of the screws provided, making sure the damping block is securely clamped. At the same time, the metal dust cover must be placed in position.

(h) After remagnetizing, it is necessary to correctly center the armature. This may be done quite accurately by feeling its play after the needle is inserted. A little practice will quickly show which way an adjustment is necessary to have the armature centered properly. The adjustment is made by loosening screws A and B (Figure *J*), and sliding the mechanism slightly in relation to the pole pieces.

(i) The cover may be now replaced over the entire assembly, and the pickup returned to the tone arm.

In assembling, it may be desirable to check the armature air gap by means of a small Feeler Gauge. This air gap should be nine mils on each side of the armature. However, a little practice with the needle in place will quickly disclose whether or not the armature is centered.

Replacing the Damping Block

If it is desired to replace the damping block, it may be done in the following manner:

(a) Disassemble the pickup as described under the preceding section.

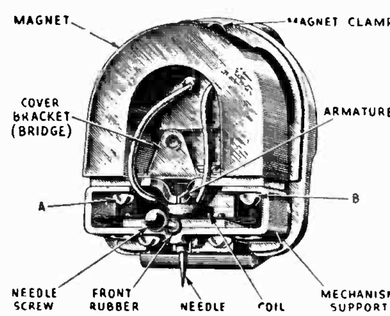


Figure J

(b) Remove the armature entirely by unsoldering it at its joint with the mechanism support.

(c) Remove the damping block from the armature and clean the bushing for holding the damping block with emery paper.

(d) Insert the armature through the new block so that it occupies the same position as that of the old. Also ascertain that the block is in correct vertical alignment with the armature. It will be noted that the hole in the damping block is somewhat smaller than the diameter of the armature. This is done so that a snug fit will be obtained.

(e) After properly locating the damping block, a soldering iron should be applied to the armature so that the block will melt slightly at its point of contact with the armature. A special tip, constructed as shown in Figure *K*, will prove desirable for fusing the block in place. The iron should be applied long enough to slightly melt the block and cause a small bulge on both sides, but should not be applied long enough to cause any bubbling. The pickup should then be reassembled as described in the preceding section.

Only rosin core solder should be used for soldering the coil leads in the pickup. Also rosin core solder should be satisfactory for resoldering the end of the spring in the hole in the mechanism, since both these parts have been previously tinned. In case the parts are not well tinned, it will be necessary to scrape the end of the spring and the hole in the mechanism until bright. These parts may now be tinned by using as a flux a water solution of zinc chloride (commonly called

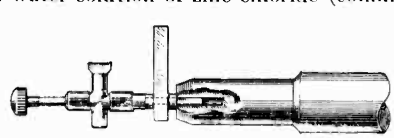


Figure K

acid flux). After tinning, dip the parts in water to wash off the acid flux and thereby prevent serious subsequent corrosion. After making sure that the pivot rubbers and damping block are properly in place, as described under (e) above, the armature may now be soldered in place in the mechanism by using rosin core solder, since the parts are now tinned. Care must be exercised to get the needle hole perfectly square with respect to the mechanism, or otherwise it will be difficult if not impossible to center the armature in the air gap as explained under (h).

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
	RECEIVER ASSEMBLIES	
2730	Resistor—18,000 ohms—Carbon type—1 watt (R24)—Package of 5	$1.10
2747	Cap—Contact cap—Package of 5	.50
3024	Capacitor—9 mmfd. (C2)—Package of 2	.50
3047	Resistor—1,500 ohms—Carbon type—½ watt (R8)—Package of 5	1.00
3085	Capacitor—400 mmfd. (C38)	.30
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R5)—Package of 5	1.00
3252	Resistor—100,000 ohms—Carbon type—½ watt (R6, R7)—Package of 5	1.00
3376	Mount—Fuse mount	.40
3435	Resistor—250 ohms—Carbon type—½ watt (R2)—Package of 5	1.00
3460	Capacitor—1,200 mmfd. (C31)	.30
3526	Resistor—2,000 ohms—Carbon type—½ watt (R4, R32)—Package of 5	1.00
3527	Resistor—800 ohms—Carbon type—½ watt (R19)—Package of 5	1.00
3528	Bracket—Noise suppressor or volume control lamp bracket	.18
3529	Socket—Noise suppressor, volume control lamp socket or tuning meter	.32
3533	Shutter—High frequency tone control shutter	.50
3534	Shutter—Low frequency tone control shutter	.50
3535	Socket—High or low frequency tone control lamp socket	.32
3556	Capacitor—0.05 mfd.—Located on antenna coil (C3)	.34
3558	Capacitor—50 mmfd. (C19)	.36
3564	Bracket—Station selector dial lamp—Mounting bracket	.25
3565	Socket—Station selector dial lamp socket	.50
3597	Capacitor—0.25 mfd. (C33, C45)	.40
3640	Capacitor—0.05 mfd. (C9, C22, C26)	.25
3641	Capacitor—0.1 mfd. (C7, C13, C23, C25, C27)	.35
3643	Capacitor—0.005 mfd. (C39)	.25
3652	Screw—No. 10-32-¼ set screw for bracket and bushing assembly—Package of 10	.32
3719	Socket—7-contact Radiotron socket	.30
3726	Arm—Range switch operating arm assembly—Comprising arm, link, studs and set screws	.45
3727	Shaft—Shaft and bushing assembly for range switch operating arm—Comprising two washers, shaft, bushing and nut	.30
3747	Capacitor—15 mmfd. (C8)	.36
3749	Capacitor—0.1 mfd. (C40)	.30
3765	Capacitor—0.025 mfd. (C34)	.34
3774	Resistor—7,400 ohms—Tapped at 3,800 and 500 ohms (R25, R26, R27)	.80
3797	Reactor—Volume control compensating reactor (L15)	.64
3798	Resistor—700 ohms—Carbon type—½ watt (R18)—Package of 5	1.00
3799	Capacitor—80 mmfd. (C30)	.70
3883	Fuse—2-ampere (F1)—Package of 5	.40
4013	Capacitor—200 mmfd (C1)	.30
4035	Switch—Radio-Phonograph switch (S9)	2.10
4036	Shield—Low or high frequency tone control light shield	.30
4037	Shield—Antenna, detector or oscillator shield	.55
4038	Shield—Radiotron shield	.30
4039	Shield—Radiotron shield—Second detector shield	.30
4040	Shield—Radiotron tube shield top	.25
4041	Cover—Fuse cover	.25
4042	Reactor—Volume control series reactor (L16)	1.20
4129	Bracket—Bracket and bushing assembly for radio-phonograph switch shaft—Located on receiver chassis	.28
4130	Shield—R. F. Radiotron shield	.30
5817	Resistor—20,000 ohms—Carbon type—3 watt (R15, R16)	.25
6186	Resistor—500,000 ohms—Carbon type—¼ watt—Located on antenna coil (R1)—Package of 5	1.00
6192	Spring—3-gang tuning condenser drive cord tension spring—Package of 10	.30
6228	Resistor—200,000 ohms—Carbon type—½ watt (R14, R34, R35, R36)—Package of 5	1.00
6277	Capacitor—0.1 mfd.—Located on rectifier socket shield (C50)	.35
6280	Resistor—400,000 ohms—Carbon type—½ watt (R11, R12, R13)—Package of 5	1.00
6281	Resistor—1,100 ohms—Carbon type—½ watt (R23)—Package of 5	1.00
6282	Resistor—60,000 ohms—Carbon type—½ watt (R22)—Package of 5	1.00
6298	Cord—3-gang tuning condenser drive cord—Package of 5	.60
6300	Socket—4-contact Radiotron socket	.35
6312	Capacitor—650 mmfd. (C15)—Package of 5	1.50
6316	Resistor—2,500 ohms—Carbon type—½ watt (R10)—Package of 5	1.00
6437	Coil—Oscillator coil (L5, L6, L7)	1.24

Stock No.	DESCRIPTION	List Price
6447	Volume control (R20, S1)	$1.92
6448	Tone control—Low frequency (R17)	1.04
6449	Tone control—High frequency (R21)	1.06
6450	Rheostat—Noise suppressor rheostat (R3)	1.24
6512	Capacitor—0.005 mfd. (C37)	.28
6537	Switch—Range switch	1.30
6539	Coil—Detector coil (L3, L4)	1.44
6541	Dial—Tuning condenser dial and scale	.75
6561	Coil—Antenna coil (L1, L2, R1, C3)	1.65
6562	Transformer—Audio driver transformer (T3)	3.04
6564	Transformer—First intermediate frequency transformer (L8, L9, R9, C20, C21, C24)	2.30
6565	Transformer—A. V. C. intermediate frequency transformer (L12, L13, C28, C29)	2.10
6566	Transformer—Second intermediate frequency transformer (L10, L11)	1.72
6567	Capacitor pack—Comprising one 0.17 mfd., and one 0.7 mfd. capacitors (C35, C36)	.95
6568	Transformer—Interstage audio transformer (T2)	3.10
6571	Capacitor—10 mfd. (C43, C44)	1.20
6572	Reactor—Tone control reactor (L14)	.90
6574	Capacitor pack—Comprising two 10.0 mfd. capacitors (C32, C41)	1.80
6578	Reactor—Filter reactor (L18)	3.22
6797	Capacitor—10.0 mfd. (C49)	1.04
6847	Shield—Rectifier socket shield and capacitor	.65
7062	Capacitor—Adjustable capacitor (C14)	.50
7439	Drum—Dial drum with set screw and three dial mounting nuts	.35
7484	Socket—5-contact Radiotron socket	.35
7485	Socket—6-contact Radiotron socket	.40
7700	Condenser—3-gang variable tuning condenser (C4, C5, C6, C10, C11, C12, C16, C17, C18, S2, S3, S4, S5, S6)	7.44
9468	Transformer—Power transformer—105-125 volts—50-60 cycles (T1)	7.75
9469	Transformer—Power transformer—105-125 volts—25-40 cycles	11.75
	MOTOR BOARD ASSEMBLIES	
2893	Spring—Trip lever latch tension spring—Package of 10	.30
2917	Washer—Spring washer, "U" type—Package of 10	.25
3654	Roller—Guide roller assembly—Comprising bracket roller and guide pin	.34
3666	Spring—Cable lever tension spring—Package of 10	.44
3670	Finger—Friction finger	.32
3672	Pin—Manual index lever pin	.42
3673	Screw—Manual index lever adjustment screw and nut—Package of 5	.20
3676	Spring—Cam and gear pawl carrier tension spring—Package of 10	.52
3677	Lever—Cable lever assembly	.40
4059	Screw—Trip lever clutch tension adjustment screw—Package of 10	.22
4060	Escutcheon—Manual—12-10	.28
4061	Spring—Main spring—Package of 10	.38
4124	Plate—Actuating plate assembly	.50
4127	Spring—Actuating plate spring—Package of 10	.24
6502	Cam—Cam and gear assembly	1.18
6503	Pawl—Trip pawl assembly	.40
6806	Lever—Manual index lever—Less pin	.55
6807	Lever—Trip lever assembly	1.16
6808	Clutch—Trip lever friction clutch	.30
6809	Finger—Manual index finger assembly	.25
6810	Lever—Main spring lever	.44
6846	Lever—Main lever and link assembly	1.45
7710	Cover—Metal cover for trip lever and friction finger assemblies	.28
	MOTOR ASSEMBLIES	
3777	Motor mounting spring washers and stud assembly—Comprising three upper and three lower springs, six cup washers, three spring washers, and three studs	.62
9477	Motor—Motor complete—105-125 volts—60 cycles	25.88
9479	Motor—Motor complete—105-125 volts—25 cycles	36.48
9478	Motor—Motor complete—105-125 volts—50 cycles	25.88
	EJECT ARM ASSEMBLIES	
3655	Retainer—Ball retainer with three ball bearings	.45
3656	Bearing—Ejector tip bearing	.48
3657	Tip—Ejector tip	.30
3658	Ball—Ball bearing—Package of 20	.30
3662	Plate—Ejector plate—Package of 5	.95
3665	Screw—Eject arm horizontal adjustment screw and nut—Package of 5	.25
3729	Roller—Counter balance roller—Located inside of eject arm	.45

REPLACEMENT PARTS—Continued

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price
3930	Cushion—Counter balance cushion and bracket—Located inside of eject arm	$0.18
4054	Bracket—Eject arm bracket assembly	1.35
4055	Post—Vertical adjustment post—Located on eject arm	.30
4056	Yoke—Eject arm yoke assembly	1.04
4057	Shaft and collar—For eject arm	.24
4058	Collar—Eject arm shaft collar	.18
4067	Spring—Eject arm bracket spring—Package of 10	.30
4125	Spring—Eject arm horizontal action tension spring—60 cycle operation—Package of 10	.42
4126	Spring—Eject arm horizontal action tension spring—For 25 cycle operation—Package of 10	.60
7708	Arm—Eject arm complete	7.74
7709	Cover—Eject arm cover	1.38
	SWITCH ASSEMBLIES	
3322	Switch—Motor switch (S8)	.75
3994	Cover—Motor switch cover	.26
6805	Switch assembly—Automatic switch complete	1.90
10174	Springs—Automatic brake springs—Package of 4	.50
10184	Plate—Automatic brake latch plate—Package of 5	.40
	PICKUP AND ARM ASSEMBLIES	
3388	Screw—Pickup needle holding screw—Package of 10	.60
3728	Coil—Pickup coil (L20)	.50
3737	Damper—Package of 5	.65
4062	Rod—Automatic brake trip rod	.20
4063	Screw—Pickup mounting screw assembly—Comprising one screw, one nut, and one washer—Package of 10	.54
4064	Cable—Pickup arm cable—Package of 5	1.00
4128	Armature—Pickup armature	.96
6811	Pickup—Pickup unit complete	4.30
6812	Cover—Pickup cover	.34
6813	Back—Pickup housing back	.68
6814	Cover—Pickup back cover	.34
6815	Escutcheon—Pickup arm escutcheon with mounting rivets	.64
7707	Arm—Pickup arm complete, less escutcheon, pickup, pickup mounting screw, nut and washer	4.12
	TURNTABLE ASSEMBLIES	
3340	Washer—Thrust washer—Package of 2	.56
3341	Pin—Groov-pin—Package of 2	.56
3342	Spring—Latch spring—Located on clamping ring—Package of 2	.56
3344	Cover—Grease retainer cover—Package of 2	.70
3347	Spring—Speed shifter lever spring—Package of 2	.30
4065	Bushing—Speed shifter lever bushing—Package of 4	.82
6816	Ring—Clamp ring assembly—Comprising spring, latch lever, and stud	.42
6817	Sleeve—Sleeve complete with ball race	2.25
6818	Lever—Speed shifter lever	.38
7711	Turntable—Complete	5.10
	REPRODUCER ASSEMBLIES	
4131	Mounting assembly for reproducer—Comprising two plate, two bolts, two nuts, and two lockwashers	.44
4193	Board—Terminal Board	.32
6887	Transformer—Output transformer (T4)	2.35
9480	Reproducer complete	15.44
9481	Cone—Reproducer cone (L17)—Package of 5	8.80
9490	Coil—Field coil magnet and cone support (L19)	11.70
	RECORDING INDICATOR ASSEMBLY	
4161	Lamp—Neon lamp	.56
4162	Escutcheon—Recording indicator escutcheon	.34
4163	Screw—Screen, escutcheon, and terminal board mounting screw assembly—Comprising two screws, two spacers, two nuts and two lockwashers	.20
4164	Screen—Recording indicator lamp screen	.18
	MICROPHONE ASSEMBLIES	
3216	Cushion—Microphone rubber cushions—Package of 6	.24
4158	Socket—Microphone socket	.40
4171	Plug—3-contact microphone plug	.30
6882	Microphone complete	7.50
6883	Cover—Microphone cover	1.96
6884	Frame—Microphone frame	1.19
7533	Mechanism—Microphone mechanism	6.80
7534	Cord—Microphone cord	.70
	CABLE ASSEMBLIES	
4151	Plug—Tone control or reproducer cable connector	.60
4152	Cable—Neon lamp cable—3-conductor with female section of connector	.65
4153	Plug—Neon lamp connector plug	.48
4154	Cord—Single conductor shielded—From volume control (R20) to terminal board	.25
4155	Cord—Single conductor shielded—From low frequency tone control (R17) to tone control reactor (L14)	.25
4156	Cable—2-conductor shielded—From radio-phonograph switch (S9) to volume control (R20)	.25

Stock No.	DESCRIPTION	List Price
4159	Cable—Microphone cable—3-conductor from selector switch to microphone socket	$0.34
6794	Cable—Single conductor shielded cable—From radio-phonograph switch (S9) to phonograph volume control (R31)	.38
6795	Cable—Power cable—Phonograph motor cable—3-conductor with female section of connector plug	1.10
6796	Cable—2-conductor—Compartment lamp and operating switch cable	.80
6849	Cable—Single conductor shielded cable with female section of connector—From phonograph volume control to receiver cable	.38
6872	Cable—Reproducer cable—8-conductor—Tapped and shielded with female section of connector	2.16
6873	Cable—Tone control cable—Two sections with female section of connector	1.14
6878	Cable—Main cable—From selector switch to receiver chassis cable, to speaker cable, and input transformer	2.30
6879	Cable—Neon lamp cable—3-conductor with male section of connector—From chassis cable to neon indicator	.72
6880	Cable—2-conductor—Motor cable from receiver cable to motor connector	.75
6881	Cable—Tone control cable—2 sections with male section of connector—From receiver cable to selector switch	1.20
	MISCELLANEOUS ASSEMBLIES	
3638	Scale—Tuning meter scale—Package of 5	.60
3651	Screw—No. 10-32-3/16"—Self locking set screw for flexible shaft—Package of 10	.32
3763	Motor mounting board spring, washer and stud assembly—Comprising one bolt, two "C" washers, one bottom spring, one top spring, two cup washers, one shakeproof washer, and one nut—Package of 1 set	.42
3780	Shutter—Noise suppressor shutter	.30
3781	Shutter—Volume control shutter	.30
4043	Switch—Compartment lamp switch (S7)	.80
4044	Socket—Compartment lamp socket	1.28
4045	Shade—Compartment lamp shade	.50
4047	Receptable—Needle receptacle	.55
4066	Rest—Pickup rest	.14
4157	Weight—Recording weight	1.72
4160	Wrench—Trimmer adjustment wrench and screwdriver	1.00
4165	Radio-phonograph operating arm and pin—Fastened to switch arm	.58
4166	Arm—Slotted arm for radio-phonograph switch—Fastened to end of flexible shaft	.58
4167	Bracket—Bracket and bearing assembly for radio-phonograph flexible shaft—Located on selector switch	.54
4168	Escutcheon—Selector switch escutcheon—Package of 5	3.46
4169	Escutcheon—Phonograph volume control escutcheon—Package of 5	3.46
4170	Resistor—100 ohms—Carbon type—½ watt (R37)—Package of 5	1.00
4190	Pointer—Selector switch pointer—Package of 5	.72
4191	Screw—No. 10-32 dog point fillister head set screw for flexible shaft—Package of 5	.50
4192	Hook—Microphone hook	.28
6456	Escutcheon—Volume control escutcheon and color screen	.50
6457	Escutcheon—Noise suppressor escutcheon and color screen	.50
6458	Escutcheon—High and low frequency escutcheon and color screen	.92
6547	Bezel—Tuning meter bezel	.45
6799	Volume control—Phonograph volume control (R31, S10)	3.00
6802	Bearing and plate assembly—For radio-phonograph switch shaft—Located on cabinet	.34
6874	Transformer pack—Phonograph input transformer pack—Comprising one transformer, one reactor, one 0.008 mfd., one 0.06 mfd., one 0.18 mfd. capacitors, one 5,000 ohm, one 4,000 ohm and one 50,000 ohm resistors (T5, L21, C46, C47, C48, R28, R29, R30)	5.66
6875	Switch—Radio-phonograph or recording selector switch (S11)	6.34
6876	Cover—Radio-phonograph or recording selector switch cover	.15
6877	Shaft—Flexible drive shaft for radio-phonograph switch	1.20
6886	Meter—Tuning meter	2.14
9050	Oscillator—Test oscillator—90 to 25000 K. C.	29.50†

SPECIAL PARTS

To be furnished on Special Order only. Delivery six to eight weeks. Prices quoted at time order is placed.

Stock No.	DESCRIPTION	List Price
X-226	Lid—Cabinet lid	
X-227	Doors—Cabinet doors—Top—1 pair matched finish	
X-228	Doors—Record pocket doors—1 pair matched finish	
X-231	Cabinet complete	
X-232	Leg—Front leg	
X-233	Grille and grille cloth assembly	
X-234	Leg—Back leg	
X-235	Panel—Control panel	
6294	Hinge—Door hinge—4 complete hinges	
6959	Pull—Door pull—Package of 2	
57523-5	Receiver Chassis complete—105-125 volts—50-60 cycles	
57523-6	Receiver Chassis complete—105-125 volts—25-40 cycles	
65155-12	Record Changer complete—105-125 volts—60 cycles	
65155-13	Record Changer complete—105-125 volts—25 cycles	
65155-14	Record Changer complete—105-125 volts—50 cycles	

.0863 † Full Discount Not Allowed.

PL 139 (2-2)

RCA Victor
Model 381 "DUO"

Twelve-Tube, Five-Band A. C. Automatic Radio-Phonograph

SERVICE NOTES

SERVICE DIVISION

RCA Victor Company, Inc.

Camden, N. J., U. S. A.

A RADIO CORPORATION OF AMERICA SUBSIDIARY

REPRESENTATIVES IN PRINCIPAL CITIES

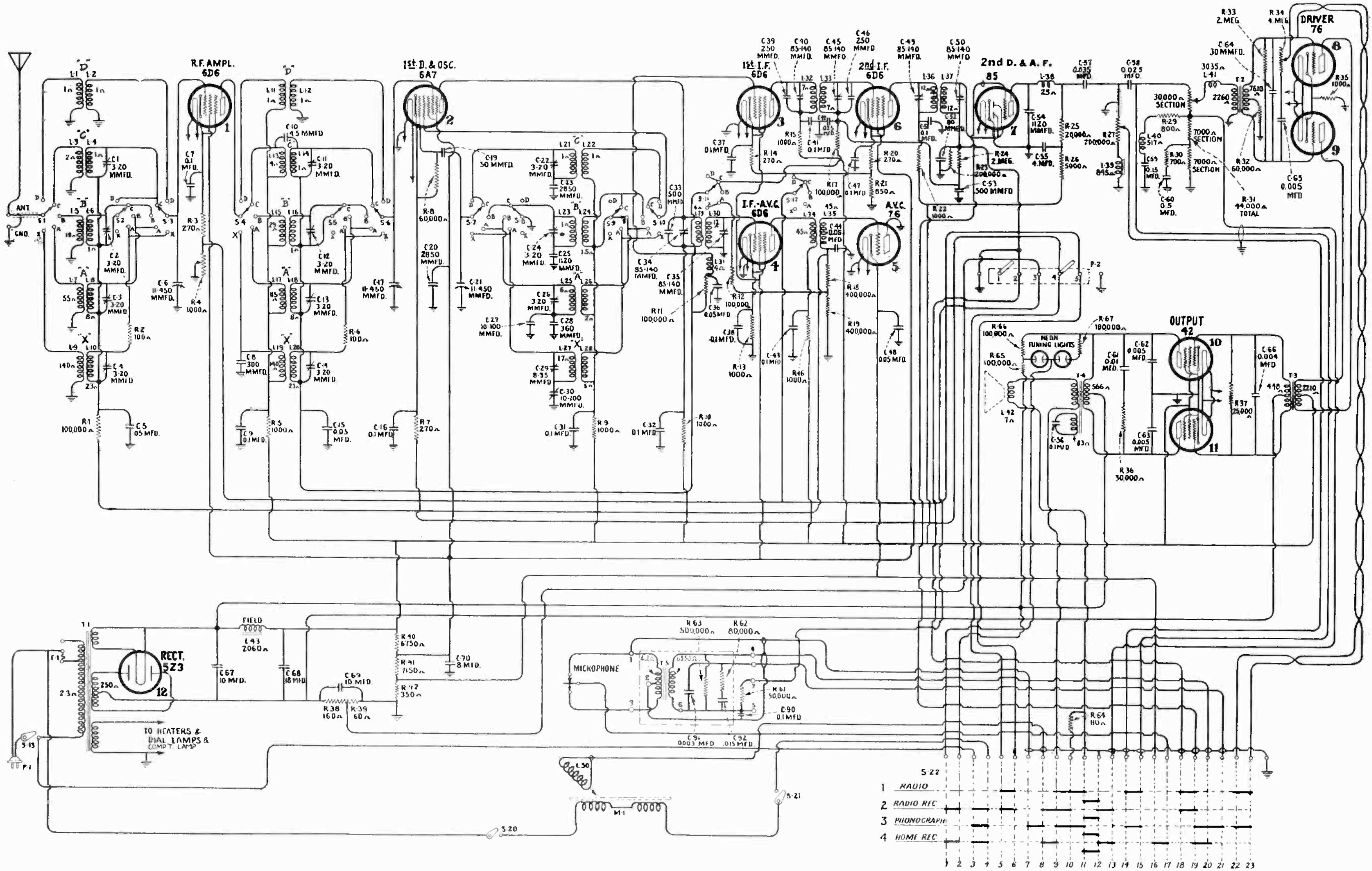


Figure 1—Schematic Circuit Diagram

RCA VICTOR MODEL 381

Twelve-Tube, Five-Band A. C. Automatic Radio-Phonograph

SERVICE NOTES

ELECTRICAL SPECIFICATIONS

Voltage Rating	105–125 Volts
Frequency Rating	25, 30, 40, 50 and 60 Cycles
Power Consumption	170 Watts, 60 Cycles
Type and Number of Radiotrons	4 RCA-6D6, 1 RCA-6A7, 3 RCA-76, 1 RCA-85, 2 RCA-42, 1 RCA-5Z3 —Total 12
Tuning Frequency Range	Band X.......140 K. C.–410 K. C. Band A......540 K. C.–1720 K. C. Band B......1720 K. C.–5400 K. C. Band C....5400 K. C.–18,000 K. C. Band D..18,000 K. C.–36,000 K. C.
Line-up Frequencies	175 K. C., 410 K. C., 600 K. C., 1720 K. C., 5160 K. C., 18,000 K. C.
Maximum Undistorted Output	8 Watts
Maximum Output	16 Watts
Type of Magnetic Pickup	Low Impedance, Viscaloid
Type of Record Changer	Record Ejector Type
Capacity of Record Changer	Eight 10-Inch and Seven 12-Inch Records
Turntable Speed	33⅓ R.P.M. and 78 R.P.M.

PHYSICAL SPECIFICATIONS

Height	43 Inches
Width	34$\frac{9}{16}$ Inches
Depth	19 Inches

This twelve-tube, five-band, all-wave radio-phonograph combination instrument incorporates the latest and most advanced developments known to the radio and phonograph art. Supplementing the radio and record reproducing facilities of the instrument, additional facilities include an arrangement whereby records may be made, either of a favorite radio program or of voice or other sounds originating in the home.

The radio facilities consist of a twelve-tube, five-band, all-wave superheterodyne radio receiver having a tuning range of from 140 K. C. to 36,000 K. C. except for one break between 410 K. C. and 540 K. C. Such an extreme range permits the listener to receive stations from all over the world in a manner not approached by other instruments. The tuning range covers every broadcasting band used throughout the world today.

A high degree of tonal fidelity is obtained through the use of a high-power, high-gain, low-distortion audio amplifier and a large-field, 10-inch electro-dynamic loudspeaker. A diode second detector further improves this characteristic. An aurally compensated volume control ensures to the listener the maintenance of this tone quality at all degrees of volume. High and low frequency tone controls provide a means whereby either the high or low frequency response may be reduced as required by adverse operating conditions (station hum, static, etc.).

Other features include a sensitivity control, two distinct automatic volume control systems, a special R. F. unit of high efficiency which greatly improves the noise to signal ratio for short-wave reception, and an automatic sensitivity change for the short-wave bands. The tuning dial is of the full vision "Airplane" type and is provided with a double-ratio vernier drive. Such a drive permits the user to tune either rapidly or slowly through stations, the slow speed being especially useful when receiving short-wave stations. A "second" or "band spread" indicator enables the operator to successfully log short-wave stations.

The phonograph facilities of this instrument consist of the perfected automatic record changer in conjunction with the new viscoloid magnetic pickup and the amplifying and reproducing facilities of the radio receiver. The instrument will play manually or automatically either 78 R.P.M. or 33⅓ R.P.M. records of ten or twelve inch diameter.

The recording facilities permit the user to make either six-inch or ten-inch home-recording records of either radio programs or of sounds such as voice, music, etc., originating in the home which are picked up by the microphone.

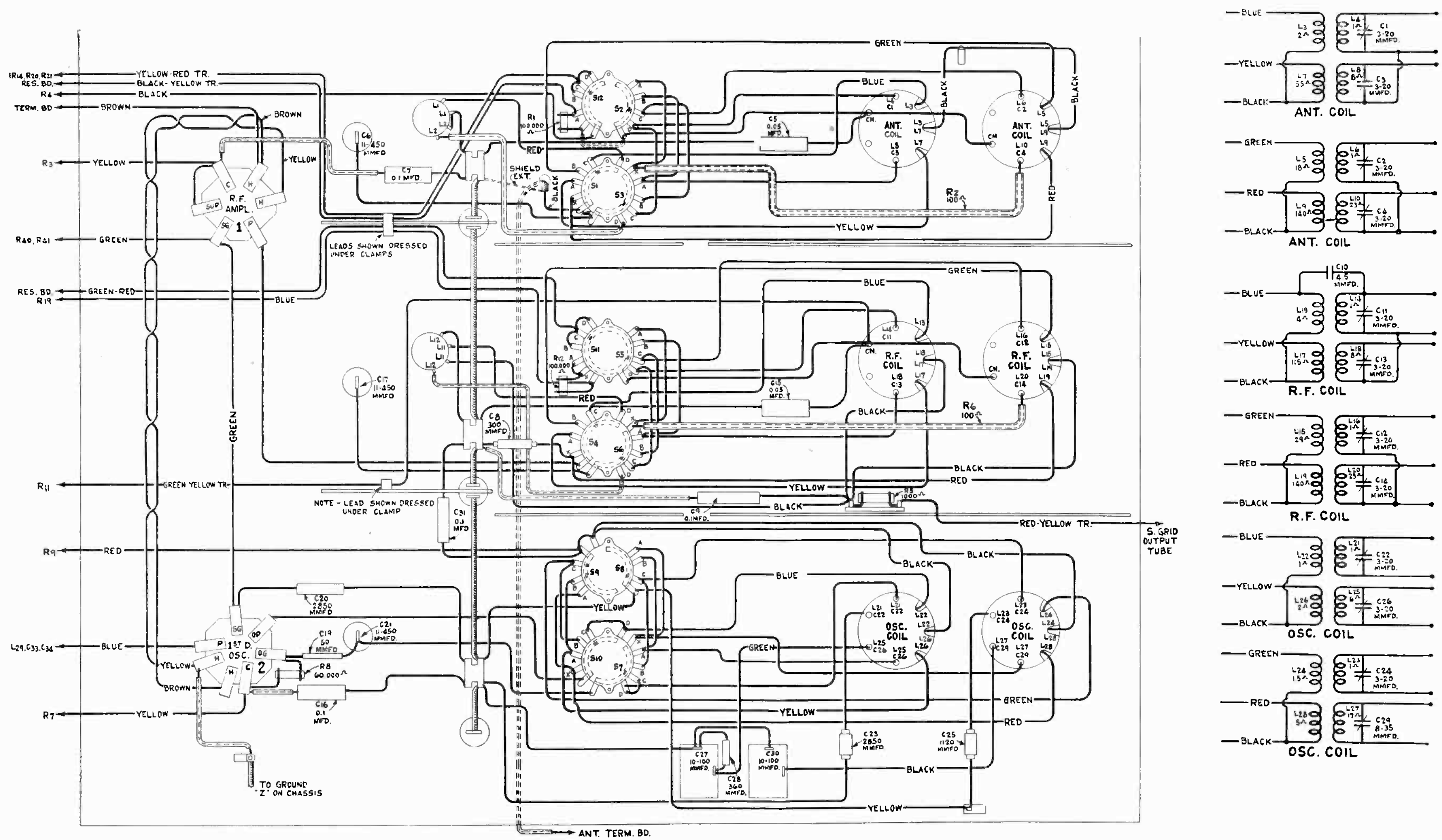


Figure 2—R. F. Assembly Wiring Diagram

DESCRIPTION OF ELECTRICAL CIRCUIT

RADIO

The general circuit arrangement consists of an R. F. stage, a combined oscillator and first detector stage, two I. F. stages, a combined second detector, automatic volume control and 1st A. F. amplifier, a push-pull audio driver stage and a push-pull Class A output stage. Plate and grid voltages are supplied by the RCA-5Z3 heavy duty rectifier combined with a suitable filtering system. In addition, a double channel A.V. C. stage is provided which uses two additional tubes. Figure 1 shows the over-all schematic circuit diagram while Figure 2 shows the R. F. assembly wiring.

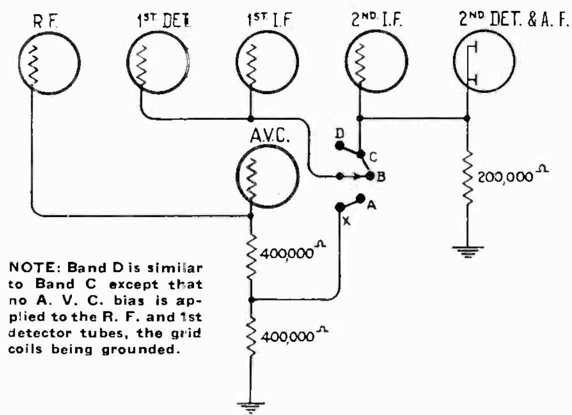


Figure 3—Switching Arrangement of Automatic Volume Control Systems

The signal enters the receiver through a shielded antenna lead and is applied to the grid of the R. F. tube through the antenna coupling transformer. The secondary of this transformer is tuned to the signal frequency by means of one unit of the gang-capacitor. The output of this stage is transformer coupled to the grid circuit of the first detector, which is also tuned to the signal frequency by a unit of the gang-capacitor.

Combined with the signal in the first detector is the local oscillator signal, which is always at a 460 K. C. frequency difference (higher) from the signal frequency. A separate coil system and the third unit of the gang-capacitor are used in the oscillator circuit.

In conjunction with these three tuned circuits it is well to point out that five different groups of tuned circuits are used, one group for each tuning band. A five-position selector switch is provided for selecting the band in which the desired signal is located. In addition to selecting the desired coil system, additional groups of contacts are provided for short-circuiting the preceding lower frequency R. F. and detector coils and the two preceding oscillator coils. This is to prevent "dead" spots due to absorption effects caused by the coils, the natural period of which without the gang-capacitor connected falls in the next higher frequency band. This gang switch also has additional contacts for performing other functions which will be discussed.

The output of the first detector, which is the I. F. signal (460 K. C.), is fed directly through two tuned circuits to the grid of the automatic volume control I. F. amplifier stage. A coupling coil adjacent to the secondary of this transformer is connected directly to the signal I. F. stage, which is in effect parallel to the A. V. C., I. F. stage. Examining the signal amplifier further we find that the output of the first signal I. F. stage is applied through a transformer to the second I. F. stage and thence through a second transformer to the second detector. Both circuits of each transformer are accurately tuned to the I. F. signal, which is 460 K. C.

Further examining the A. V. C., I. F. stage it will be seen that the output of this stage is applied to the A. V. C. tube through an untuned I. F. transformer. The A. V. C. stage, which is an RCA-76, is operated as a straight rectifier, its plate being grounded and only the grid being used. This tube is shielded in the usual manner. A small grid voltage, approximately 5.0 volts, is maintained so that rectification does not occur until the signal level exceeds this grid voltage. When this occurs, a portion of the rectified signal produces a voltage drop across resistors R-18 and R-19. The drop across both of these resistors constitutes the automatic bias voltage for the R. F. stage. The drop across R-19 alone gives the automatic bias voltage for the first detector and first I. F. stage on bands X and A.

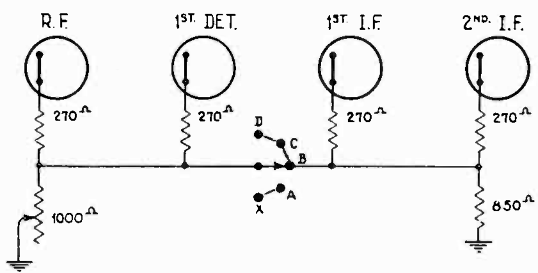
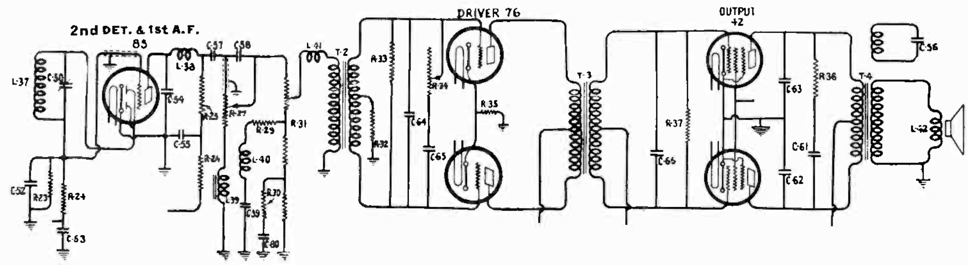


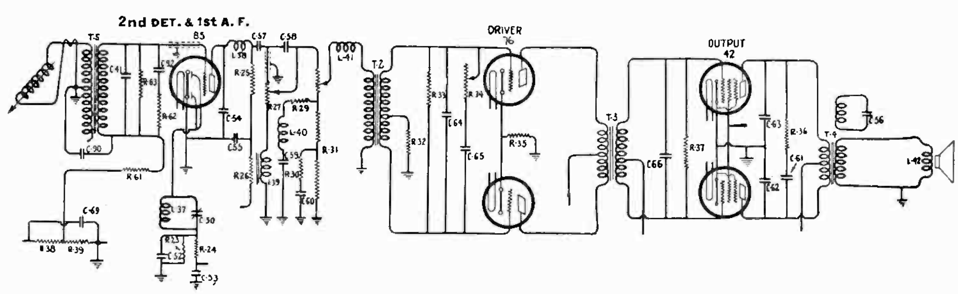
Figure 4—Sensitivity Control Switching Arrangement

Examining the second detector, the diode electrodes provide the detector action while the grid and plate give audio amplification. A portion of the rectified signal also gives a voltage drop across R-23, which is a second automatic volume control system for the receiver. The voltage drop is applied to the second I. F. stage in all bands and to the first detector and first I. F. stage in bands B and C. The change in automatic volume control systems is made by an additional group of contacts on the band selector switch. Figure 3 shows the switching arrangements for changing the A. V. C. system in the various bands.

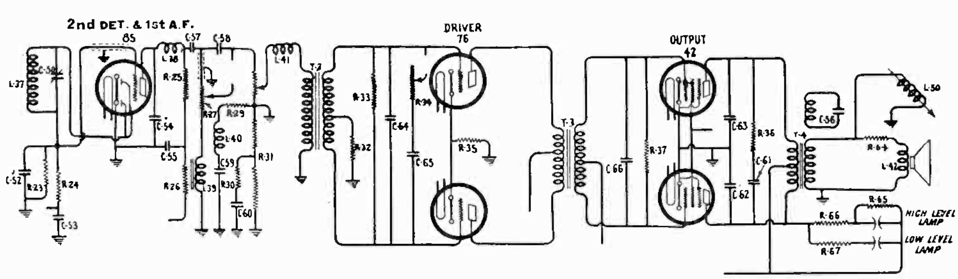
At this point, an explanation as to why two automatic volume control systems are used and why the sensitivity control is changed in different bands may be in order.



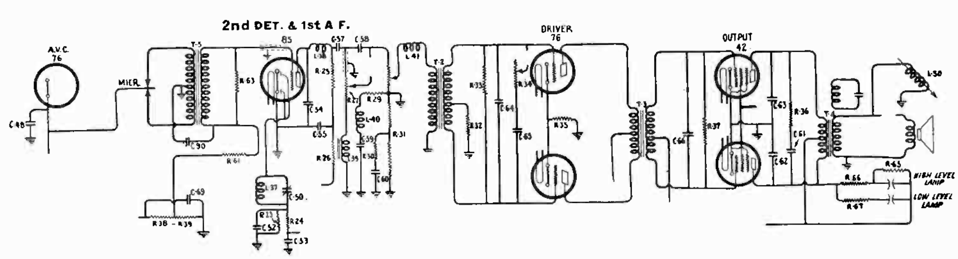
Radio Receiving



Record Reproduction



Radio Recording



Home Recording

Figure 5—Schematic Circuits of Audio Amplifier at each Selector Switch Position

Two automatic volume control systems are used because of the different receiving conditions in the various bands. For example, in the broadcast and long-wave band (X and A) signal levels are very high. Also due to the use of an aurally compensated volume control, a constant input to the second detector must be maintained. From this it is evident that the double channel I. F. automatic volume control is ideal. It maintains a constant input to the second detector and yet does not function on an extremely weak signal. In the short-wave bands, however, conditions are different. Signal strengths are always very low and fluctuate widely. For this reason it is important to have some automatic volume control action below the level at which the double channel system works. This is provided by the tube marked 2nd detector and 1st A. F. which functions on the first detector and two I. F. stages on the short-wave bands. It should be noted that this action is present on the second I. F. stage on all bands. This further flattens the action of the double-channel system in bands X and A.

At this point it is well to examine the sensitivity control, which also changes on different bands. The sensitivity control adjusts the residual bias on the R. F. and first detector stages in bands X and A while it controls the R. F., 1st detector and both I. F. stages on bands B, C, and D. Figure 4 shows the switching arrangement used.

The sensitivity control is changed so that in bands X and A it controls the R. F. and 1st detector while in bands B, C, and D it controls the R. F., 1st detector, 1st I. F. and 2nd I. F. stages. The reason for this is that for a given degree of sensitivity in bands X and A the residual bias will be considerably higher in the R. F. and 1st detector stages than in the bands B, C, and D used. This is to prevent possible overloading of these stages due to the high-signal strengths encountered in bands X and A. Also, in bands B, C, and D, for a given degree of sensitivity the R. F. stage operates at a higher gain, which gives an improved signal to noise ratio. This is caused by the paralleling of the sensitivity control with an 850-ohm resistor in these bands.

Returning to the second detector, we find its output circuit is coupled to the grid circuit of the driver stage through a compensated volume control system, tone control system and transformer. The volume control uses two stages of compensation, which serves to increase the high and low frequencies as the volume is reduced. This compensates for the natural loss in sensitivity of the human ear to the high and low frequencies at low sound levels. A low and a high frequency tone control enables the listener to alter the fidelity of the receiver to his individual taste.

The driver stage, which is a pair of RCA-76 Radiotrons connected in push-pull, is transformer coupled to a pair of RCA-42's which are the output stage. A feature of the output stage is the use of fixed bias, which reduces distortion and increases the available output. This is accomplished by the use of the drop across R-38 and R-39, which carries the entire D. C. output from the rectifier. Naturally the output stage uses but a portion of the total rectified current and current variations in it will have but little effect on the drop across the resistor.

The output of the power stage is coupled through a step-down transformer to the voice coil of the loudspeaker. A separate winding, which is shunted by a capacitor, has been provided in this transformer which gives a very sharp, high-frequency cut-off for the entire

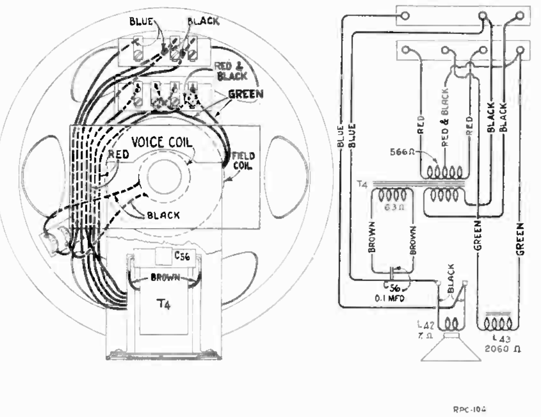


Figure 6—Loudspeaker Wiring

audio system. This greatly reduces the reproduction of any high-frequency interchannel interference or other disturbance of a high-frequency character which is outside of the useful musical range.

The loudspeaker used is of the large-field ten-inch type. It is fully capable of handling the high-power, high-quality output of the receiver and converting it into faithful sound reproduction.

Figure 6 shows the loudspeaker wiring while Figure 7 shows the chassis wiring diagram. Figure 9 shows the assembly wiring diagram.

PHONOGRAPH AND RECORDING

The record reproducing facilities consist of a low impedance magnetic pickup with its associated inertia type tone arm, a compensated volume control, the audio amplifier of the receiver and the loudspeaker of the receiver. The radio receiver is made inoperative by the switch used for changing to record reproduction.

The recording facilities use the audio amplifier of the radio receiver, the output of which is connected to the magnetic pickup instead of the voice coil of the loudspeaker. The input to the amplifier may be either from the microphone or from the radio receiver, depending on whether radio recording or home recording is desired. It should be noted that when radio recording is being used, the loudspeaker is connected across the output through a resistor so that the program being recorded may be monitored at the same time.

Figure 5 shows schematic circuit diagram of the audio circuits at each of the four selection switch positions.

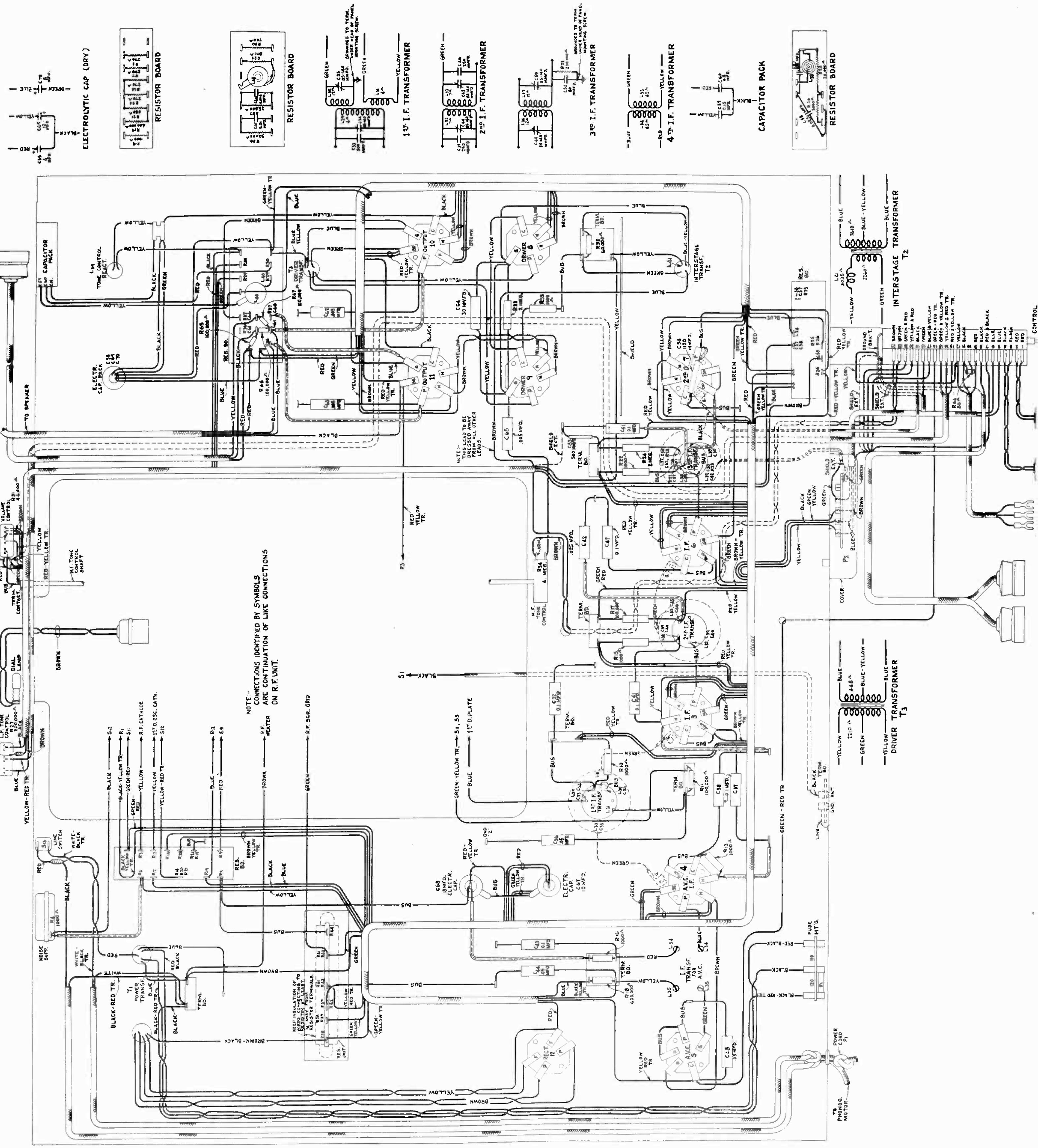


Figure 7—Chassis Wiring Diagram

SERVICE DATA

(1) LINE-UP PROCEDURE

The line-up procedure of this receiver is somewhat involved and it is important that these instructions be carefully followed when making adjustments. Properly aligned, this receiver has outstanding performance; improperly aligned, it may be impossible to receive signals on all bands.

Equipment

To properly align this receiver, the following equipment must be used. This is a modulated R. F. oscillator having proper frequency range, an output indicator, an alignment tool, a tuning wand, and a "dummy" Radiotron RCA-76. These parts have been developed by the manufacturer of this receiver

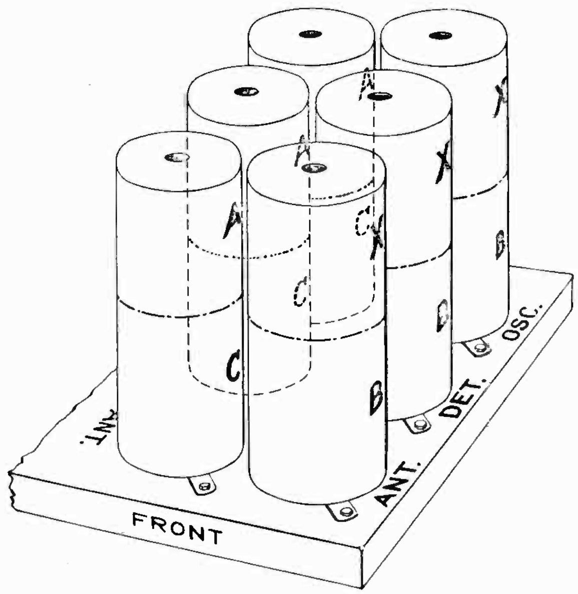


Figure 8—Location of Various Coils in Shields

for use by service men to duplicate the original factory adjustments. The "dummy" Radiotron, RCA-76, is obtained by removing one heater prong from an otherwise perfect tube.

Checking with Tuning Wand

Before making any R. F., oscillator or first detector adjustments, the accuracy of the present adjustments may be checked by means of the tuning wand (Stock No. 6679). The tuning wand consists of a bakelite rod having a brass cylinder at one end and a special finely divided iron insert at the other end. Inserting the cylinder into the center of a coil lowers its inductance, while inserting the iron end increases its inductance. From this it is seen that unless the trimmer adjustment for a particular coil is perfect at alignment frequencies, inserting one end of the wand may increase the output of a particular signal. A perfect adjustment is evidenced by a lowering of output when either end of the wand is inserted into a coil.

The shields over the R. F. coil assembly have a hole at their top for entrance of the tuning wand. The location of the various coils inside of the shield is shown in Figure 8. An example of the proper manner of using the tuning wand would be to assume the external oscillator were set at 1720 and the signal tuned in. The A. V. C. tube would be replaced by the "dummy" RCA-76 and the output indicator connected across the voice coil of the loudspeaker. Then the tuning wand should be inserted, first one end and then the other end, into the top of the three transformers at the left of the R. F. assembly, facing the front of the chassis. A perfect adjustment of the trimmer would be evidenced by a reduction in output when each end of the wand is inserted in each of the three transformers. If one end—for example, the iron end—when inserted in one coil caused an increase in output, then that circuit is low. An increase in the trimmer capacitance would be the proper remedy.

(2) I. F. TUNING CAPACITOR ADJUSTMENTS

Although this receiver has three I. F. stages, two for the signal and one for the A. V. C., only three transformers having six adjustable capacitors require adjustment. The fourth transformer is in the A. V. C. circuit and is broadly tuned, not requiring adjustments. The transformers are all peaked, being tuned to 460 K. C.

A detailed procedure for making this adjustment follows:

(a) Connect the output of an external oscillator tuned to 460 K. C. between the first detector grid and ground. Connect the output indicator across the voice coil of the loudspeaker. Replace the A. V. C. tube in the receiver with the "dummy" RCA-76.

(b) Place the oscillator in operation at 460 K. C.; place the receiver in operation and adjust the station selector until a point is reached (Band A) where no signals are heard and turn both the volume and sensitivity controls to their maximum position. Reduce the oscillator input until a slight indication is obtained in the output indicator.

(c) Refer to Figure 10. Adjust each trimmer of the I. F. transformers until a maximum output is obtained. Go over the adjustments a second time.

This completes the I. F. adjustments. However, it is good practice to follow the I. F. adjustments with the R. F. and Oscillator adjustments due to interlocking which always occurs.

(3) R. F. OSCILLATOR AND FIRST DETECTOR ADJUSTMENTS

Four R. F., oscillator and first detector adjustments are required in bands "X" and "A." Three are required in bands "B" and "C" while none are required in band "D." Band "D" uses the second harmonic of the oscillator while the detector and R. F. coils do not have trimmers.

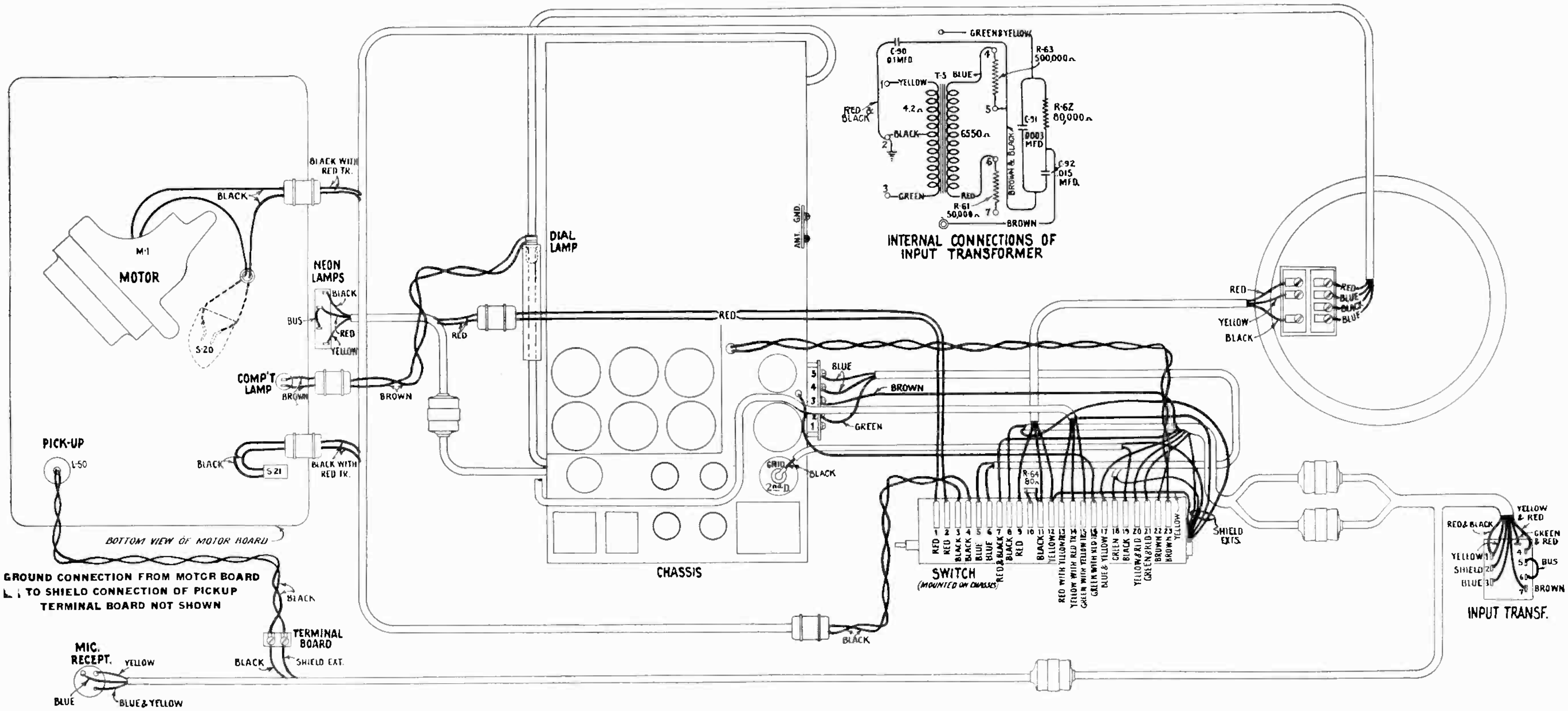


Figure 9—Assembly Wiring Diagram

To properly align the various bands, each band must be aligned individually. The preliminary set-up requires the external oscillator to be connected between the antenna and ground terminals of the receiver. The output indicator must be connected across the voice coil of the loudspeaker while the "dummy" RCA-76 must be placed in the A. V. C. socket. The sensitivity and volume controls must be at their maximum position and the input from the oscillator must be at the minimum value possible to get an output indication under these conditions. In the high-frequency bands, it may be necessary to disconnect the oscillator from the receiver and place it at a distance in order to get a sufficiently low input to the receiver.

The Dial Pointer must be properly set before starting any actual adjustments. This is done by turning the variable capacitor until it is at its maximum capacity position. One end should point exactly at the horizontal line at the lowest frequency end of band "A," while the other end should point to within 1/64" of the horizontal line at the highest frequency end of band "A."

Figure 10 shows the location of the trimmers for each band. Care must be exercised to only adjust the trimmers in the band under test.

Band "X"

(a) Tune the external oscillator to 410 K. C., set the pointer at 410 K. C. and adjust the oscillator, detector and R. F. trimmers for maximum output.

(b) Shift the external oscillator to 175 K. C. Tune in the 175 K. C. signal irrespective of scale calibration and adjust the series trimmer marked 175 K. C. on Figure 10, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 410 K. C. as described in (a).

Band "A"

(a) Tune the external oscillator to 1720 K. C., set the pointer at 1720 K. C. and adjust the oscillator, detector and R. F. trimmers for maximum output.

(b) Shift the external oscillator to 600 K. C. Tune in the 600 K. C. signal irrespective of scale calibration and adjust the series trimmer, marked 600 K. C. on Figure 10, for maximum output, at the same time rocking the variable tuning capacitor. Then readjust at 1720 K. C. as described in (a).

Band "B"

(a) Tune the external oscillator to 5160 K. C., and set the pointer at 5160 K. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacitor from minimum to maximum.

(b) Check for the image signal, which should be received at approximately 4240 on the dial. It will be necessary to increase the external oscillator output for this check.

(c) The antenna and detector trimmers should now be peaked for maximum output.

Band "C"

(a) Tune the external oscillator to 18,000 K. C., and set the pointer at 18 M. C. Adjust the oscillator trimmer for maximum output. The trimmer should be set at the first peak obtained when increasing the trimmer capacity from minimum to maximum.

(b) Check for the image signal, which should be received at approximately 17,080 on the dial. It may be necessary to increase the external oscillator output for this check.

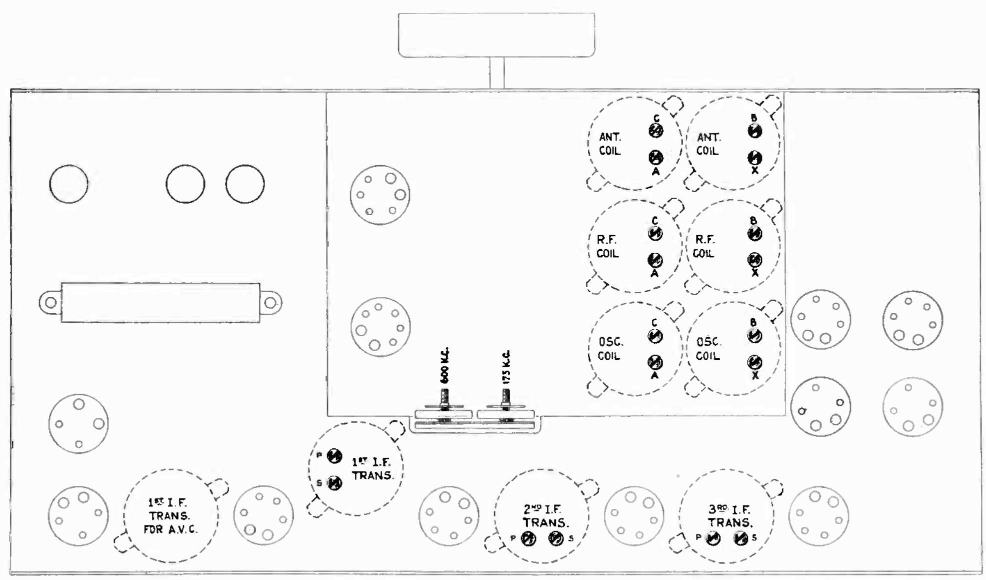


Figure 10—Location of Various Trimmer Capacitors

(c) Reduce the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal disappears. The first detector circuit is then at the oscillator frequency and the RCA-6A7 tube is blocked. Then increase the capacity of the detector trimmer, while rocking the tuning capacitor, until the signal is peaked for maximum output.

(d) The antenna trimmer should now be peaked for maximum output. It is not necessary to rock the main tuning capacitor while making this adjustment.

Band "D"

No adjustments are required for Band D.

(5) VOLTAGE READINGS

The following voltages are those at the various tube sockets while the receiver is in operating condition. No allowance has been made for currents drawn by the meter, and if low-resistance meters are used, such allowances must be made. Figure 13 shows the location and voltage at each socket contact.

(6) TESTING NEON LEVEL INDICATING LAMPS

Two Neon Level Indicating Lamps are provided so that a visual indication of the recording level may be obtained at all times. These lamps normally give long service without attention. However, if failure occurs, and all circuits have been checked and eliminated as possible source of failure, the lamps may be

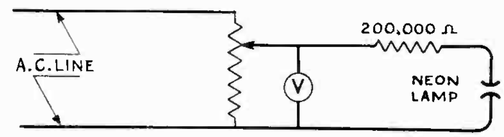


Figure 11—Testing Circuit

easily checked as indicated in the circuit shown in Figure 11. The method for checking involves testing for lighting between certain voltages. The lamps must not light before 52 volts have been applied and must not require a voltage greater than 64 volts to cause them to light. Lamps requiring different voltages from these are defective and must not be used.

RADIOTRON SOCKET VOLTAGES

Maximum Sensitivity—No Signal—120-Volt A. C. Input

Radiotron No.		Cathode to Ground, Volts	Screen Grid to Ground, Volts	Plate to Ground, Volts	Cathode Current, M. A.	Heater Volts, A. C.
RCA-6D6—R. F.		2.3	100	231	8.8	6.3
RCA-6A7	Osc.	3.0	—	232	10.9	6.3
	Det.		100	238		
RCA-6D6—1st I. F.		7.0	100	236	3.5	6.3
RCA-6D6—2nd I. F.		7.0	100	236	3.5	6.3
RCA-6D6—A. V. C.-I. F.		6.0	100	236	4.0	6.3
RCA-76—A. V. C.		4.7	—	0	0	6.3
RCA-85—2nd Det.		0	—	60	7.2	6.3
RCA-76—A. F.		11.0	—	235	5.5	6.3
RCA-76—A. F.		11.0	—	235	5.5	6.3
RCA-42—Power		0	240	365	23.0	6.3
RCA-42—Power		0	240	365	23.0	6.3
RCA-5Z3—Rectifier		—	—	768–384 RMS	104.0	5.0

Power Transformer connected to 120-volt Tap

(7) SERVICE DATA ON MAGNETIC PICKUP

The Magnetic Pickup used in this combination instrument is of a new design with an improved frequency range. While in physical appearance it is similar to that of the older type, details of construction are considerably different. It consists essentially of a chromium steel magnet, two thin pole pieces, a mechanism support and bracket, a coil, and an armature that is damped by means of an anchored damping block.

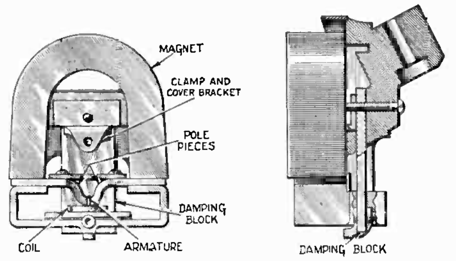


Figure 12—Details of Magnetic Pickup

The use of the anchored damping block eliminates any bad peaks in the frequency range. The frequency-response characteristic is substantially flat from 50 to 5,000 cycles.

(8) REPLACING MAGNET COIL, PIVOT RUBBERS, ARMATURE OR DAMPING BLOCK

In order to replace a defective coil or the hardened pivot rubbers (see Figure 15), it is necessary to proceed as follows:

(a) Remove the pickup cover by removing the center holding screw and needle screw.

(b) Remove the pickup magnet and the magnet clamp by pulling them forward.

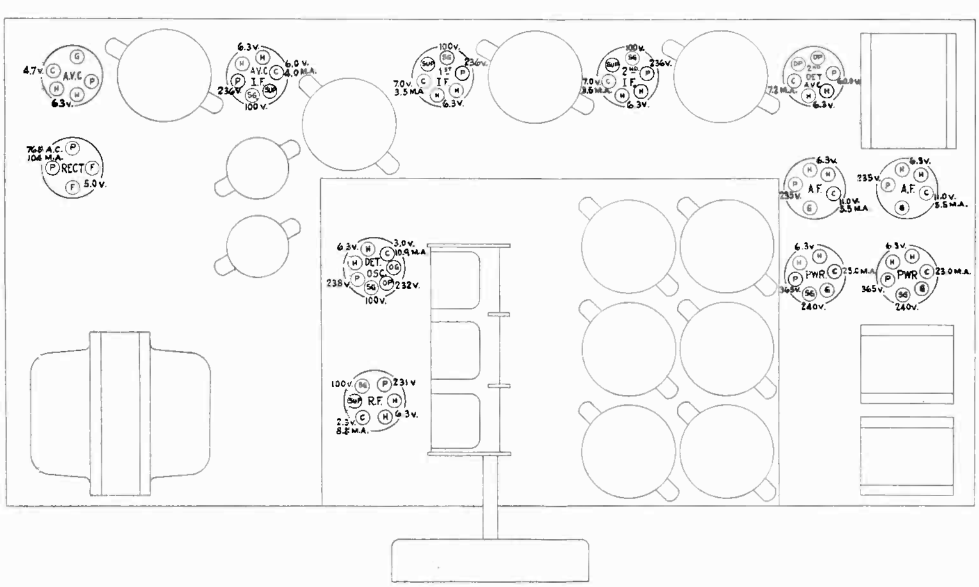
(c) Unsolder the coil leads and remove the mechanism assembly from the back plate by releasing the two mounting screws and the damping block clamping screw.

(d) Remove screws A and B, Figure 15, and then remove the mechanism assembly from the pole pieces.

(e) The coil or the front pivot rubber may now be removed and replaced. If it is desired to replace the rear pivot rubber, then the end of the armature soldered to the mechanism support must be unsoldered and the damping block removed. The rear pivot rubber now may be replaced. After putting the pivot rubbers in place a new damping block should be fastened to the armature as outlined in instructions on replacing the damping block.

(f) The mechanism should now be reassembled, except for the magnet, which must be magnetized. After being magnetized, the mechanism—with the pole pieces upward—should be placed so that the magnet may be slid from the magnetizer onto the pole pieces without breaking physical contact. After placing the pole pieces on the magnet, the entire assembly should be remagnetized thoroughly, being careful not to change the polarity obtained by the initial magnetization.

(g) After assembling to the mechanism, the entire assembly should be fastened to the back plate by means of the screws provided, making sure the damping block is securely clamped. At



ALL D. C. VOLTAGES ARE TO GROUND

Figure 13—Radiotron Socket Voltages

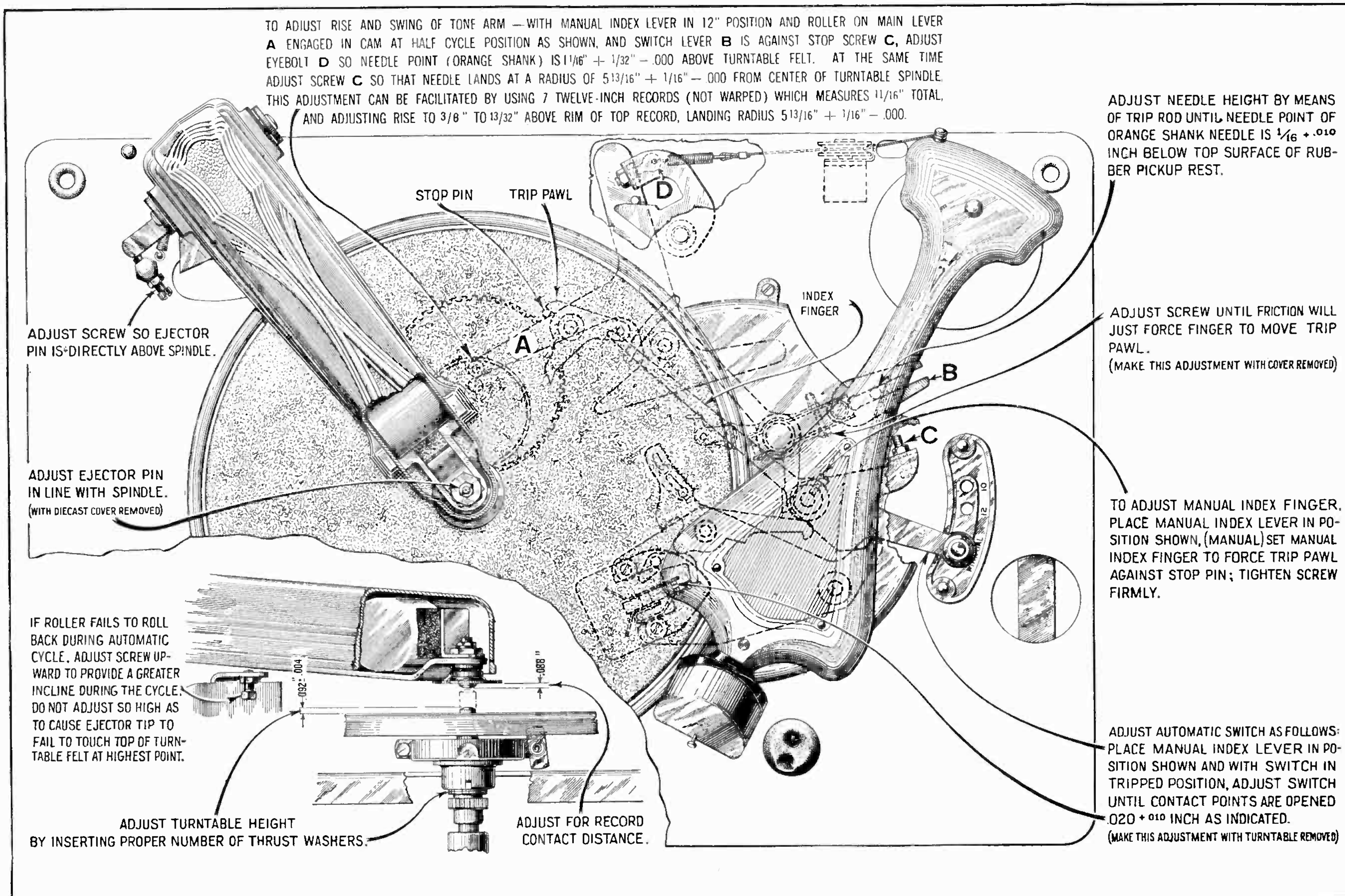


Figure 14—Automatic Record Changer Adjustments

the same time, the metal dust cover must be placed in position.

(h) After remagnetizing, it is necessary to correctly center the armature. This may be done quite accurately by feeling its play after the needle is inserted. A little practice will quickly show which way an adjustment is necessary to have

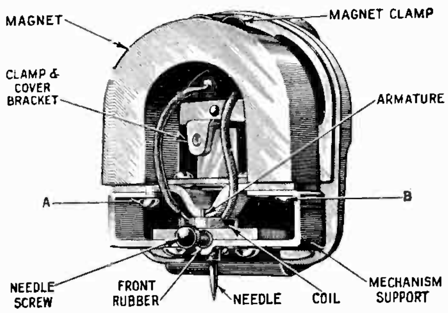


Figure 15—Pickup Nomenclature

the armature centered properly. The adjustment is made by loosening screws A and B (Figure 15), and sliding the mechanism slightly in relation to the pole pieces.

(i) The cover may be now replaced over the entire assembly, and the pickup returned to the tone arm.

In assembling, it may be desirable to check the armature air gap by means of a small Feeler Gauge. This air gap should be .009″ on each side of the armature. However, a little practice with the needle in place will quickly disclose whether or not the armature is centered.

(9) REPLACING THE DAMPING BLOCK

If it is desired to replace the damping block, it may be done in the following manner:

(a) Disassemble the pickup as described under the preceding section.

(b) Remove the armature entirely by unsoldering it at its joint with the mechanism support.

(c) Remove the damping block from the armature and clean the bushing for holding the damping block with emery paper.

(d) Insert the armature through the new block so that it occupies the same position as that of the old. Also ascertain that the block is in correct vertical alignment with the armature. It will be noted that the hole in the damping block is somewhat smaller than the diameter of the armature. This is done so that a snug fit will be obtained.

(e) After properly locating the damping block, a soldering iron should be applied to the armature so that the block will melt slightly at its point of contact with the armature. A special tip, constructed as shown in Figure 16, will prove desirable for fusing the block in place. The iron should be applied long enough to slightly melt the block and cause a small bulge on both sides, but should not be applied long enough to cause any bubbling. The pickup should then be reassembled as described in the preceding section.

Only rosin core solder should be used for soldering the coil leads in the pickup. Also rosin core solder should be satisfactory for resoldering the end of the spring in the hole in the mechanism, since both these parts have been previously tinned. In case the parts are not well tinned, it will be necessary to scrape the end of the spring and the hole in the mechanism until bright. These parts may now be tinned by using as a flux a water solution of zinc chloride (commonly called acid flux). After tinning, dip the parts in water to wash off the acid flux and thereby prevent serious subsequent corrosion. After making sure that the pivot rubbers and damping block are properly in place,

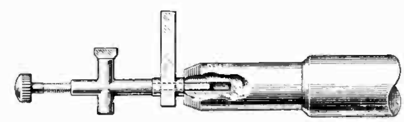


Figure 16—Special Soldering-Iron Tip

as described under (e) above, the armature may now be soldered in place in the mechanism by using rosin core solder, since the parts are now tinned. Care must be exercised to get the needle hole perfectly square with respect to the mechanism, or otherwise it will be difficult if not impossible to center the armature in the air gap as explained under (h), section (8).

(10) AUTOMATIC RECORD CHANGING MECHANISM

The automatic record changer used in this instrument is of simple design and fool-proof construction. Under normal operating conditions service difficulties should be negligible. However, in event adjustments are required, a reference to Figure 14 will disclose the proper method of making all adjustments.

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
	RECEIVER ASSEMBLIES	
4372	Bracket—Low frequency tone or volume control mounting bracket	$0.20
4406	Bracket—High frequency tone control mounting bracket	.25
2747	Cap—Contact cap—Package of 5	.50
4407	Capacitor—30 mmfd. (C64)	.25
4405	Capacitor—80 mmfd. (C52)—Package of 5	.85
4376	Capacitor—250 mmfd.—Located on second intermediate frequency transformer (C39, C46)—Package of 5	.80
4404	Capacitor—500 mmfd. (C33, C53)—Package of 5	.85
4409	Capacitor—1120 mmfd. (C54)	.35
4070	Capacitor—.004 mfd. (C66)	.42
3643	Capacitor—.005 mfd. (C62, C63)	.25
5512	Capacitor—.005 mfd. (C65)	.28
3787	Capacitor—.01 mfd. (C61)	.30
3888	Capacitor—.05 mfd. (C36, C44, C48)	.25
3765	Capacitor—.025 mfd. (C42, C58)	.34
4645	Capacitor—.1 mfd. (C32, C41, C43, C51)	.25
3877	Capacitor—.1 mfd. (C37, C38, C47)	.32
4720	Capacitor—.035 mfd. (C57)	.42
7790	Capacitor—10 mfd. (C67)	1.05
7788	Capacitor—18 mfd. (C68)	1.10
7787	Capacitor pack—Comprising one .15 mfd. and one .5 mfd. capacitors (C59, C60)	1.10
7789	Capacitor pack—Comprising one 4., one 8. and one 10. mfd. capacitors (C55, C69, C70)	2.68
4358	Clamp—Electrolytic capacitor clamp	.15
7806	Coil—Second detector plate choke coil (L38)	.30
4371	Cover—Fuse mount cover	.15
4359	Cover—Terminal board cover	.15
10907	Fuse—3-ampere—Package of 5	.40
3376	Mount—Fuse mount 105–125-volt instrument	.40
7784	Reactor—Tone control reactor (L39)	1.30
7483	Reactor—Volume control compensating reactor (L40)	.68
6135	Resistor—270 ohms—Carbon type—¼ watt (R3, R7, R14, R20)—Package of 5	1.00
4240	Resistor—700 ohms—Carbon type—¼ watt (R30)—Package of 5	1.00
4375	Resistor—800 ohms—Carbon type—¼ watt (R29)—Package of 10	2.00
6247	Resistor—850 ohms—Carbon type—¼ watt (R21)—Package of 5	1.00
4687	Resistor—1,000 ohms—Carbon type—¼ watt (R9, R10, R13, R15, R16, R22, R35)—Package of 10	2.00
3110	Resistor—25,000 ohms—Carbon type—¼ watt (R37)—Package of 5	1.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R32)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R11, R17)—Package of 5	1.00
3116	Resistor—200,000 ohms—Carbon type—¼ watt—Located on third I. F. transformer (R23)—Package of 5	1.00
4368	Resistor—400,000 ohms—Carbon type—¼ watt (R18, R19)—Package of 10	2.00
6242	Resistor—2 megohms—Carbon type—¼ watt (R24, R33)—Package of 5	$1.00
3413	Resistor—5,000 ohms—Carbon type—½ watt (R26)—Package of 5	1.00
2240	Resistor—30,000 ohms—Carbon type—1 watt (R36)	.22
5817	Resistor—20,000 ohms—Carbon type—3 watt (R25)	.25
6997	Resistor—Total resistance 14,470 ohms with 160–60–350–7150 and 6750 ohm sections (R38, R39, R40, R41, R42)	.95
7804	Rheostat—Noise suppressor rheostat (R4)	1.30
4453	Shield—First I. F., AVC—I. F. or second I. F. Radiotron shield	.32
3683	Shield—Radiotron shield top	.20
4452	Shield—Second detector or AVC Radiotron shield	.35
7800	Shield—Shield for intermediate frequency coils	.45
3859	Socket—4-contact rectifier Radiotron socket	.30
7484	Socket—5-contact AVC Radiotron socket	.35
6676	Socket—6-contact output Radiotron socket	.40
7485	Socket—6-contact driver Radiotron socket	.40
7796	Switch—Operating switch (S13)	.62
7795	Tone control—Low frequency (R27)	1.30
7797	Tone control—High frequency (R34)	1.35
7794	Transformer—AVC intermediate frequency transformer (L34, L35)	.82
7785	Transformer—Driver transformer (T3)	2.40
7791	Transformer—First intermediate frequency transformer (L29, L30, L31, C33, C34, C35)	2.35
9505	Transformer—Power transformer 105–125-volt, 50–60 cycle (T1)	6.35
9506	Transformer — Power transformer 105–125 volts, 25–40 cycles	8.90
7792	Transformer—Second intermediate frequency transformer (L32, L33, C39, C40, C45, C46)	2.22
7793	Transformer—Third intermediate frequency transformer (L36, L37, C49, C50, C52, R23)	2.50
7786	Transformer pack—Comprising one reactor and interstage transformer (L41, T2)	4.25
7798	Volume control—Radio and Phonograph (R31)	2.05
	R. F. UNIT ASSEMBLIES	
4646	Capacitor—4.5 mmfd. (C10)	.20
4416	Capacitor—50 mmfd. (C19)—Package of 5	1.25
3981	Capacitor—300 mmfd. (C8)	.30
4413	Capacitor—360 mmfd. (C28)	.22
4412	Capacitor—1120 mmfd. (C25)	.25
4524	Capacitor—2850 mmfd. (C23)	.35
4615	Capacitor—2850 mmfd. (C20)	.34
4417	Capacitor—0.05 mfd. (C5, C15)	.25
4415	Capacitor—0.1 mfd. (C7, C16)	.30
4645	Capacitor—0.1 mfd. (C9, C31)	.25
3861	Capacitor—Adjustable capacitor (C27, C30)	.78
4420	Clamp—Antenna lead clamp and screw—Package of 10	.40
4410	Coil—Antenna coil—Band "D" (L1, L2)	.70
7803	Coil—Antenna coil—"B"—"SW" (L3, L4, L7, L8, C1, C3)	1.82

REPLACEMENT PARTS—(Continued)

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
7810	Coil—Antenna coil—"PB"—"LW" (L5, L6, L9, L10, C2, C4)	$2.10
7805	Coil—Detector coil—"B–SW" (L13, L14, L17, L18, C11, C13)	2.15
7808	Coil—Detector coil—"PB–LW" (L15, L16, L19, L20, C12, C14)	2.05
4421	Coil—Detector coil—Band "D" (L11, L12)	.70
7807	Coil—Oscillator coil—"B–SW" (L21, L22, L25, L26, C22, C26)	1.62
7809	Coil—Oscillator coil—"PB–LW" (L23, L24, L27, L28, C24, C29)	1.70
7801	Condenser—3-gang variable tuning condenser (C6, C17, C21)	4.42
4419	Lead—Shield single-conductor antenna lead	.45
4687	Resistor—1,000 ohms—Carbon type—¼ watt (R5)—Package of 10	2.00
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R8)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R1, R12)—Package of 5	1.00
4418	Resistor—100 ohms—Flexible type (R2, R6)—Package of 10	1.50
7800	Shield—Antenna, detector or oscillator coil shield	.45
4452	Shield—First detector oscillator coil shield	.35
3683	Shield—Radiotron shield top	.20
4454	Shield—R. F. amplifier Radiotron shield	.44
3529	Socket—Dial lamp socket	.32
7485	Socket—6-contact Radiotron socket	.40
3572	Socket—7-contact Radiotron socket	.38
4686	Strip—Terminal strip engraved "ANT–GND"	.20
7802	Switch—Range switch (S1, S2, S3, S4, S5, S6, S7, S8, S9, S10, S11, S12)	4.05
	CABLE AND PLUG ASSEMBLIES	
4547	Cable — 3-conductor — Recording indicator cable—With female section of connector plug—Stock No. 4153—One end connected to resistor board	.85
4548	Cable—3-conductor with spade terminals—Phonograph chassis cable—One end connected to selector switch, other end to terminal board	.50
4553	Cable—3-conductor—Reproducer cable with spade terminals	.45
4549	Cable—Input transformer cable—3 branches—With 2 male and one female section of connector plugs—Stock Nos. 4571, 4574 and 6123	2.30
4576	Cable—Input transformer—One end connected to selector switch—With two female sections of connector plugs—Stock Nos. 4153 and 4571	1.84
4550	Cable—Microphone cable—One end connected to microphone receptacle—3-conductor with male section of connector plug—Stock No. 4574	1.00
4551	Cable—Recording indicator cable—One end connected to indicator with one male and one female section of connector plug—Stock Nos. 4573 and 6123	1.88
4552	Cable—2-conductor—Motor power cable—With three female sections of connector—Stock No. 4573	$3.36
4554	Cable—Volume control cable—One end connected to selector switch, other end to volume control and low frequency tone control	.50
4153	Plug—Female section of 4-contact connector plug—Used with following cables—Stock No. 4547 and 4576	.48
4573	Plug—Female section of 2-contact connector plug—Used with dial lamp cord and following cables—Stock Nos. 4551 and 4552	.30
4571	Plug—Female section of 6-contact connector plug—Used with cables—Stock Nos. 4549 and 4576	.65
6123	Plug—Male section of 4-prong connector plug—Used with the following cables—Stock Nos. 4549 and 4551	.30
4577	Plug—Male section of 2-prong connector plug—Connected to terminals Nos. 1, 2, 3 and 4 of selector switch	.30
4574	Plug—Male section of 6-prong connector plug—Used with cables Stock Nos. 4550 and 4549	.48
	DRIVE ASSEMBLIES	
4362	Arm—Band indicator operating arm	.28
10194	Ball—Steel ball for variable condenser drive assembly—Package of 20	.25
4422	Clutch—Tuning condenser drive clutch assembly—Comprising drive shaft, balls, ring, spring and washers assembled	.88
4455	Dial—Station selector dial	.60
7799	Drive—Variable tuning condenser drive assembly complete	2.45
4364	Gear—Spring gear assembly complete with hub pinion, gear cover and spring	.96
4361	Indicator—Band indicator—Celluloid-lettered D-C-B-A-X	.12
4363	Pointer—Station selector main pointer—Large	.18
4367	Pointer—Station selector vernier pointer—Small	.15
3993	Screw—No. 6–32–5/32" square head set screw for variable condenser drive assembly—Package of 10	.25
4377	Spring—Band indicator and arm tension spring—Package of 5	.25
4360	Stem—Pointer stem assembly	.35
4378	Stud—Band indicator operating arm stud—Package of 5	.25
	EJECT ARM ASSEMBLIES	
4713	Arm—Eject arm complete	7.74
3658	Ball—Steel ball bearing—Package of 20	.30
3656	Bearing—Ejector tip bearing	.48
4054	Bracket—Eject arm bracket assembly	1.35
4058	Collar—Eject arm shaft collar and set screw	.18
4714	Cover—Eject arm cover	1.38

REPLACEMENT PARTS—(Continued)

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	Description	List Price
3930	Cushion—Counter balance cushion and bracket—Located inside of eject arm	$0.18
3662	Plate—Ejector plate—Package of 5	.95
4055	Post—Vertical adjustment post—Located on eject arm bracket	.30
3655	Retainer—Ball retainer with three balls	.45
3729	Roller—Counterbalance roller — Located inside of eject arm	.45
3665	Screw—Eject arm horizontal adjustment screw and nut—Package of 5	.25
4057	Shaft and collar—For eject arm	.24
4067	Spring—Eject arm bracket spring—Package of 10	.30
4125	Spring—Eject arm horizontal action tension spring—60 cycle operation—Package of 10	.42
4126	Spring—Eject arm—Horizontal action tension spring—For 25 cycle operation—Package of 10	.60
3657	Tip—Ejector tip	.30
4056	Yoke—Eject arm yoke assembly	1.04

MICROPHONE ASSEMBLIES

Stock No.	Description	List Price
7534	Cord—Microphone cord	.70
6883	Cover—Microphone cover—Two sides	1.96
3216	Cushion—Microphone rubber cushions—Pkg. of 6	.24
6884	Frame—Microphone frame	1.19
7533	Mechanism—Microphone mechanism	6.80
6882	Microphone complete	7.50
4171	Plug—3-contact microphone plug	.30
4158	Socket—Microphone socket	.40

MOTOR ASSEMBLIES

Stock No.	Description	List Price
9477	Motor—105-125 volts—60 cycles	25.88
9478	Motor—105-125 volts—50 cycles	25.88
9479	Motor—105-125 volts—25 cycles	36.48
4562	Motor mounting spring, washer and stud assembly—Comprising six springs, six cup washers, three spring washers and three studs	.58

MOTOR BOARD ASSEMBLIES

Stock No.	Description	List Price
4060	Escutcheon — Index escutcheon engraved "Manual 12-10"	.28
3764	Nut—Cap nut for motor board—Package of 4	.40
3672	Pin—Manual index pin	.42
4066	Rest—Pickup rest	.14
3654	Roller—Pickup arm guide roller assembly—Comprising bracket and guide pin	.34
3763	Suspension spring, washer and bolt assembly for motor board—Comprising one bolt, two cup washers, two springs, one "C" washer and one cap nut	.42

OPERATING MECHANISM ASSEMBLIES

Stock No.	Description	List Price
6502	Cam—Cam and gear assembly	1.18
6808	Clutch—Trip lever friction clutch	.30
4719	Cover—Metal cover for trip lever and friction finger assembly	$0.28
3670	Finger—Friction finger assembly	.32
6809	Finger—Manual index lever finger assembly	.25
6846	Lever—Main lever and link assembly	1.45
6810	Lever—Main spring lever	.44
6806	Lever—Manual control index lever—Less pin	.55
3677	Lever—Pickup arm cable lever assembly complete—Comprising lever with cable screw spring and nut	.40
6807	Lever—Trip lever and friction clutch assembly	1.16
6503	Pawl—Trip pawl assembly	.40
4124	Plate—Eject arm actuating plate assembly	.50
4563	Screw—Cable lever cable screw and nut—Package of 10	.60
4564	Screw—Manual index lever finger set screw—Package of 10	.20
4567	Screw—Manual index lever assembly—Adjustment screw and nut—Package of 10	.32
4566	Screw—Special screw used to fasten main lever and link assembly bushing—Package of 10	.30
4059	Screw—Trip lever clutch tension adjustment screw—Package of 10	.22
4127	Spring—Actuating plate tension spring—Package of 10	.24
3666	Spring—Cable lever tension spring—Package of 10	.44
3676	Spring—Cam and gear, pawl carrier tension spring—Package of 10	.52
4061	Spring—Main spring	.38
4565	Spring—Manual index lever finger tension spring—Package of 10	.30
2893	Spring—Trip lever latch plate tension spring—Package of 10	.30
2917	Washer—Spring washer "U" type—Package of 10	.25

PICKUP AND ARM ASSEMBLIES

Stock No.	Description	List Price
4581	Arm—Pickup arm complete less escutcheon and pickup unit	5.72
4128	Armature—Pickup armature	.96
6813	Back—Pickup housing back	.68
4064	Cable—Pickup arm cable—Package of 5	1.00
4583	Coil—Pickup coil (L50)	.80
4711	Cover—Pickup cover	.34
4709	Cover—Pickup back cover with two mounting screws	.34
3737	Damper—Pickup damper—Package of 5	.65
6815	Escutcheon—Pickup arm escutcheon	.64
4561	Pad—Cork pad—Used when making home recordings	.45
4582	Pickup unit complete	4.30
4062	Rod—Automatic brake trip rod	.20

REPLACEMENT PARTS—(Continued)

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

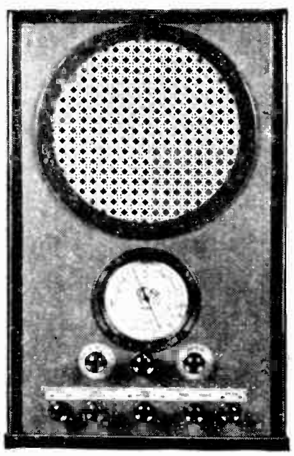
Stock No.	Description	List Price
4063	Screw assembly—Pickup mounting screw assembly—Comprising one screw, one washer and one nut—Package of 10	$0.54
3388	Screw—Needle holding screw—Package of 10	.60
3419	Screw—Pickup cover holding screw—Package of 10	.40
4157	Weight—Home recording weight	1.72
	RECORDING INDICATOR ASSEMBLIES	
4162	Escutcheon—Recording indicator escutcheon	.34
4161	Lamp—Neon lamp	.56
4164	Screen—Indicator lamp screen	.18
4163	Screw—Screen, escutcheon and terminal board mounting screw assembly—Comprising two screws, two spacers, two nuts and two lockwashers	.20
	REPRODUCER ASSEMBLIES	
4706	Board—Terminal board—Three terminals	.30
4568	Bolt assembly—Reproducer mounting bolt assembly—Comprising one bolt, one lockwasher, one washer and one nut—Package of 10	.55
9542	Coil—Field coil, magnet and cone support (L43)	11.16
7000	Cone—Reproducer cone (L42)—Package of 5	9.45
9541	Reproducer complete	17.32
6999	Screen—Dust screen—Package of 6	.12
7826	Transformer—Output transformer and capacitor (T4, C56)	2.80
	SWITCH ASSEMBLIES	
3994	Cover—Motor switch cover	.26
10184	Plate—Automatic brake latch plate—Package of 5	.40
10174	Springs—Automatic brake springs—Package of 4	.50
6805	Switch assembly—Automatic switch complete	1.90
3322	Switch—Motor switch (S20)	.75
	TURNTABLE ASSEMBLIES	
4065	Bushing—Speed shifter lever bushing—Package of 4	.82
3344	Cover—Grease retainer cover—Package of 2	.70
6818	Lever—Speed shifter lever	.38
3341	Pin—Groov pin—Package of 2	.56
6816	Ring—Clamp ring assembly—Comprising spring, latch lever and stud	.42
4708	Turntable complete	5.10
6817	Sleeve—Sleeve complete with ball race	2.25
3342	Spring—Latch spring—Located on clamping ring—Package of 2	.56
3347	Spring—Speed shifter lever spring—Package of 2	.30
3340	Washer—Thrust washer—Package of 2	.56

Stock No.	Description	List Price
	MISCELLANEOUS PARTS	
4556	Base—Phonograph compartment lamp base and socket	$0.55
4546	Bearing—Selector flexible shaft bearing and nut and set screw—Fastened to motor board	.50
4677	Bezel—Metal bezel (escutcheon) for station selector dial	.56
4555	Box—Needle box complete with lid	.40
4559	Bracket and bushing—Selector switch flexible shaft bracket and bushing—Fastened to selector switch	.52
4572	Escutcheon—Selector switch escutcheon	.46
6614	Glass—Station selector dial glass	.30
4425	Knob—Station selector or Radio-phonograph—Recording switch knob—Package of 5	.75
3829	Knob—Volume control, tone control, noise suppressor or range switch knob—Package of 5	1.10
4340	Lamp—Dial lamp—Package of 5	.60
4190	Pointer—Selector switch pointer—Package of 5	.72
4710	Receptacle—Needle receptacle	.35
4091	Resistor—80 ohms—Carbon type—¼ watt—Located on selector switch (R64)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R65, R66, R67)—Package of 5	1.00
4678	Ring—Station selector dial glass retaining ring—Package of 5	.34
4119	Screw—8-32-¼″ headless set screw for knob—Stock Number 4425—Package of 20	.38
4393	Screw—8-32-5/16″ headless set screw for knob—Stock Number 3829—Package of 10	.25
4191	Screw—10-32-7/16″ dog point fillister head set screw—Used with flexible shaft bearing—Package of 10	.50
3651	Screw—10-32-3/16″ self-locking headless set screw—Used with flexible shaft bearing—Package of 10	.32
3652	Screw—10-32-¼″ self-locking set screw for selector switch, flexible shaft bracket and bushing—Package of 10	.32
4580	Screw—6-32-3/16 square head set screw for selector switch flexible shaft—Package of 10	.25
4560	Screw assembly—Receiver chassis mounting screw and washer assembly—Package of 10	.30
4557	Shade—Phonograph compartment lamp shade	.35
4558	Shaft—Selector switch flexible shaft	1.10
4544	Switch—Radio-phonograph, or home recording selector switch (S22)	7.10
4579	Switch—Toggle type—Motor starting switch (S21)	1.55
4545	Transformer — Input transformer pack — Comprising one input transformer, one 50,000 ohm, one 500,000 ohm and one 80,000 ohm resistor, one .0003 mfd. and one 0.1 mfd. and one .015 mfd. capacitors (T5, C90, C91, C92, R61, R62, R63)	5.40

Instructions 23273

Nine-Tube General Purpose "All-Wave" Receiver

(With CW Oscillator)



RCA Victor Company, Inc.

CAMDEN, N. J., U. S. A.

INTRODUCTION

This all-wave radio receiver utilizes the widely-recognized superheterodyne circuit and the broad range covered makes it an ideal general purpose receiver. The receiver is capable of operation through a continuous tuning range of from 540 to 18,000 kilocycles (555 to 16.7 meters) and also in the aviation long-wave services of 150 to 410 kilocycles (2,000 to 732 meters). A separate heterodyne oscillator unit is included to provide a beat-note for CW reception. All facilities provided in this instrument for reception beyond the limits of the standardized broadcast band (540 to 1500 kilocycles) are built-in as integral parts of the radio chassis—not simply connected to an existing chassis as a short-wave adaptor—resulting in distinctly superior performance.

To facilitate tuning as much as possible, the complete main tuning range is divided into five bands, each spread over the full span of the dial. These steps, or frequency bands, are quickly interchangeable by means of a range-switch controlled by a knob on the front panel. Also contributing to tuning ease and accuracy are the clock-type "full-vision" illuminated dial which is calibrated throughout in frequency, and the associated vernier (double-reduction ball-bearing) tuning drive. For greater flexibility in operation, a separate heterodyne oscillator unit is included which provides an audio beat-note for reception of CW signals. A switch is provided for disconnecting the automatic volume control when desired and a radio sensitivity control is provided as an inter-channel noise suppressor or for adjustment of the r-f gain when the AVC is off. Pin-jacks are provided for connection of headphones and a switch is provided for connecting the output to either the loudspeaker or headphones.

The technically-informed user of this instrument naturally will be interested in its many advanced engineering features. Of chief importance is the use of tuned-radio-frequency amplification preceding the first heterodyne oscillator circuit to minimize extraneous signal interference (image-frequency response, etc.) and to improve the "signal-noise" ratio. Two t-r-f stages are included, one being common to all bands and the second used only in conjunction with the highest-frequency band to compensate for the inherently greater circuit losses obtained in that range. Additional features of note are: (1) Its automatic volume control operating uniformly at all carrier frequencies and (2) its high-powered (Class B) audio-output system utilizing the new "twin-amplifier" Radiotron RCA-53. In general, all of the best practices observed heretofore in modern high-grade receivers of the standard broadcast type are incorporated in this "all-wave" instrument, thus insuring excellent performance over the entire tuning range.

INSTALLATION

Location.—The instrument should be placed convenient to the antenna and ground connections and near an electrical outlet.

Tubes.—The instrument is equipped and tested at the factory with RCA Radiotrons and is shipped with these tubes installed. Before making the required external connections, however, it will be advisable to examine the tube installation, as one or more of the tubes, shields or dome terminal clips may have been jarred loose in shipment. Refer to the tube location diagram printed on the instrument label inside the cabinet and make certain:

(1) That all tubes are in the proper sockets and pressed down firmly.

(2) That all shields are rigidly in place over the tubes represented by double circles on the diagram.

(3) That the spring connectors of the short flexible (grid) leads, shown on the diagram, are securely attached to the dome terminals of the proper tubes.

NOTE—The grid lead for the RCA-2B7 Radiotron must be enclosed by the cylindrical tube shield. A slot is provided at the bottom of this shield for entrance of the lead.

Antenna and Ground.—The efficiency of any antenna varies greatly with the frequency of incoming radio waves, a given length being excellent at certain frequencies and comparatively poor at others. For uniform results throughout a wide tuning range such as found in this instrument, therefore, an antenna of adjustable length would be desirable theoretically. From a practical standpoint, however, very good results will be obtained using two antennas of different lengths, one 24–29 feet for short-wave reception, and the other 50–100 feet for reception in the long-wave, standard broadcast and police bands, the lead-in considered as part of the total length in each case.

The shorter antenna may be used alone if preferred, but probably will not be satisfactory for receiving distant or low-powered stations in the standard broadcast band. Further, no advantage will be gained by its use on the shorter wave-lengths unless it can be installed so that the majority of its length is unshielded (not contained in a building of metallic construction) and sufficiently remote from sources of man-made interference (such as house wiring, power lines, street-railways and passing automobiles) to prevent excessive noise. If these conditions cannot be fulfilled, it will be preferable to erect a single antenna of compromise length (100–105 feet overall), which, in addition to providing excellent results in the standard broadcast band, will also favor reception in the short-wave broadcast bands located at 49, 31, 25 and 19 meters.

Best performance of this receiver on the shorter wave-lengths can be insured by installation of the recently introduced "World-Wide" antenna system, available from your dealer as a convenient accessory kit. The advantages of this system are two-fold, its use providing: (1) A great improvement in efficiency, as evidenced by increased signal strength—often several times that obtainable with the conventional single-wire type and (2) a considerable decrease in local electrical interference (man-made static) which is apt to be objectionably severe at the higher frequencies. For densely-populated districts, therefore, this system is virtually a necessity.

Good reception in many installations will be obtained without connecting the instrument to an external ground, since the power-line characteristics often render a separate radio ground unnecessary. In any case, however, best results will be insured by grounding the set in the conventional manner to a water-pipe or radiator or to a metallic pipe or stake driven from five to eight feet into the soil. The ground lead when used should be short, preferably not more than 15 feet in length, and connected to a clean portion of the pipe or stake surface by means of an approved ground clamp.

A terminal board is provided at the rear of the receiver chassis for connection to the antenna and ground. Attach the antenna wire or lead-in to the left-hand terminal (marked "ANT") and the ground wire to the right-hand terminal (marked "GND"). Tighten both terminals with a screw-driver to insure permanent electrical connections.

Power Supply.—These equipments are furnished for operation from a 100–125/200–250 volts, 50–60 cycle supply. To insure correct tube operating voltages, internal connections may be changed to adapt the receiver for operation from 100–115, 115–125, 200–230 and 230–250 volt, 50–60 cycle supplies. (The receiver as shipped is connected for 115–125 volt operation.) Consult your local power company if you are in doubt as to the specific voltage of the supply. Reconnections when required should be made only by a competent technician; changes are as shown in Figure F.

After making certain that the instrument has been connected for the proper voltage, attach the power cord to the electrical outlet.

OPERATION

(1) **Range Switch** (Upper Left-hand Knob)—This switch converts the receiver for operation within any of the tuning ranges provided. As indicated on the selector dial, the letters on the switch escutcheon signify:

X—*Long-Wave Range*—150 to 410 kilocycles (2000 to 732 meters). Airport band.

A—*Standard Broadcast Band*—540 to 1500 kilocycles (555 to 200 meters).

B—*Police Band*—1500 to 3900 kilocycles (200 to 77 meters). Services available within this band include police calls at 1574, 1712 and 2450 kilocycles, amateur radio "phone" communications between 1800 and 2000 kilocycles, and aviation communications (phone) between 2500 and 3500 kilocycles.

C—*Short-Wave Range*—3900 to 10,000 kilocycles (77 to 30 meters). Within the limits of this range are included two of the internationally-assigned short-wave broadcast bands. These are known as the 49 and 31 meter bands. (The portion of this range from 8000 to 10,000 kilocycles, which includes the 31 meter band, is preferably received on range D.)

D—*Short-Wave Range*—8,000 to 18,000 kilocycles (37.5 to 16.7 meters). This range embraces four of the standardized short-wave broadcast bands located at 31, 25, 19 and 16 meters, respectively.

(2) **Station Selector** (Upper Middle Knob with Crank)—Scales X, A and B on the illuminated dial are calibrated in kilocycles and traversed by the lower end of the moving pointer. The upper end of the pointer traverses scales C and D which are calibrated in megacycles (affix three ciphers to convert to kilocycles). The scale portions covered by the police bands on scale B and by the standardized short-wave broadcast bands on scales C and D are bracketed and clearly identified; each police band is designated by the letter "P" and each broadcast band by numerals corresponding to the wavelength followed by the letter "M" (meters), such as "49M."

(3) **Audio Volume Control** (Upper Right-hand Knob)—This control varies the output volume level by variation of the input to the audio amplifier. Sound level (volume) increases with rotation of this control in a clockwise direction.

(4) **AVC Switch** (Lower Left-hand Knob).—This switch serves to turn the automatic volume control on and off. Turn to "Off" position for reception of CW signals, and "On" for reception of phone, MCW, ICW and damped wave signals.

(5) **Radio Sensitivity Control** (to right of AVC Switch).—This control serves to vary the receiver sensitivity by variation of the bias on the r-f and i-f amplifier stages and is normally employed to control the volume when the AVC is "Off." When so employed, the Audio Volume Control should be set near its maximum position. This control should be in the extreme clockwise position when the AVC is "On," using Audio Volume Control to vary the volume. For operation where unusually high electrical noise levels exist, this control may be employed to reduce the inter-carrier noise levels when tuning with the AVC "On."

(6) **Power Switch and Tone Control** (Lower Middle Knob)—The power switch operates at the counter-clockwise end of the control range. A slight clockwise rotation actuates the switch, causing illumination of the dial—indicative of normal operation. Treble response increases gradually to a maximum with continued clockwise rotation.

(7) **Speaker-Phones Switch** (right of Power Switch and Tone Control)—This switch serves to connect the receiver output to either the loudspeaker or to headphones. Headphone cord tips are to be plugged into the two pin-jacks located on the same mounting plate as the CW oscillator unit, available at the back of the set. It is recommended that high impedance (approximately 20,000 ohm) headphones be used.

(8) **CW Oscillator Switch** (Lower Right-hand Knob)—This switch serves to turn the separate CW oscillator on and off. Switch should be "On" for reception of CW signals or when locating station carriers, and "Off" for all other (modulated) types of reception.

Procedure.—The actual operation is simple and not unlike that of more conventional instruments designed for the reception of standard broadcast programs alone. However, the full possibilities of any short-wave receiver cannot be attained unless the user has a practical knowledge of short-wave transmission behavior and operating schedules. It is therefore recommended that the appended Notes on Short-Wave Reception and the inserted Short-Wave Broadcasting Station List and Program Schedule be studied carefully.

A brief outline of the recommended operating procedure for reception of phone and modulated signals follows:

1. Set the Range Switch for the frequency range within which the desired station is included; turn AVC "On," CW Oscillator "Off," Radio Sensitivity Control to extreme clockwise position and select "Speaker" or "Phones" as desired.

2. Turn the Power Switch "On" and the Tone Control fully clockwise—for full-range reproduction. Wait a few seconds in order that the tubes may attain the proper temperature before attempting further operation.

3. Advance the Audio Volume Control to a position near the middle of its range and rotate the Station Selector until the dial indicator assumes a position coincident with the listed frequency of the desired station (on that scale which is designated by the letter corresponding to the range-switch setting). Then turn the selector very slowly over a narrow range on each side of that setting, advancing the Audio Volume Control further in a clockwise direction and repeating the tuning process, if necessary, until the signal is heard.

NOTE—This procedure is important—especially so for short-wave reception. Because of the wide band of frequencies covered by the short-wave ranges, tuning is critical (sharp). A station of suitable strength often will be imperceptible if passed through rapidly or in a haphazard manner. (Very weak signals may be located by turning the CW oscillator "On.")

4. After receiving the signal, turn the Audio Volume Control counter-clockwise until the volume is reduced to a low level. Then readjust the Station Selector accurately to the position mid-way between the points where the quality becomes poor or the signal disappears. This setting minimizes the proportion of background noise (static) and provides the fine quality of reproduction possible with this instrument.

5. Adjust the Audio Volume Control to the desired volume level. Once the desired audio level has been set, the automatic volume control functions to prevent overloading of the receiver for considerable variations of input signal strength.

6. If less treble response is preferred, rotate the Tone Control counter-clockwise to obtain the most pleasing quality of reproduction; static interference, when excessive, also may be reduced in this manner.

7. When through operating, turn the Tone Control fully counter-clockwise, thus switching "Off" the power.

For reception of CW signals, proceed as follows:

Turn AVC switch "Off" and CW switch "On." Procedure is the same as above except all references to volume control should refer to Radio Sensitivity Control and Audio Volume Control should be near the extreme clockwise position. Each station tuned in will be indicated by a whistle caused by the beating of the CW oscillator frequency with the signal frequency. This feature provides unmistakable signal indication and may also be used when tuning signals other than CW, noting the presence of the signal with the oscillator "On" and tuning the station in finally with the oscillator turned "Off."

NOTES ON SHORT-WAVE RECEPTION

While the design of this instrument is such that no previous experience or special skill is required for proper operation, its full possibilities can be realized only by those familiar with the general characteristics of transmission on the shorter wavelengths. The following notes are a summary of extensive data compiled mainly by experimentation and should be found both interesting and helpful, especially to beginners in the field of short-wave reception.

Broadcast transmission at 49 meters is most reliable when received from a distance of 300 miles (500 kilometers) or more, although good reception at distances greater than 1500 miles (2400 kilometers) can be expected only when a large portion of the signal path lies in darkness.

Thirty-one (31) meter stations afford greatest reliability of service to receivers situated at a distance exceeding 800 miles (1300 kilometers). Good reception from distant stations in this band is possible both day and night.

Reception from stations operating in the 25 meter band is most common when a span of 1000 miles (1600 kilometers) or more separates the receiver and transmitter. Such transmission over distances of less than 2000 miles (3200 kilometers), will be received best during daylight hours. The more distant stations, however, can still be heard well after nightfall under favorable conditions.

In the 19 meter band, stations situated at a distance of 1500 miles (2400 kilometers) or greater will be found most satisfactory. Signals in this band will generally be heard during daylight hours—rarely after nightfall or when any appreciable portion of the transmission path is in darkness. Wavelengths below 19 meters are useful only when transmitted entirely through daylight and over long distances (2000 miles or more); ordinarily they cannot be received after sunset.

Transmitted signals of any wavelength are known to divide into two components—the "ground" wave and the "sky" wave. The former remains close to the earth's surface, providing reliable service only over short distances from the broadcasting station. The sky wave, however, travels into the higher layers of the atmosphere and is reflected back to the earth's surface at an appreciable distance from the station. With short-wave signals, the sky wave usually does not return within the radius covered by the ground wave, resulting in a so-called dead-spot region within which reception is impossible or extremely unsatisfactory. The length of the region wherein such conditions are effective is known as the skip distance, varying greatly from day to night and from summer to winter approximately as shown in Table I.

When attempting to receive distant or foreign stations, the time standards observed at various longitudes throughout the world must be considered. At 8:00 P. M. in New York or 7:00 P. M. in Chicago, it is of the next day—1:00 A. M. in London, 2:00 A. M. in most of Europe and 11:00 A. M. in Australia. On the American continents, therefore, regular evening broadcasts from Europe will be received in the late afternoon and from Australia in the early morning. Special programs, however, are frequently transmitted from European stations at times chosen for evening reception in America.

Although reception on the short wavelengths is less affected by atmospherics or static and good results may be had in midsummer even during a thunder storm, the reverse is true of man-made interference. Electrical machinery such as trolleys, dial telephones, motors, electric fans, automobiles, airplanes, electrical appliances, flashing signs and oil burners create far more interference to the shorter waves than to frequencies in the standard broadcast band (200 to 555 meters).

While the foregoing statements are valid, many other factors may so influence the transmission of short waves that exceptions are probable in certain locations. Experience in the operation of short-wave receivers in a given location is the best guide as to what to expect in reception at various times.

Any person interested primarily in short-wave reception will find membership in the International Short-Wave Club of great value. The club is a non-commercial organization and issues a monthly magazine (International Short-Wave Radio) which contains up-to-date information pertaining to short-wave broadcasting, amateur activities and commercial, police and aircraft services. The annual membership fee, including the magazine subscription, is one dollar ($1.00), U. S. Currency; single copies of the periodical may be procured by non-members for ten cents ($0.10) U. S. Currency, each. Address International Short-Wave Club, P. O. Box 713, Klondyke, Ohio, U. S. A.

Table I—Effect of Time of Day and Season of Year on Short-Wave Transmission*

Wavelength (Meters)	Ground Wave Range		Sky Wave (Mid-Summer) Approximate Range				Sky Wave (Mid-Winter) Approximate Range			
			Noon		Midnight		Noon		Midnight	
	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.	Miles	Kilom.
100	90	145	—90	—145	90—600	145—960	90—100	145—160	90—2500	145—4000
49	75	120	100—200	160—320	250—5000	400—8000	200—600	320—960	400—∞	640—∞
31	60	97	200—700	320—1125	1000—∞	1600—∞	500—2000	800—3200	1500—∞	2400—∞
25	50	80	300—1000	480—1600	1500—∞	2400—∞	600—3000	960—4800	2000—∞	3200—∞
19	35	56	400—2000	640—3200	2500—∞	4000—∞	900—4000	1450—6400	X	X
15	15	24	700—4000	1125—6400	X	X	1500—∞	2400—∞	X	X

∞—Unlimited distance. X—Ordinarily cannot be heard.

*Time and season apply to transmitting station. Distances specified are based on relatively high-power transmission and favorable conditions of reception.

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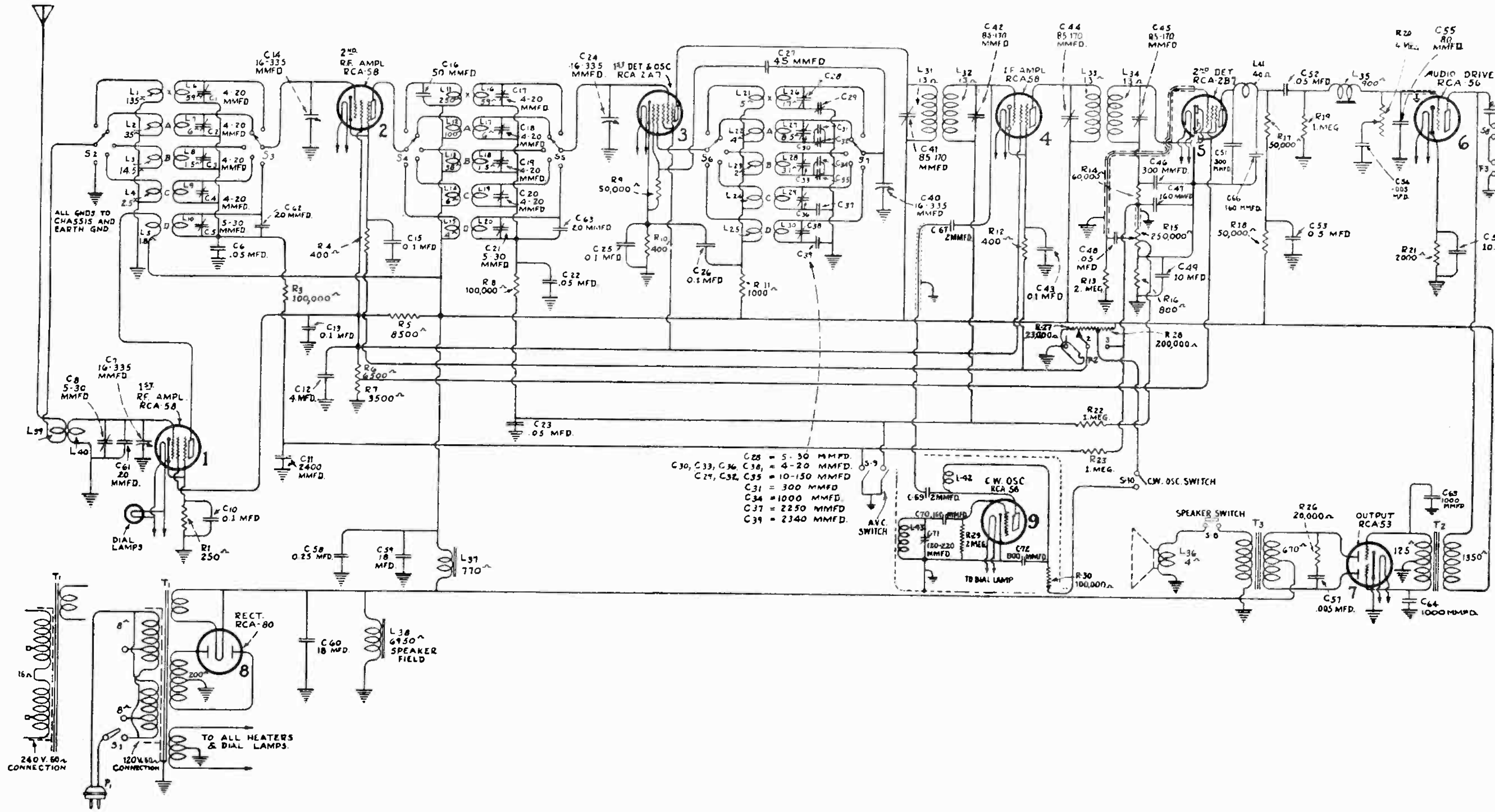

Figure A—Schematic Circuit Diagram—Additional Resistor–750,000 ohms–Parallel to R-28 on some models

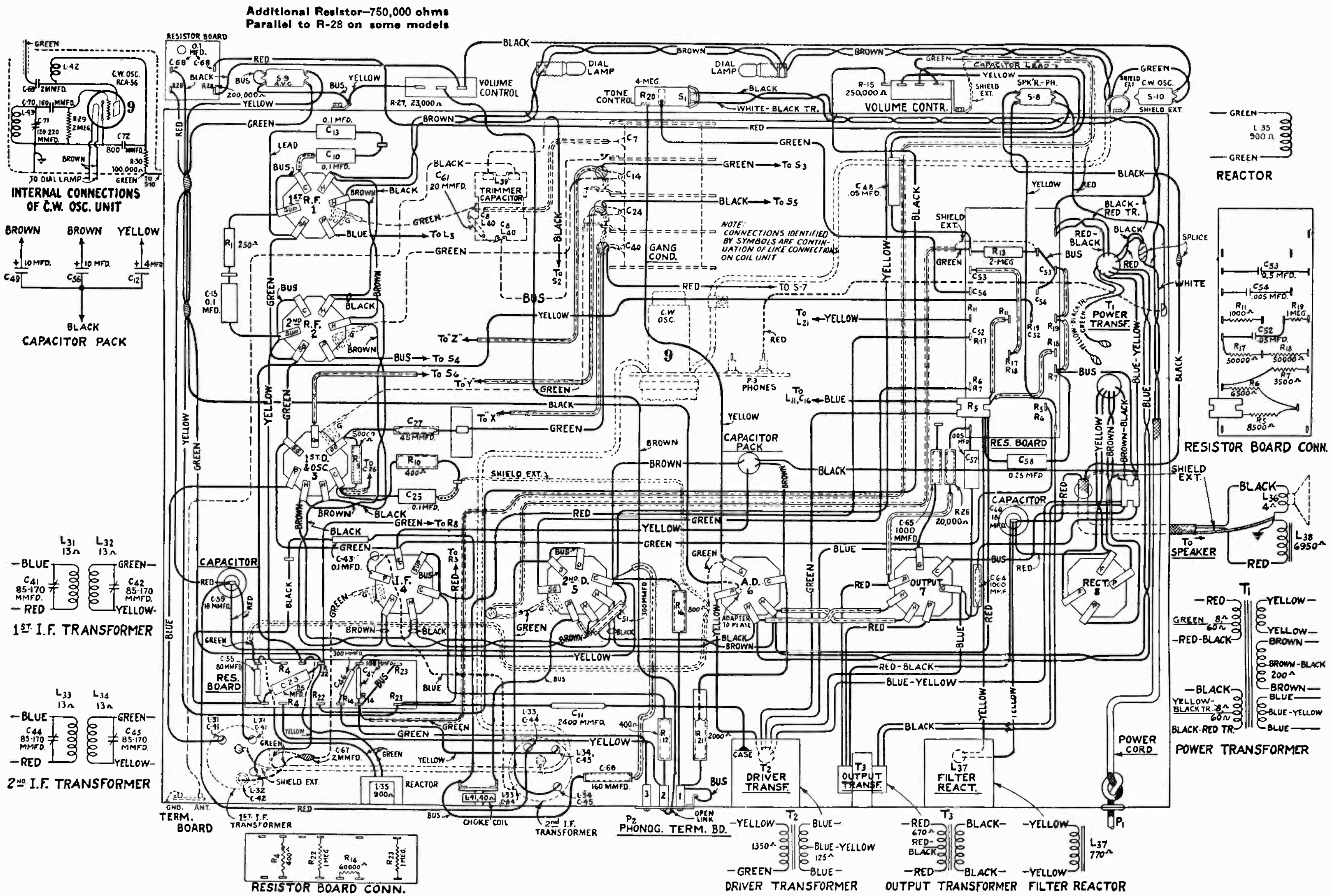

Figure B—Chassis Wiring

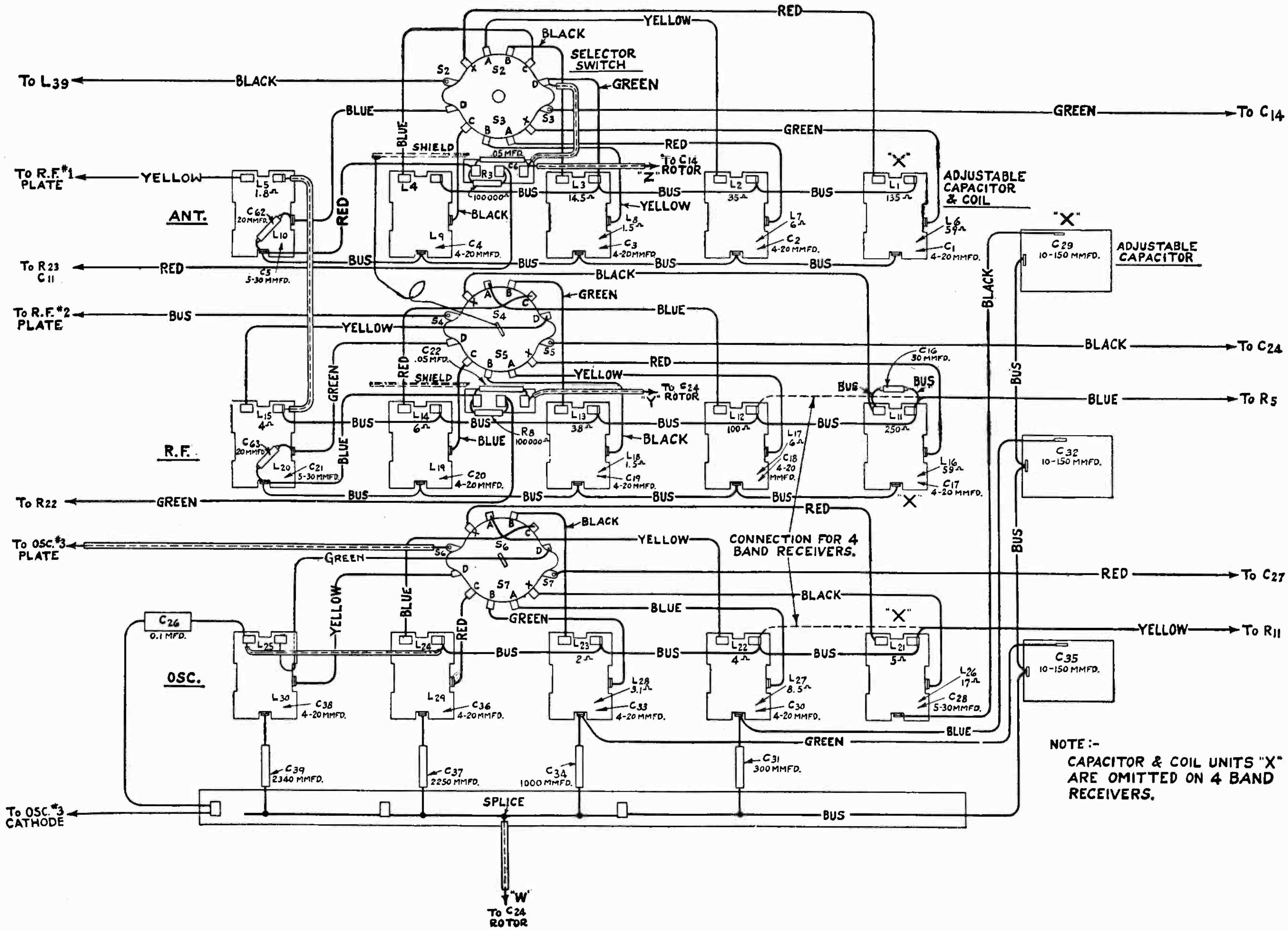

Figure C—Wiring Diagram of Coil Assembly

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SERVICE DATA

Electrical Specifications

Voltage Rating............100–125 Volts and 200–250 Volts
Frequency Rating..........................50–60 Cycles
Power Consumption..........................110 Watts
Type and Number of Radiotrons
3 RCA-58, 1 RCA-2A7, 1 RCA-2B7, 2 RCA-56, 1 RCA-53, 1 RCA-80—Total 9
Type of Circuit
Straight Super-Heterodyne for all frequencies with Class "B" Output Stage.
Undistorted Output............................6 Watts

This all-wave super-heterodyne receiver is of the continuous tuning type utilizing a straight super-heterodyne circuit in all bands. The bands are as follows:

Selector Switch Position	*Frequency Range (Kilocycles)*	*Wave-Length Range (Meters)*
X	150–410	2000–732
A	540–1500	555–200
B	1500–3900	200–77.0
C	3900–10000	77.0–30
D	8000–18000	37.5–16.7

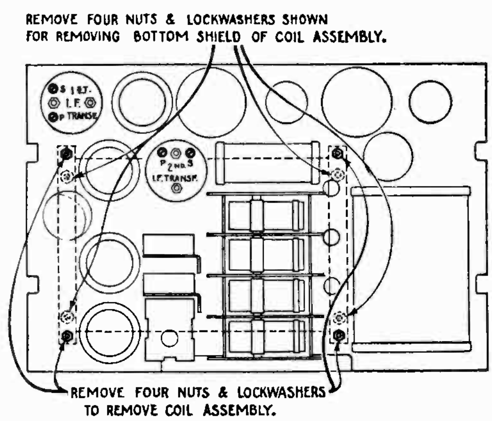

Figure D—Location of nuts and lockwashers holding coil assembly

The circuit consists of an R. F. stage using Radiotron RCA-58, a combined oscillator and first detector using Radiotron RCA-2A7, an I. F. stage using RCA-58, a second detector and A. V. C. using RCA-2B7, an A. F. driver using RCA-56, and a Class "B" output stage using an RCA-53. The RCA-80 functions as the rectifier in the power supply circuits.

The foregoing Radiotrons and circuit functions apply to bands X, A, B and C only. In the case of band D, an additional R. F. stage utilizing an additional Radiotron RCA-58 is used. This is to increase the sensitivity and image frequency selectivity and to reduce the interference caused by tube hiss and 445 K. C. signals or static.

The intermediate frequency is 445 K. C. The use of this frequency gives an especially good image frequency ratio and makes easier alignment of the oscillator at the higher frequency bands.

In order to receive pure C W signals, an I. F. heterodyne oscillator has been provided. This oscillator is an RCA-56 that operates at a 1000-cycle higher frequency than the I. F. An adjustable capacitor is provided so that the pitch of the heterodyne frequency may be varied throughout the audible range.

Mechanical Construction

The chassis consists of two major assemblies, which must be disassembled for certain repair work. These assemblies consist of the chassis proper, including the main frame, power transformer, etc., and the coil assembly. The coil assembly consists of fifteen transformers supported upon individual tubular bakelite forms, each fastened to a separate porcelain strip upon which the coil terminals are mounted with their associate trimmer capacitor. This entire assembly with the selector switch is grouped in a shielded compartment which is mounted in the base of the main chassis assembly.

In order to remove this assembly it is necessary to remove the four nuts shown in Figure D and unsolder the connections of the fifteen leads shown in Figure C at the points where they connect to the main chassis. The leads should be allowed to remain on the coil assembly. After this is done, the coil assembly may be removed and repairs to it or to the main chassis may be easily made. If a coil or its associated trimmer is to be replaced, then only the bottom shield of the coil assembly must be removed. This is done by removing the four nuts that hold it to the chassis studs. This is shown in Figure D.

Line-up Capacitor Adjustments

This receiver is aligned in a similar manner to that of a standard broadcast band receiver. That is, the three main tuning capacitors are aligned by means of three trimmers in each band and on the three lowest frequency bands a series trimmer is adjusted for aligning the oscillator circuit. The other two bands do not require this low frequency trimmer, it being fixed in value. In the case of band D, it is necessary to adjust four trimmers due to the additional R. F. stage used.

RADIOTRON SOCKET VOLTAGES

120 Volt, A. C. Line

Radiotron No.	Control Grid to Cathode. Volts	Screen Grid to Cathode, Volts	Plate to Cathode, Volts	Plate Current, M. A.	Filament or Heater, Volts
RCA-58, R. F.	**2.0	100	255	6.0	2.6
RCA-58, S. W. R. F.	**2.0	100	255	6.0	2.6
RCA-2A7, Det.-Osc.	**2.5	100	250	*5.0	2.6
RCA-58, I. F.	**2.0	100	255	6.0	2.6
RCA-2B7, 2nd Det.-AVC	**1.5	35	105	1.5	2.6
RCA-56, A. F. Driver	**12.0	—	245	6.0	2.6
RCA-53, Output	0	—	300	36.0	2.6
RCA-80, Rectifier	640 R. M. S. Plate to Plate			130 per Plate	5.0
RCA-56, CW-Osc.	**	—	20	0.1	2.6

* Voltages and current apply to detector portion of tube.

** These voltages cannot be measured because of the high resistance of the circuits.

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The intermediate frequency amplifier is aligned in a similar manner to that of standard broadcast receivers except that it is aligned at 445 K. C. In order to properly align the receiver, it is essential that the Stock No. 9050 Test Oscillator be used. This oscillator covers the frequencies of 90 K. C. to 25,000 K. C. continuously, has good stability and includes an attenuator. In addition to the oscillator, a 300 ohm resistor for use as a "dummy" antenna, a non-metallic screwdriver (such as Stock No. 4160), and an output meter are required. The output meter should be preferably a thermocouple galvanometer connected either across or in place of the cone coil of the loudspeaker.

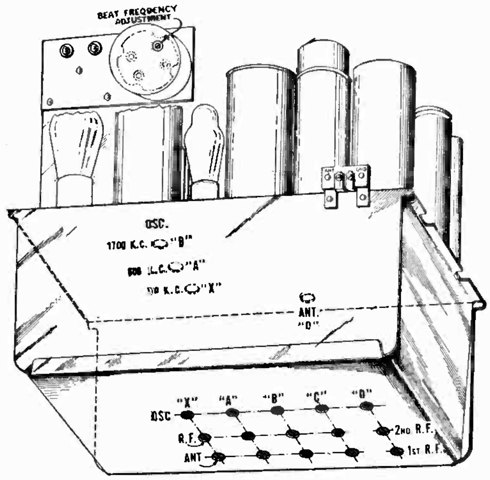

Figure E—Location of line-up capacitors.

To align the intermediate frequency circuits, connect the output of the external oscillator to the grid of the first detector. For the R. F. and oscillator adjustments, the oscillator output should be connected to the antenna and ground terminals of the receiver with a 300 ohm resistor inserted in series with the antenna lead. In many cases, however, the signal strength obtained with this direct connection will be too great to permit proper alignment, even at the minimum setting of the oscillator attenuator. When this is true, the external oscillator must be loose-coupled to the receiver. This is done by connecting the 300 ohm resistor between the antenna and ground terminals of the receiver and attaching a short length of wire to the antenna post. Lay the free end of this wire across the oscillator case, adjusting its position as necessary to obtain the degree of pickup required.

The output of the external oscillator should be at the minimum value necessary to obtain a deflection in the output meter when the volume control is at its maximum position. All adjustments are made for a maximum deflection in the output meter.

The accuracy of line-up of each band may be checked without touching the trimmer condensers, by the use of the tuning wand, Stock No. 6679.

One end of the wand consists of a brass cylinder. When this is inserted in a coil the effective inductance of the coil is lowered.

The other end of the wand contains a special finely divided iron suitable for use at radio frequencies. When this is inserted in a coil the inductance is raised.

To use the tuning wand a signal is first tuned in at the frequency at which a check is desired on alignment. The wand is then inserted slowly in the Antenna and R. F. transformers, using first one end and then the other end of the wand. Unless the alignment is perfect, it will be found that the power output indicated by the meter will be increased to a peak for a critical position of the wand in the coils.

The end of the wand required indicates whether the coil is high or low.

Of course, alignment correction at the high frequency end of a tuning range should be accomplished by the use of the trimmer condenser. If alignment correction should be required at the low frequency end of a tuning range it may be accomplished by sliding the end coil of the transformer. The winding farthest from the trimmer panel is pushed toward the trimmer panel to increase the inductance, and farther away to decrease the inductance. On band D coils, the last two or three turns may be pushed in a similar manner to obtain the proper inductance.

This adjustment should not be attempted unless a quite appreciable improvement will result (as shown by the tuning wand).

The following chart gives the details of all line-up adjustments. The receiver should be lined up in the order of the adjustments given on the chart. Refer to Figure E for the location of the line-up capacitors.

The CW oscillator beat frequency may be adjusted by means of the trimmer capacitor shown in Figure E. (It may be necessary to slightly loosen the shielding cover to gain access to this screw.) A weak modulated or telephone signal should be accurately tuned-in with the oscillator "off". The oscillator should then be turned "On" and the trimmer screw adjusted until a 1000 cycle note is obtained.

Transformer Connections

The power transformer of the 50–60 cycle receiver uses two tapped primary windings. By connecting them in parallel or in series, the receiver may be used either on 110 or 220 volt lines. Figure F shows the proper manner of making the various connections possible for this transformer.

External Oscillator Frequency	Dial Setting	Location of Line-Up Capacitors	Position of Selector Switch	Adjust for	Number of Adjustments To Be Made
445 K. C.	Any setting that does not bring in station.	Top of chassis.	Any position that does not bring in station.	Maximum output.	4
370 K. C.	370 K. C.	Bottom of chassis.	X	Maximum output.	3
175 K. C.	Set for signal.	Top of chassis.	X	Maximum output while rocking dial back and forth.	1
1400 K. C.	1400 K. C.	Bottom of chassis.	A	Maximum output.	3
600 K. C.	Set for signal.	Top of chassis.	A	Maximum output while rocking dial back and forth.	1
3900 K. C.	3900 K. C.	Bottom of chassis.	B	Maximum output.	3
1710 K. C.	Set for signal.	Top of chassis.	B	Maximum output while rocking dial back and forth.	1
10 M. C.	10 M. C.	Bottom of chassis.	C	Maximum output. (See Note)	3
15 or 18 M. C.	15 or 18 M. C.	Bottom and top.	D	Maximum output. (See Note)	4

NOTE—It is important to note, when aligning bands C and D, that two peaks will be observed on the trimmers for the oscillator and for the first detector. The correct oscillator peak is the one obtained using the lower trimmer capacitance, whereas the correct detector peak is the one obtained with the greater capacitance. It is essential that the proper peak be chosen, as otherwise tracking and sensitivity will be very poor at other frequencies. When adjusting the detector trimmer, the tuning capacitor should be rocked, since there is reaction on the oscillator tuning.

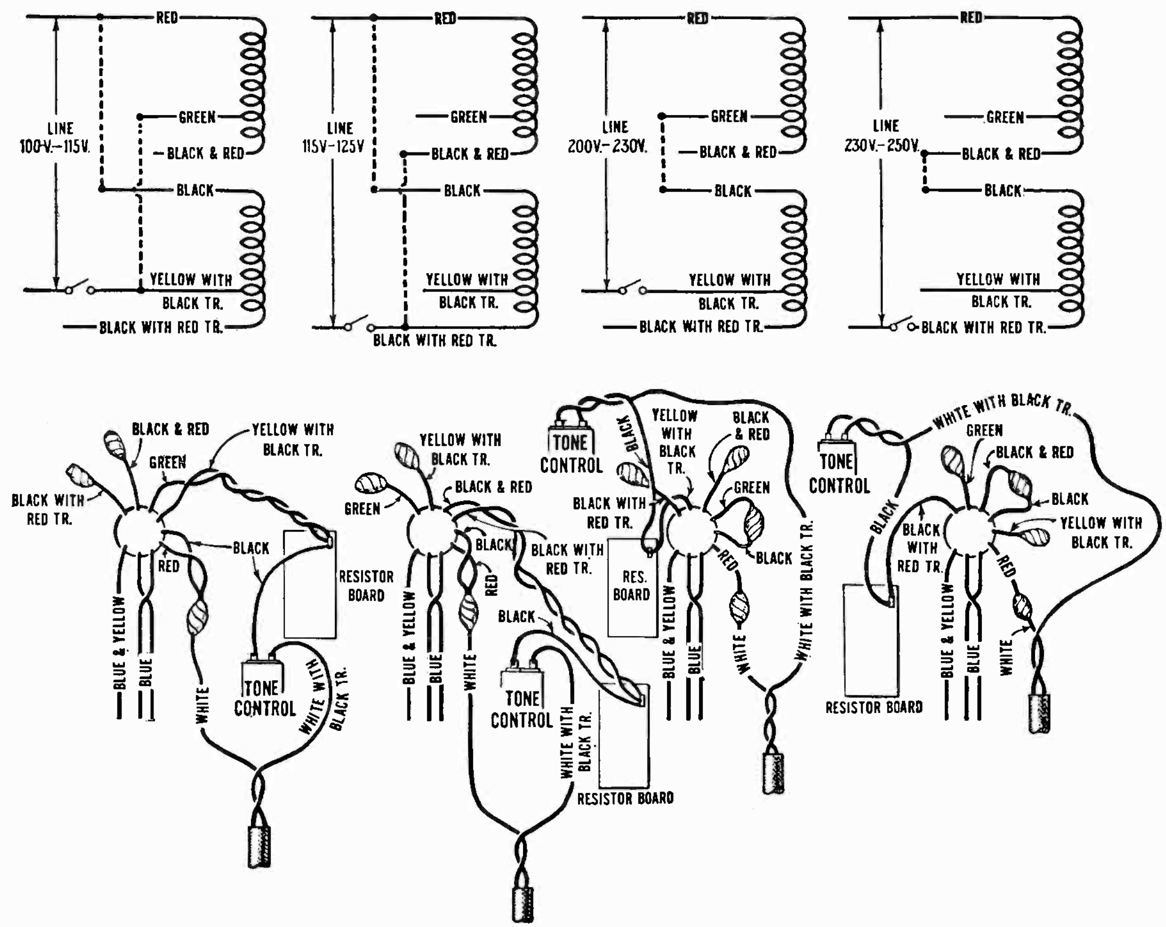

Figure F—Power Transformer Connections (50–60 cycles)

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

RECEIVER ASSEMBLIES

Stock No.	DESCRIPTION	List Price
2747	Contact cap—Package of 5	$0.50
2816	Resistor—1,000 ohms—Carbon type—½ watt (R11)—Package of 5	1.00
3056	Shield—Output Radiotron shield—Package of 2	.40
3076	Resistor—1 megohm—Carbon type—½ watt (R19, R22, R23)—Package of 5	1.00
3114	Resistor—50,000 ohms—Carbon type—¼ watt (R9)—Package of 5	1.00
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R3, R8)—Package of 5	1.00
3435	Resistor—250 ohms—Carbon type—½ watt (R1)—Package of 5	1.00
3470	Resistor—6,500 ohms—Carbon type—1 watt (R6)—Package of 5	1.10
3526	Resistor—2,000 ohms—Carbon type—½ watt (R21)—Package of 5	1.00
3527	Resistor—800 ohms—Carbon type—½ watt (R16)—Package of 5	1.00
3529	Socket—Dial lamp socket	.32
3555	Capacitor—0.1 mfd. (C26, C68)	.36
3572	Socket—7-contact Radiotron socket—First detector and oscillator	.38
3594	Resistor—50,000 ohms—Carbon type—½ watt (R17, R18)—Package of 5	1.00
3597	Capacitor—0.25 mfd. (C58)	.40
3602	Resistor—60,000 ohms—Carbon type—¼ watt (R14—Package of 5	1.00
3616	Capacitor—300 mmfd. (C51)	.34
3622	Shield—Second detector Radiotron shield	.36
3641	Capacitor—0.1 mfd. (C10, C15, C25)	.35
3643	Capacitor—.005 mfd. (C57)	.25
3711	Capacitor—80 mmfd. (C55)	.40
3719	Socket—7-contact Radiotron socket	.30
3771	Resistor—8,500 ohms—Carbon type—3 watt (R5)	.25
3845	Capacitor—2,340 mmfd. (C39)	.50
3846	Capacitor—2,250 mmfd. (C37)	.50
3848	Capacitor—300 mmfd. (C31)	.30
3849	Capacitor—50 mmfd. (C16)	.30
3861	Capacitor—Adjustable trimmer (C29, C32, C35)	.78
3863	Resistor—400 ohms—Carbon type—½ watt (R4, R10, R12)—Package of 5	1.00
3864	Capacitor—300 mmfd. (C46)	.30
3865	Capacitor—160 mmfd. (C47)	.30
3888	Capacitor—.05 mfd. (C6, C22, C23, C52)	.25
3901	Capacitor—.05 mmfd. (C48)	.36
3931	Capacitor—45 mmfd. (C27)	.30
3932	Capacitor—.0024 mfd. (C11)	.30
3973	Capacitor—1,000 mmfd. (C64, C65)	.34
4019	Capacitor—1,000 mmfd. (C34)	.34
4030	Bracket—Tone or volume control mounting bracket	.10
4033	Capacitor—20 mmfd. (C61, C62, C63)	.34
4103	Shield—First detector and R. F. Radiotron shield	.20
4104	Shield—I. F. Radiotron shield	.20
4160	Trimmer adjustment wrench and screwdriver	1.00
4205	Coil—Second detector choke coil (L41)	.50
4207	Capacitor—0.1 mfd. (C13, C43)	.34
4217	Switch—Single pole—Single throw—"CW-OSC" (S10)	1.15
4218	Switch—Double pole—Single throw—"AVC" (S9)	1.00
4219	Switch—Single pole—Double throw—"Speaker-Phone" (S8)	1.90
4220	Resistor—200,000 ohms—Carbon type—1 watt (R28)—Package of 5	1.10
6112	Cushion—Rubber cushions for chassis—Package of 4	.25
6136	Resistor—3,500 ohms—Carbon type—1 watt (R7)—Package of 5	1.10
6188	Resistor—2 megohms—Carbon type—½ watt (R13)—Package of 5	1.00
6278	Resistor—750,000 ohms—Carbon type—½ watt (R31)—Package of 5	1.00
6300	Socket—4-contact Radiotron socket	.35
6303	Resistor—20,000 ohms—Carbon type—½ watt (R26)—Package of 5	1.00
6512	Capacitor—.005 mfd. (C54)	.28
6603	Condenser—4-gang variable tuning condenser (C7, C14, C24, C40)	3.80
6604	Capacitor—0.5 mfd. (C53)	.50
6605	Transformer—Output transformer (T3)	1.48
6606	Reactor—Filter reactor (L37)	1.66
6607	Reactor—Tone control reactor (L35)	1.14
6608	Transformer—Audio driver transformer (T2)	2.04
6609	Capacitor—18. mfd. (C59)	1.10
6612	Volume control—Audio volume control (R15)	1.20
6613	Drive—Variable condenser drive assembly—Complete	1.00
6626	Capacitor pack—Comprising one 4. mfd., and two 10. mfd., capacitors (C12, C49, C56)	1.86
6628	Capacitor and coil—Antenna coil and capacitor assembly—8,000–18,000 kilocycles—4- or 5-band (L39, L40, C8)	1.50
6629	Switch—5-band selector switch	3.48
6630	Switch—4-band selector switch	3.48
6631	Coil and capacitor assembly—Antenna coil and capacitor—150–410 kilocycles—5-band (L1, L6, C1)	2.16
6632	Coil and capacitor—R. F. coil and capacitor assembly—150–410 kilocycles—5-band (L11, L16, C17)	2.10
6633	Coil and capacitor—Oscillator coil and capacitor assembly—150–410 kilocycles—5-band (L21, L26, C28)	$1.40
6634	Coil and capacitor—Antenna coil and capacitor assembly—540–1,500 kilocycles—4- or 5-band (L2, L7, C2)	1.86
6635	Coil and capacitor—R. F. coil and capacitor assembly—540–1,500 kilocycles—4- or 5-band (L12, L17, C18)	2.00
6636	Coil and capacitor—Oscillator coil and capacitor assembly—540–1,500 kilocycles—4- or 5-band (L22, L27, C30)	1.40
6637	Coil and capacitor—Antenna coil and capacitor assembly—1,500–4,000 kilocycles—4- or 5-band (L3, L8, C3)	1.56
6638	Coil and capacitor—R. F. coil and capacitor assembly—1,500–4,000 kilocycles—4- or 5-band (L13, L18, C19)	1.66
6639	Coil and capacitor—Oscillator coil and capacitor assembly—1,500–4,000 kilocycles—4- or 5-band (L23, L28, C33)	1.40
6640	Coil and capacitor—Antenna coil and capacitor assembly—4,000–10,000 kilocycles—4- or 5-band (L4, L9, C4)	1.54
6641	Coil and capacitor—R. F. coil and capacitor assembly—4,000–10,000 kilocycles—4- or 5-band (L14, L19, C20)	1.60
6642	Coil and capacitor—Oscillator coil and capacitor assembly—4,000–10,000 kilocycles—4- or 5-band (L24, L29, C36)	1.34
6643	Coil and capacitor—Antenna or R. F. coil and capacitor assembly—8,000–18,000 kilocycles—4- or 5-band (L5, L10, C5—L15, L20, C21)	1.52
6644	Coil and capacitor—Oscillator coil and capacitor assembly—8,000–18,000 kilocycles—4- or 5-band (L25, L30, C38)	1.54
6675	Shaft—Shaft for condenser drive assembly—Comprising shaft, ball race with retainer and set screw	.35
6679	Wand—Tuning wand for R. F. and oscillator adjustments	.75†
6889	Capacitor—18. mfd. (C60)	1.55
6890	Transformer—First intermediate frequency transformer (L31, L32, C41, C42)	2.40
6891	Transformer—Second intermediate frequency transformer (L33, L34, C44, C45)	2.40
6892	Tone control (R20)	1.50
6953	Volume control—Radio sensitivity control (R27)	1.25
6955	Shield—Second R. F. Radiotron Shield	.25
6956	Shield—Radiotron shield top	.15
7484	Socket—5-contact Radiotron socket	.35
7485	Socket—6-contact Radiotron socket	.40
9042	Transformer—Power transformer—105–250 volts—50–60 cycles (T1)	6.84
9046	Transformer—Power transformer—105–125 volts—25–40 cycles	9.22
9050	Oscillator—Test oscillator—90–25,000 K. C.	29.50†
10194	Ball—Steel ball for condenser drive assembly—Package of 20	.25

MISCELLANEOUS PARTS

Stock No.	DESCRIPTION	List Price
4224	Bezel—Station selector dial bezel	.50
4225	Ring—Dial glass retaining ring—Package of 5	.95
4226	Escutcheon — Engraved — "AVC-on-off" — "Radio Sensitivity" — "Power Tone-off-on" — "Speaker-Phone" —"CW-OSC-off-on"	.85
4227	Escutcheon—Audio sensitivity control escutcheon	.70
4228	Escutcheon—Range switch escutcheon	.35
4229	Knob—Audio volume control tone control or radio sensitivity control knob—Package of 5	1.15
4230	Knob—"AVC" — "CW-OSC" — "Speaker-Phone" and range switch knob—Package of 5	1.15
4231	Knob—Station selector knob—Package of 5	1.15
6614	Glass—Station selector dial glass	.30
6954	Adapter—5-prong adapter	.82

OSCILLATOR ASSEMBLIES

Stock No.	DESCRIPTION	List Price
3118	Resistor—100,000 ohms—Carbon type—¼ watt (R30)—Package of 5	1.00
3634	Capacitor—160 mmfd. (C70)	.34
3682	Shield—Radiotron shield	.22
4027	Capacitor—800 mmfd. (C72)	.44
4221	Jack—Pinjack—Package of 2	.45
4222	Shield—Coil shield	.28
6242	Resistor—2 megohms—Carbon type—¼ watt (R29)—Package of 5	1.00
6950	Coil—Oscillator coil (L42, L43, C69)	.38
6899	Capacitor—Adjustable capacitor—120-220 mmfd. (C71)	.70
6951	Cable—3-conductor shielded cable	.32
6952	Cable—Single conductor shielded	.24
7484	Socket—5-contact Radiotron socket	.35

REPRODUCER ASSEMBLIES

Stock No.	DESCRIPTION	List Price
8969	Cone—Reproducer cone complete (L36)—Package of 5	6.35
9438	Reproducer complete	6.88
9439	Coil assembly—Field coil, magnet and cone support (L38)	5.22

† Full Discount not allowed.

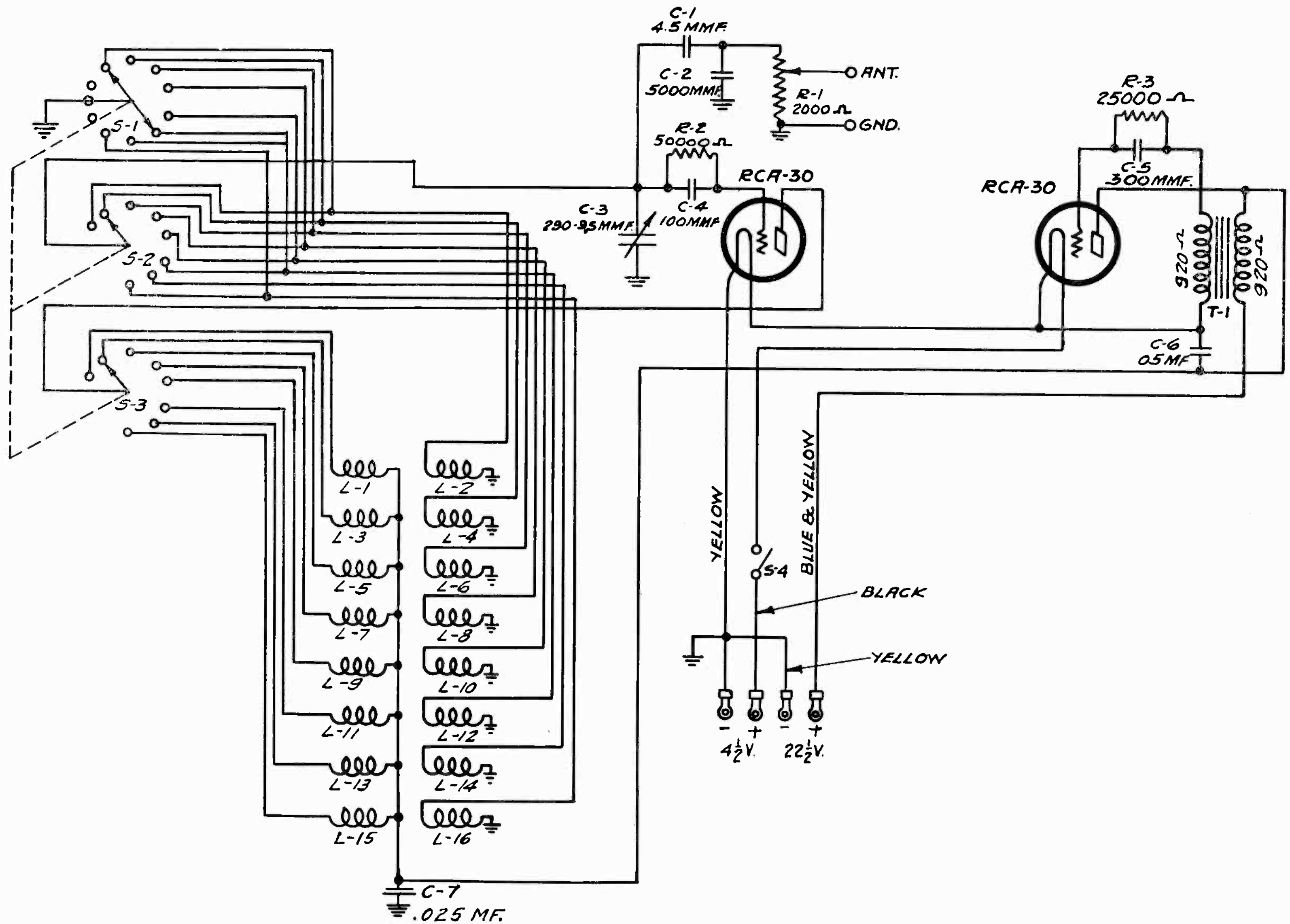

Figure 1—Schematic Circuit

For the lower frequencies, 90 K. C. to 550 K. C., a calibration is readily made by using harmonics of the oscillator for checking against frequencies in the broadcasting band. For example, 175 K. C. can be checked by beating its fourth harmonic with Station WLW, the frequency of which is 700 K. C.

NOTE—An adapter may be obtained, which when plugged into the modulator tube socket provides an unmodulated (CW) output signal.

Maintenance

The battery voltages should be checked if at any time the output of the oscillator becomes weak. The drain on the batteries is small, so that their expected life is approximately 15 hours' operation. However, the batteries should be replaced when the filament battery voltage is less than 3 volts and the "B" battery voltage is less than 17 volts. Always replace the batteries by withdrawing the entire unit from the front of the cabinet. Never remove the back panel.

REPLACEMENT PARTS

Insist on genuine factory tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
2039	Switch—Single pole, single throw toggle switch	$0.72	3986	Scale—Attenuator potentiometer dial scale	$0.66
2744	Capacitor—4.5 mmfd. capacitor (C1)—Package of 5	1.60	3987	Potentiometer — Attenuator potentiometer (R1)	1.70
2932	Capacitor—5,000 mmfd. capacitor (C2)	.50	3988	Post—"Antenna-Ground" binding post	.32
3110	Resistor—25,000 ohm—¼ watt carbon resistor (R3)—Package of 5	1.00	3990	Clip—Spring steel clip	.25
3114	Resistor—50,000 ohm—¼ watt carbon resistor (R2)—Package of 5	1.00	4309*	Coil—R. F. oscillation coil (L1, L2, L3, L4)	2.60
3640	Capacitor—.05 mfd. capacitor (C6)	.25	4310*	Coil—R. F. oscillation coil (L5, L6, L7, L8)	2.50
3765	Capacitor—.025 mfd. capacitor (C7)	.34	4311*	Coil—R. F. oscillation coil (L9, L10, L11, L12)	3.15
3794	Capacitor—100 mmfd. capacitor (C4)	.30	4312*	Coil—R. F. oscillation coil (L13, L14)	2.65
3979	Transformer—A. F. oscillation transformer (T1)	1.94	4313	Switch—Range switch (S1, S2, S3)	4.10
3980	Condenser—Tuning condenser (C3)	1.40	4314	Scale—Range switch dial scale	.66
3981	Capacitor—300 mmfd. capacitor (C5)	.30	4315	Dial—Tuning condenser vernier dial	4.68
3982	Handle—Carrying handle	.60	4316	Adapter	.45
3984	Knob—Moulded knob	.30	6300	Socket—Radiotron socket	.35
			7817	Holder—Calibration chart holder complete with rivets and cover	1.85

* FOR REPLACEMENT PURPOSES ONLY—ITEM TO BE REPLACED MUST BE RETURNED WITH ORDER.

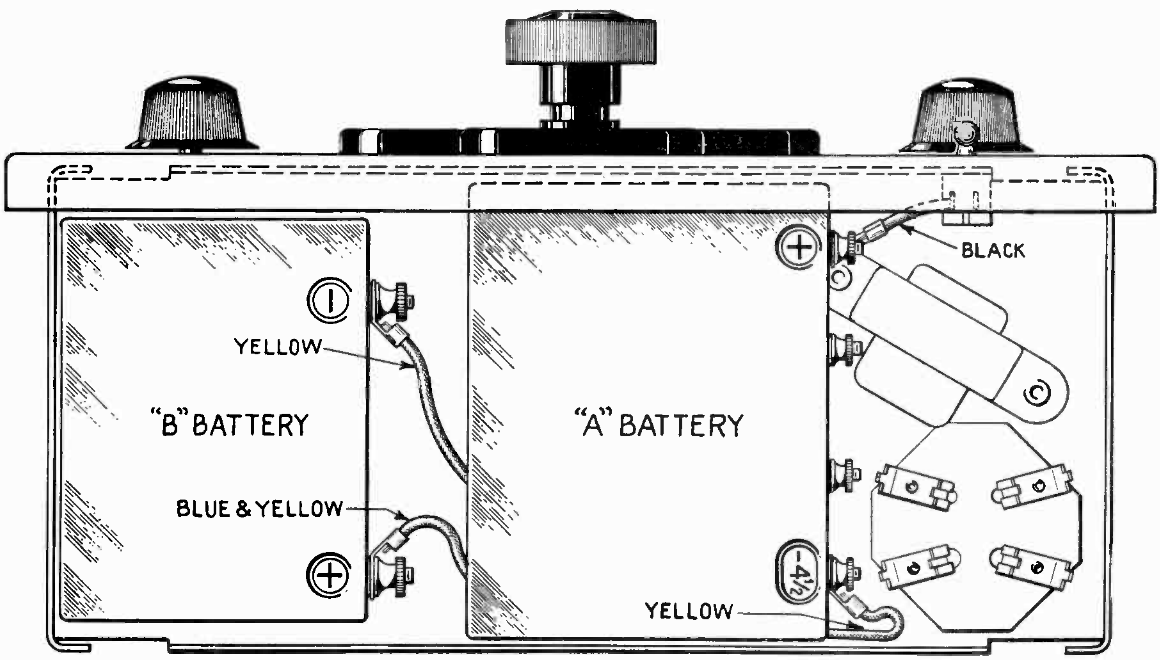

Figure 2—Location of Batteries

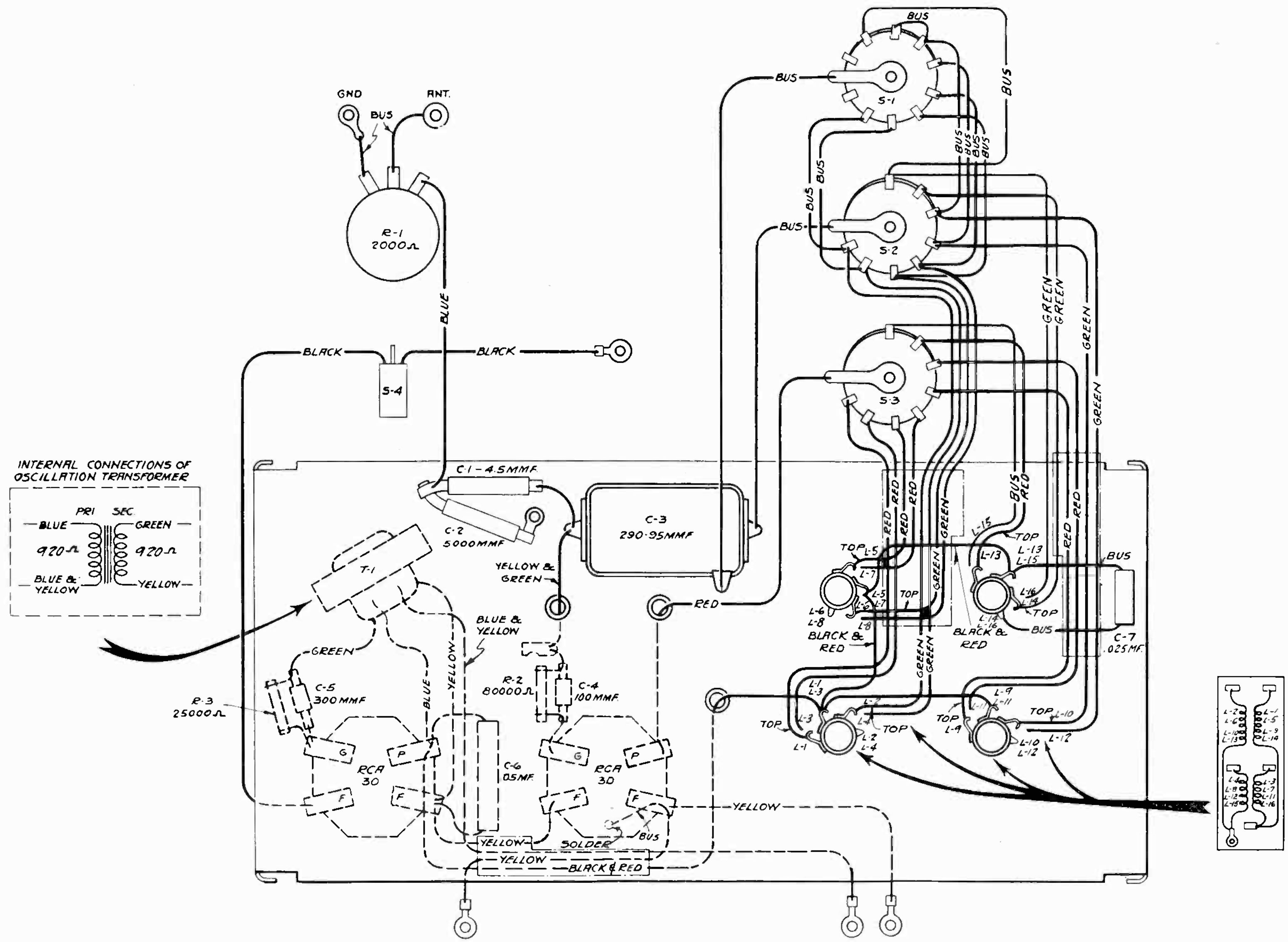

Figure 3—Wiring Diagram

1B-23334

Instructions 25006
for
RCA "World-Wide" Antenna System

INTRODUCTION

The RCA "World-Wide" Antenna System makes available to every owner of a short-wave or all-wave radio receiver the advantages of a scientifically-correct antenna. Through its installation are overcome the two major faults common to any antenna of the conventional type: (1) Lack of uniform reception over the short-wave broadcast range—nominally 16 to 49 meters, and (2) severity of local noise interference produced at the higher frequencies by electrical appliances, power lines, street cars, automobiles and other devices.

Briefly, this system embodies two separate antennas of the efficient *doublet* type, a twisted-pair lead-in (hereinafter called the transmission line), and a special coupling transformer for the receiver. The two antennas are tuned respectively to opposite ends of the short-wave range and cross-connected to provide uniform performance at all intervening frequencies. Signals collected by the antenna are transferred to the receiver with negligible loss since the transmission-line length has been selected to insure proper *electrical matching*. Signals "picked-up" by the transmission line itself, however, are rejected because of the special characteristics of the coupling transformer. Noise interference, which ordinarily is "picked-up" along this length, is thereby reduced to a negligible value or entirely eliminated.

An additional feature of this system is the wavelength-transfer switch incorporated in the coupling transformer. By means of this switch, the antenna may be converted for use in the standard broadcast band (540 to 1500 kc) and in the police, aviation and amateur bands at frequencies up to 6000 kc. The system then functions as a conventional antenna without the coupling transformer, both transmission line conductors being common and connected directly to the receiver. Since the transmission line when so converted becomes part of the effective antenna length, better reception of weak or distant stations in the lower-frequency bands is thus attained. Obviously, however, local or strong stations in those bands may be received well, even though the switch is set for short-wave operation.

INSTALLATION

A typical installation of the RCA "World-Wide" Antenna System is shown in the full-page illustration (Figure 1). Although various forms of installation are possible to satisfy space limitations, the arrangement illustrated is convenient and practical and therefore should be used if possible. All parts necessary for this arrangement, except the supporting poles, are supplied.

Equipment

The following parts are supplied in each kit:

- 2 Stranded antenna wires, each 46½ feet long.
- 1 Transmission line, 110 feet long.
- 1 Receiver coupling transformer with wavelength-transfer switch.
- 4 Porcelain strain insulators.
- 1 Porcelain crossover insulator.
- 2 Porcelain insulator knobs (for supporting transmission line outside dwelling).
- 2 Pieces cambric tubing (for protecting insulation of transmission line at crossover insulator and knob).
- 1 Porcelain entrance-tube insulator.
- 1 Cleat (for supporting transmission line inside receiver cabinet).
- 1 Ground clamp.

Dependent upon the available facilities and space limitations of, or local ordinances at, any given installation, the following items may be necessary:

- 1 or more additional lengths of transmission line—procurable from dealer.
- 1 or 2 antenna masts with auxiliary apparatus such as the rope halyards, metallic guy wires, pulleys, iron pipes, base blocks and base flanges shown in Figure 1.
- 2 Loading coils (for reducing the required length of antenna span—procurable from dealer).
- 2 Lightning arrestors (inside or outside dwelling to comply with local codes).

ALTERNATIVE ANTENNA ARRANGEMENTS

In certain installations, space limitations may prevent the use of the full antenna span—approximately 60 feet. Three alternative arrangements, listed in order of preference, are possible:

(a) Reduced overall length through the use of loading coils.
(b) Reduction of the horizontal angle from a straight line span (180 degrees) to any other of not less than 90 degrees.
(c) Vertical suspension.

The first arrangement (a), in which loading coils are inserted to replace lengths removed from the horizontal sections of the antenna as illustrated by Figure 2, is recommended as the preferred alternative. In this manner, the overall span is reduced to approximately 34 feet, without impairing the original tuning characteristics of the system except in the region of 31 meters. The loss encountered within the broadcast band at this wavelength, however, will not be serious.

Using the second alternative (b), the length of the antenna span is decreased by reducing the horizontal angle between the halves of the system (as viewed from above), rather than by shortening the lengths of the horizontal sections. While loading coils are not required, a third support for the antenna at the crossover insulator must be provided, the installation therefore being usually more difficult than for either *straight-line* arrangement. The antenna efficiency naturally will be lowered as the angle is decreased, resulting in a signal-strength loss on all bands of approximately 30 percent at an angle of 90 degrees.

If vertical suspension (c) is employed, much less ground space than for any horizontal form of antenna is necessary. Although somewhat inferior in noise ratio to the horizontal type, the vertical system enjoys an additional advantage of being practically non-directional. Such an installation, however, is usually both difficult and expensive, but can be simplified to a large extent through the use of loading coils.

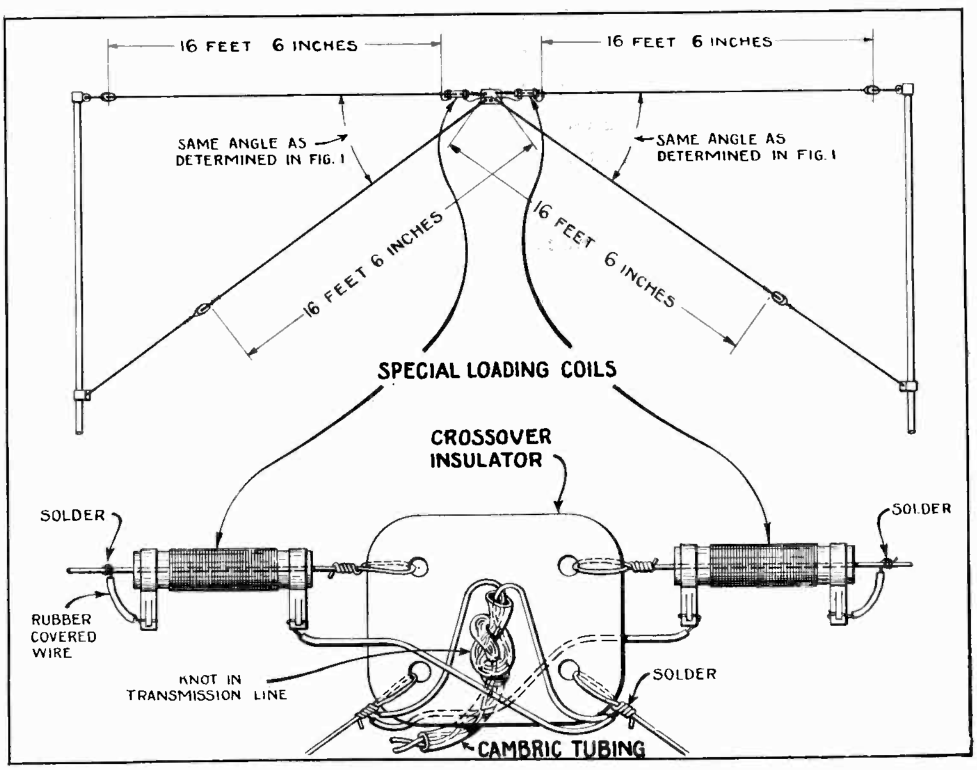

Figure 2

REPLACEMENT PARTS

Insist on genuine factory-tested parts, which are readily identified and may be purchased from authorized dealers

Stock No.	DESCRIPTION	List Price	Stock No.	DESCRIPTION	List Price
4324	Transformer (Coupling transformer and switch assembly)—For replacement purposes only; item to be replaced must be returned with order	$2.50	4327	Insulator (Crossover insulator)—For replacement purposes only; item to be replaced must be returned with order	$0.10
			4328	Transmission line (special lead-in—110 feet long)	3.72
			4329	Transmission line (special lead-in—220 feet long)	7.44
4325	Knob (Switch knob)—Package of 5	1.00	4330	Transmission line (special lead-in—330 feet long)	11.16
4326	Wire (2 rolls stranded wire, each 46½ feet long)	1.16	6958	Coil—Antenna loading coils—1 pair	.60